

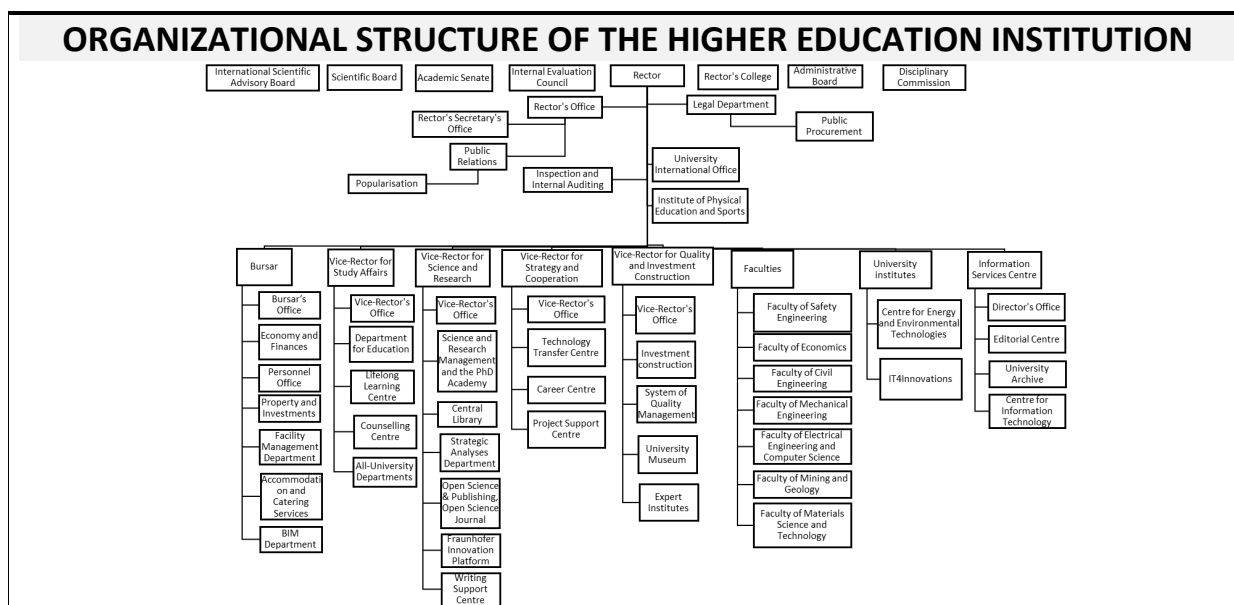
SELF-EVALUATION REPORT FOR EVALUATION OF RESEARCH ORGANIZATIONS IN THE SEGMENT OF HIGHER EDUCATION INSTITUTIONS IN YEAR 2025

VSB – Technical university of Ostrava

COMPANY REGISTRATION NUMBER (CRN): **CZ61989100**

THE LIST OF EVALUATION UNITS IN MODULE 3:

- 1. Faculty of Mining and Geology (FMG)**
- 2. Faculty of Materials Science and Technology (FMST)**
- 3. Faculty of Mechanical Engineering (FME)**
- 4. Faculty of Economics (FE)**
- 5. Faculty of Electrical Engineering and Computer Science (FEECS)**
- 6. Faculty of Civil Engineering (FCE)**
- 7. Faculty of Safety Engineering (FSE)**
- 8. IT4Innovations National Supercomputing Center (IT4I)**
- 9. Centre for Energy and Environmental Technologies (CEET)**



HIGHER EDUCATION INSTITUTION WEBSITE (HTML LINK): <https://www.vsb.cz/en>

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Signature (Rector), stamp

Introductory information about the evaluated higher education institution

The HEI briefly introduces itself. The organizational chart, the position of the HEI within the research, development and innovation system and the system of HEIs in the Czech Republic may be commented on, the mission and vision, the size of the HEI, the number and focus of the units evaluated will be briefly presented.

Maximum 500 words.

VSB-TUO is a technical university that combines technical, economic, scientific and artistic disciplines in modern study programmes that respond to the real problems of the present. We conduct cutting-edge basic and applied research in computing, supercomputing, energy, safety/security and materials engineering. Thanks to our tradition and cooperation with industry and many domestic and foreign universities in a wide range of fields, we offer innovative technical solutions in a number of fields and the security of employment for our graduates.

Our mission

VSB-TUO is a university with a technical and economic focus. The mission of the university is to shape the society through education, research, and innovation by:

- developing creative, entrepreneurial, and socially responsible citizens,
- generating knowledge to address the world's major global challenges,
- engaging in public debate and critical analysis on matters of social significance, and
- collaborating with businesses for the benefit of our students, our region, and the entire economy.

Our vision

We are a confident, industry respected university that successfully cultivates the individual professional and personal aspirations of future graduates. We are a unique, living laboratory with high-profile and internationally recognized research that addresses the society's future challenges in real time. Everyone at the University contributes to the future success of individuals, the University itself, and society as a whole.

Our values

The courage to innovate

We are distinctive for our curiosity and our desire to move things forward, beyond the horizon of current knowledge. We are a living laboratory where acquired knowledge is further developed and tested and verified for practical application. We have the courage to seek out non-traditional solutions to current and future challenges.

Achieving through quality

We strive for uniqueness in everything we do, and we do the things where we can be the best. For us, quality is not just a goal, it is the way we work. We work to achieve the maximum benefit in relation to our students, staff, and partners.

A team can do more

The diversity of our teams is one of the strengths of our University. Teamwork and solidarity, based on mutual respect and openness, are what unite our University as a single organism. We hold each other accountable to moral and ethical principles of conduct.

Conscious of our responsibility

We see ourselves as an integral part of the wider community. We want to set an example of

responsible behaviour and have a positive impact on the world around us. We believe in the transformative power of knowledge and consciousness.

Support and stability

We are a source of support for our students and employees and a reliable partner. We create a stable and safe environment for development of personalities, where innovative thoughts and ideas are born and grow. Practical education has become an integral part of our DNA.

Faculties

- [Faculty of Mining and Geology \(FMG\)](#)
- [Faculty of Materials Science and Technology \(FMST\)](#)
- [Faculty of Mechanical Engineering \(FME\)](#)
- [Faculty of Economics \(FE\)](#)
- [Faculty of Electrical Engineering and Computer Science \(FEECS\)](#)
- [Faculty of Civil Engineering \(FCE\)](#)
- [Faculty of Safety Engineering \(FSE\)](#)

Higher education institutes

- [IT4Innovations National Supercomputing Center \(IT4I\)](#)
- [Centre for Energy and Environmental Technologies \(CEET\)](#)

SWOT ANALYSIS	
Strengths ○ multidisciplinary character of professional focus ○ implementation of large projects such as REFRESH, MATUR, CirkArena, LERCO and increasing number of solved international projects ○ a large number of laboratories, high-end laboratory equipment and annual high investment in the development of these laboratories ○ stable projects partners (national and international) ○ motivational environment for academic and research staff – support of quality outputs (publication, application, project) ○ contract research ○ motivational university financing (with roughly a third of the funds coming from the ministry), ○ half of the funding allocated to scientific research activities ○ increase in top-tier international and domestic researchers at the university ○ active participation in applied research projects such as National Centres of Competence and cross-sector collaboration ○ profiling of university's research activities in defined areas	Weaknesses ○ a moderate increase in publications in prestigious journals included in Q1 and Q2 and citations of professional publications entering the criteria of the University methodology for dividing the subsidy for LCDRO (the long-term concept for developing the research organisation) – compared to leading universities in the Czech Republic ○ lower volume of patent licences sold; low success rate in commercialising the results of applied research ○ uneven involvement of academic staff in publication activities ○ uneven quantity and quality of R&D results for individual employees ○ unbalanced workload of individual employees ○ significant dependence of higher education institutes on funding from projects and the related difficulty of long-term planning
Opportunities ○ higher involvement in international scientific and research activities, international projects ○ creating and developing strategic partnerships with other, as well as foreign, universities to increase joint R&D projects and the number of foreign students ○ the opportunity is an already approved MATUR project, which, however, only includes certain	Threats ○ continued classification of VSB-TUO in category C (according to the national ranking of universities A-D) and the resulting lower sources of funding ○ excellent employees leaving University for a better offer and possible lack of human resources ○ insufficient financial resources for PhD students due to funding changes; lack of funding for PhD scholarships

specialisations ○ further development of support for workplace project activities in support of projects–administration, financial management ○ significant financial support for creative activity for both students and academics to increase motivation (education, publishing costs) ○ greater involvement of the European research area, e.g. through the Fraunhofer Innovation Platform ○ the recruitment of excellent researchers; an influx of top foreign experts with a direct impact on the service sector, and the strategic direction of MSR and the Czech Republic ○ an increase in the dynamics of the rise in Q1 and Q2 publications compared to other public universities ○ changes in strategic direction at the national level (e.g. in energy, AI, materials research)	will not allow for the establishment of intergenerational research teams with the prospect of further application in research and academia ○ outflow of PhD students ○ sustainability of large projects ○ great competition for research at the national, but especially international level ○ the frequent reluctance to cooperate within the University ○ further increase in administrative burden ○ the Czech Republic's unwelcoming visa policy (a problem in recruiting new staff, especially outside the EU) ○ non-transparent budget policy of the Ministry of Education, Youth and Sports concerning the R&D assessment – does not reflect inflation ○ instability of funding of national and European agencies for the provision of R&D support ○ the unsustainability of the built infrastructure due to insufficient funding for operation

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SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Faculty of Mining and Geology (FMG)

FORD: 1 - Natural sciences

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.¹ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

Mission and Vision of the Faculty

The Faculty of Mining and Geology (FMG) of VSB-TUO is a modern academic workplace that connects traditional mining and geology with current challenges of sustainable development, technological innovations, and environmental protection. The faculty aims to provide an excellent education in the areas of the raw materials industry, geology, geoinformatics, geodesy, environmental engineering, and economics linked to the management of natural resources.

The scientific research activities of the faculty focus on strategic topics such as efficient extraction and processing of raw materials, circular economy, sustainable development, industrial safety, and modern methods of data analysis and management. Within its vision, FMG strives for a strong international standing and close cooperation with industrial partners as well as academic institutions in the Czech Republic and abroad.

Societal Contribution of R&D&I and Long-Term Goals

The faculty has long been oriented towards applied research and innovations beneficial to industrial practice and society. The main areas of contribution include:

- Development of new methods of raw material extraction and treatment with minimal environmental impact,
- Optimization of geological and geoinformatics processes for effective resource utilization,
- Application of new technologies in landscape monitoring, mining sites, and environmental risks,
- Development of safety systems in the mining industry,
- Innovation in the areas of waste management, recycling, and sustainable resource handling.

¹ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

The faculty is actively involved in national and international research projects and supports interdisciplinary collaboration. It also provides expert consultations and knowledge transfer to industrial practice.

Organizational Structure and Size of the Faculty

The Faculty of Mining and Geology is divided into six departments, two science learning centres, and two purpose-built units:

Departments:

- Department of Geological Engineering,
- Department of Mining Engineering and Safety,
- Department of Geodesy and Mine Surveying,
- Department of Economics and Control Systems,
- Department of Environmental Engineering,
- Department of Geoinformatics.

Science learning centres:

- Geological Pavilion of Prof. F. Pošepný,
- Planetarium Ostrava.

Specialised facilities of the FMG:

- Institute of Clean Technologies for Extraction and Utilization of Energy Resources,
- Institute of Combined Studies in Most.

The faculty has a scientific research centre (the Institute of Clean Technologies for Mining and Utilization of Energy Resources) focused on applied research in the area of mining and environmental technologies.

Personnel Staffing

The average full-time equivalent (FTE) count of employees as of December 31, 2023, was 126.72 FTE, representing a slight increase compared to previous years. The academic community of the faculty consists of professors, associate professors, assistant professors, research staff, and technical-administrative employees.

Number of Students and Implemented Study Programmes

The faculty offers study programmes at all three levels (bachelor's, master's, and doctoral), and in 2023, there were 1 475 students. The programmes are oriented towards geosciences and technical disciplines associated with mining, geoinformatics, environmental engineering, and raw materials economics.

Overall, the faculty focuses on linking theoretical education with practical application, while emphasizing the quality of the teaching process, research excellence, and cooperation with industry.

Table 3.1.1 - Staffing per FTE²

Academic/Professional position	Total/Of which women					
	2019	2020	2021	2022	2023	Total
Professor	10,2/0,5	9,6/0,5	9,7/1,1	11,6/1,5	13,9/2,4	13/2
Associate Professor	29,0/8,3	28,5/8,7	27,2/8,7	25,3/8,4	25,9/7,8	29/8
Assistant Professor	48,5/26,2	39,8/18,4	39,1/17,7	41,7/16,5	42,1/15,7	48/26
Assistant	0,6/0,6	0/0	0,1/0	0/0	0/0	0,6/0
R&D Personnel ³	4,8/1,5	2,4/1	1,4/0,3	0,5/0,2	0,3/0,1	4/1
Researchers in other categories ⁴	14,8/5,5	2,8/0,6	2,2/0,3	4,9/0,8	5,1/1,2	14/5
Technical and economic staff ⁵	44,8/34,2	37,6/30,2	36,5/29,9	35,5/29,6	34,9/28,9	44/34
Scientific, research and development staff involved in teaching activities	88,98/35,59	77,95/27,62	76,02/27,53	78,58/26,36	81,85/25,87	88/35
Early career researchers ⁶	9,91/4,3	10,33/3,99	10,2/3,5	10,52/3,71	5,95/3,23	10/4
Total ⁷	153,6/76,8	120,8/59,4	116,2/58,0	119,5/56,9	122,2/56,1	153/76

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

² The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

³ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

⁴ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

⁵ Who participates in the management and support of R&D&I in the institution.

⁶ See Definition of Terms in Methodology HEI2025+.

⁷ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 of the evaluation period (numbers of physical employees and personnel)⁸

Academic/professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor					2				5	1	5	
Associate Professor			3		13	3	9	6	4		2	
Assistant Professor	2	1	18	6	7	4	16	11	7	4		
Assistant												
R&D Personnel ⁹	8	3										
Researchers in other categories ¹⁰	3	3	2	1	1	1	2		2		1	
Technical and economic staff ¹¹	1	1	4	4	16	12	17	14	5	3		
Scientific, research and development staff involved in teaching activities	2	1	21	6	23	7	25	17	17	5	7	
Early career researcher ¹²			13	4	5	2	1	1	1			
Total¹³	14	8	27	11	29	20	44	31	23	8	8	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

⁸ The total number of employees/workers as of 31st December of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

⁹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁰ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹¹ Who participates in the management and support of R&D&I in the institution.

¹² See Definition of Terms in Methodology HEI2025+.

¹³ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the last year of the evaluation period (numbers of physical employees and personnel)¹⁴

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor					2	1	5	2	3	1	6	
Associate Professor			3	1	12	2	7	3	6	3	1	
Assistant Professor	2		13		17	10	6	2	8	5	2	
Assistant												
R&D Personnel ¹⁵												
Researchers in other categories ¹⁶	1	1	5	1	1				2			
Technical and economic staff ¹⁷	1		4	4	11	10	14	12	4	4		
Scientific, research and development staff involved in teaching activities	2		16	1	31	13	18	7	17	8	9	
Early career researcher ¹⁸			2		2	2	2	2			1	
Total¹⁹	4	1	25	6	43	23	32	19	23	12	9	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

¹⁴ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

¹⁵ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁶ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁷ Who participates in the management and support of R&D&I in the institution.

¹⁸ See Definition of Terms in Methodology HEI2025+.

¹⁹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	626	246	666	279	744	290	861	353	953	371	3850	1539
Master's ²⁰	503	242	462	202	464	192	481	218	343	160	2253	1014
Doctoral	255	96	261	98	214	82	190	69	179	71	1099	416
Lifelong Learning Courses	163		170		173		174	78	267	113	949	192
Total	1547	584	1559	579	1595	564	1706	718	1742	715	8151	3161

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ²¹ / Of which professional study programmes											
	year 1		year 2		year 3		year 4		year 5		Total	
Undergraduate	9/5		15/6		17/7		16/8		16/8		23/11	
Master's	7/5		15/8		20/9		19/9		19/9		23/12	
Doctoral	12/10		14/10		17/13		17/12		17/12		19/13	
Lifelong Learning courses	6/0	4/0	9/0	4/0	18/0	1/0	18/0	1/0	27/0	1/0	27/0	4/0
Total	34/20	4/0	53/24	4/0	78/29	1/0	70/29	1/0	79/29	1/0	92/36	4/0

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

²⁰ All master's degree students are listed, regardless of the length of their programme of study.

²¹ The total number of study programmes for which admissions have been announced in a given academic year.

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	0,64	Applied Research	43,14
	1.2 Computer and information sciences	3,36	Applied Research	
	1.3 Physical sciences	3,00	Balanced basic and applied research	
	1.4 Chemical sciences	3,71	Balanced basic and applied research	
	1.5 Earth and related environmental sciences	28,21	Balanced basic and applied research	
	1.6 Biological sciences	0,43	Basic Research	
	1.7 Other natural sciences	3,79	Balanced basic and applied research	
2. Engineering and Technology	2.1 Civil engineering	0,43	Applied Research	48,71
	2.2 Electrical engineering, Electronic engineering, Information engineering	2,14	Applied Research	
	2.3 Mechanical engineering	1,93	Applied Research	
	2.4 Chemical engineering	0,71	Applied Research	
	2.5 Materials engineering	1,79	Applied Research	
	2.6 Medical engineering	0		
	2.7 Environmental engineering	35,71	Balanced basic and applied research	
	2.8 Environmental biotechnology	0,29	Balanced basic and applied research	
	2.9 Industrial biotechnology	0		
	2.10 Nanotechnology	1,29	Basic Research	
	2.11 Other engineering and technologies	4,43	Balanced basic and applied research	
3. Medical and Health Sciences	3.1 Basic medicine	0		0
	3.2 Clinical medicine	0		
	3.3 Health sciences	0		
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries	0		0
	4.2 Animal and Dairy science	0		
	4.3 Veterinary science	0		
	4.4 Other agricultural sciences	0		
5. Social Sciences	5.1 Psychology and cognitive sciences	0		7,57
	5.2 Economics and Business	2,86	Applied Research	

	5.3 Education	0,85	Balanced basic and applied research	
	5.4 Sociology	0		
	5.5 Law	0		
	5.6 Political science	0		
	5.7 Social and economic geography	3,86	Basic Research	
	5.8 Media and communications	0		
	5.9 Other social sciences	0		
6. Humanities and the Arts	6.1 History and Archaeology	0		0,57
	6.2 Languages and Literature	0,57	Basic Research	
	6.3 Philosophy, Ethics and Religion	0		
	6.4 Arts (arts, history of arts, performing arts, music)	0		
	6.5 Other Humanities and the Arts	0		
Total		100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the previous five-year period based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

Over the past period, the Faculty of Mining and Geology has established itself as an important research centre with strong international connections. The results of its research teams are regularly published in prestigious scientific journals, and its academic staff hold significant roles in professional organisations and project calls. Active involvement in the international scientific community and the continuous enhancement of the faculty's reputation confirms its long-term commitment to excellence in research and education.

An interdisciplinary approach and significant ties to international research institutions characterise the faculty. Evidence of this position is not only its long-term collaboration with universities worldwide but also its engagement in prestigious initiatives such as the European Energy Research Alliance (EERA) or the evaluation of projects under the COST programme. These activities enable the connection of Czech research with the latest global trends and strengthen its impact.

Membership of Prof. Ing. Jan Nečas, Ph.D. and Prof. Ing. Jiří Zegzulka, Ph.D. in the European Federation of Chemical Engineering (EFCE), specifically in the Mechanics of Particulate Solids working group (prof. Ing. Jan Nečas, Ph.D. being an elected member), represents a significant international recognition of expertise in the field of bulk solids mechanics.

Among the specific outputs of the faculty that contributed to its international recognition is the work of Prof. Ing. Marian Marschalko, Ph.D., who was ranked among the top 2% of the world's most cited scientists in the fields of Mining & Metallurgy and Geological & Geomatics Engineering. Another example is a highly cited article published in 2019 by Ing. M. Šafář, Ph.D. and Prof. Ing. H. Raclavská, CSc., which ranked among the top 1% most cited publications in the field of engineering, for which a Web of Science award was received (Highly cited paper: As of July/August 2024, this highly cited paper received enough citations to place it in the top 1% of the academic field of Engineering based on a highly cited threshold for the field and publication year).

Oldřich Motyka achieved significant recognition in the scientific community by winning the prestigious Czech POLYMATH popularisation competition. This national contest, supported by 21 universities, showcases the best science communicators across disciplines. His engaging and insightful stand-up performance on the hidden secrets of plants captivated the audience and secured him the title. This achievement highlights not only his deep scientific expertise but also his exceptional ability to communicate complex topics in an engaging manner, further enhancing the university's reputation in science popularisation.

The faculty is also significantly involved in the organisation and professional leadership of

international scientific conferences and seminars. For example, Prof. Ing. Jan Nečas, Ph.D. was a keynote speaker at prestigious meetings in Norway, at the University of Trondheim and Fagskolen i Finnmark, where he lectured on applying DEM simulations in industrial processes. Furthermore, Assoc. Prof. Ing. Pavel Staša, Ph.D., as a Keynote speaker, gave an invited lecture at ICSM 2019 – International Conference on Smart Manufacturing in Malaysia, titled “Czech Industry (Past, Present, Future),” and also was invited to give a lecture at Kyushu University in Japan (New Possibilities and Approaches to Smart Manufacturing and Safety Management in Industry). Ing. Filip Beneš, Ph.D. gave an invited lecture at Universitas Gadjah Mada on the topic: Virtual and Augmented Reality Use Cases and Their Potential. Such activities not only strengthen the faculty’s reputation but also create important ties for future collaboration.

Assoc. Prof. Ing. Pavel Staša, Ph.D. is also a member of the organising committee of CINEST – International Symposium on Earth Science and Technology. (<https://mine.kyushu-u.ac.jp/cinest/committees/>). This ensures the faculty’s involvement in international activities in the field of Earth sciences and technology, enhances its prestige, and enables the dissemination of research results on a global forum.

In the area of academic collaboration and pedagogical excellence, the faculty regularly hosts leading experts from around the world. One the significant lecturers was, for instance, Prof. Francesco Nex from the University of Twente, who shared the latest insights in the field of UAV mapping, or Prof. Blaž Zupan from the Baylor College of Medicine, who led an interactive workshop on the application of data science in geoinformatics.

In its strategic priorities, the faculty focuses on further developing its research base, strengthening international cooperation, and more intensive participation in prestigious EU research programmes (Horizon, COST, Interreg, Era-Min). It also plans to expand research capacities in the area of advanced data analysis and artificial intelligence, reflecting current trends in scientific disciplines related to sustainable management of natural resources.

Thanks to these ambitions, FMG is profiling itself as a key academic institution capable of responding to global challenges in the field of the raw materials industry and environmental safety.

The Faculty of Mining and Geology has established a solid position in the international scientific community, and thanks to its vision, expertise, and research activities, it ranks among the leading academic institutions in geosciences, raw material extraction, and environmental management.

Prestigious R&D&I Awards:

During the past period, the FMG participated in significant research activities that led to awards for academic staff. Among the most significant awards are:

- Prof. Ing. Marian Marschalko, Ph.D. – Inclusion among the top 2% of the world’s best scientists according to Stanford University in Mining & Metallurgy and Geological & Geomatics Engineering. (<https://www.vsb.cz/veda/en/news-detail/?reportId=42675&linkBack=%2Fveda%2Fen%2Fnews%2Findex.html>)
- Assoc. Prof. Ing. Martin Klempa, Ph.D. – Special Jury Prize in the “Publishing Achievement of 2023” (Památková komora ČR).
- Ing. M. Šafář, Ph.D. and Prof. Ing. H. Raclavská, CSc. – Web of Science (Highly cited paper).
- Prof. Ing. Jan Kostelecký, DrSc. and Prof. Ing. Hana Staňková, Ph.D. – Award of the prestigious “SKV rating” (System of Quality Outcomes) with a score of 2 for social relevance (Ministry of Education, Youth and Sports of the Czech Republic).

- Ing. Oldřich Motyka, Ph.D. - Czech POLYMATH (1st place winner): (<https://www.vsb.cz/en/news-detail/?reportId=46445>)

Membership in Significant International Organizations:

- Prof. Ing. Jan Nečas, Ph.D.: European Federation of Chemical Engineering (EFCE), Elected Member – European Federation of Chemical Engineering, working party Mechanics of Particulate Solids.
- Prof. Ing. Jiří Zegzulka, Ph.D.: European Federation of Chemical Engineering (EFCE), National Delegate – European Federation of Chemical Engineering, working party Mechanics of Particulate Solids.
- (<https://efce.info/Scientific+Groups/Mechanics+of+Particulate+Solids/Members/Elected+Members.html>)
- (<https://efce.info/Scientific+Groups/Mechanics+of+Particulate+Solids/Members/Delegates.html>)

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
prof. Ing. Marian Marschalko, Ph.D.	Ranked among the top 2% of scientists in the world by Stanford University in Mining & Metallurgy and Geological & Geomatics Engineering	Stanford University
Assoc. Prof. Ing. Martin Klempa, Ph.D.	Special Jury Prize in the category "Editorial Achievement of the Year 2023" My Homeland in the Heart of Europe – Get to Know It and Protect It	The Heritage Chamber of the Czech Republic in cooperation with the Czech Council for Children and Youth, the Association of Non-Governmental Non-Profit Organizations in the Czech Republic and other partners under the patronage of the National Heritage Institute
prof. Ing. Jan Kostecký, DrSc.	Awarding of the prestigious SKV mark with a rating of 2 for social relevance (R&D Assessment Module 1)	MEYS
prof. Ing. Hana Staňková, Ph.D.	Awarding of the prestigious SKV mark with a rating of 2 for social relevance (R&D Assessment Module 1)	MEYS
Ing. M. Šafář, Ph.D. and prof. Ing. H. Raclavská, CSc.	Highly cited paper (published in 2019)	Web of Science
Ing. Oldřich Motyka, Ph.D.	Czech POLYMATH	Night of Scientists

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
prof. Ing. Marian Marschalko, Ph.D.	Archives of Mining Sciences (0860-7001), Geologos (1426-8981) http://archives.pl/about-the-journal/ http://www.geologos.com.pl/editors.php
prof. Ing. Hana Staňková, Ph.D. and Assoc. Prof. Ing. Pavel Černota, Ph.D.	Inżynieria Mineralna – Journal of the Polish Mineral Engineering Society (1640-4920) http://www.potopk.com.pl/an_czlonkowie.html
RNDr. Michal Nemčok, DrSc.	Geological Society Special Publication (0305-8719) http://michalnemcok.sk/cv/
prof. Ing. Vojtěch Václavík, Ph.D.	Materials (1996-1944) and GeoScience Engineering (1802-5420)
Assoc. Prof. Ing. Michal Kačmařík, Ph.D.	Sensors (1424-8220) and ISPRS International Journal of Geo-Information (2220-9964)
prof. Dr. Ing. Jiří Horák	Geographia Cassoviensis (1337-6748) https://gcass.science.upjs.sk/redak%C4%8Dn%C3%A1-rada
Ing. Radmila Sousedíková, Ph.D.	Editor-in-Chief GeoScience Engineering journal (1802-5420)

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
Assoc. Prof. Ing. Pavel Staša, Ph.D.	Czech Industry (Past, Present, Future)	ICSM 2019 – International Conference on Smart Manufacturing; Penang Malaysia	2019
Assoc. Prof. Mgr. Hana Vojtková, Ph.D.	Microorganisms as bioindicators of the state of reclamation in post-mining areas	Comenius University Bratislava	2022
Assoc. Prof. Ing. Mgr. Kateřina Peterek Dědková, Ph.D.	Selected nano- and microscopic particles báseň on metal oxides: Properties, applications and their presence in the environment	University, Utrecht, Netherland	2022
Assoc. Prof. Ing. Michal Kačmařík, Ph.D.	GNSS in displacement monitoring and meteorology applications	GI-Forum, University of Münster, Institute for geoinformatics, Germany	2022
Ing. Pavel Kukuliač, Ph.D.	Series of seminars in the field of geoinformatics (ArcGIS online, Geoserver, QGIS programming, Spatial databases Postgres, Machine Learning in GIS 1 and 2)	The University of British Columbia, Faculty of science, Earth Ocean & Atmospheric Sciences Dept., Vancouver, British Columbia, Canada	2022-2023
prof. Ing. Jan Nečas, Ph.D.	DEM Simulations: Research and Development, Industry Applications, and Knowledge Transfer in Bulk Materials	University of Trondheim, Norway	2023
Assoc. Prof. Ing. Jiří Rozbroj,	Particle Technology Lab team introduction and	University of Salerno, Italy	2023

Ph.D.	DEM use in the science and development		
Mgr. et Mgr. Kamila Pokorná	Circular Economy and the Czech Republic	Edinburgh Napier University, Great Britain	2023
Assoc. Prof. Ing. Pavel Staša, Ph.D.	New Possibilities and Approaches to Smart Manufacturing and Safety Management in Industry	Kyushu University, Japan	2023
Ing. Filip Beneš, Ph.D.	Virtual and Augmented Reality Use Cases and Their Potential	Universitas Gadjah Mada, Indonesia	2023

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Blaž Zupan, prof.	Baylor College of Medicine, Houston, USA	Gentle Introduction to Data Science: A Hands-on Workshop	2019
Francesco Nex, prof.	University of Twente, Netherlands	Towards real-time UAV mapping	2020
Fabio Remondino, prof.	FBK Trento, Italy	Dense Image Matching and Multi View Stereo in Urban Areas	2020
Stephan Michael Weiss, prof.	Alpen-Adria-Universität Klagenfurt, Austria	Visual-Inertial Navigation: Basics and Beyond	2021
Maria Brovelli, prof.	Politecnico di Milano, Italy	Citizen Science and Smart Communities	2022
Krzysztof Labus	Silesian University of Technology	Underground storage of energy in form of hydrogen and ammonia	2022
Dr. Ing. Tansel Dogan	Technische Hochschule Georg Agricola, Bochum, Germany	Social impacts of mining and post mining	2022
Silvia Irene Carrasquero	Universidad Nacional de La Plata, Argentina	The geological collection from the Scottish National Antarctic Expedition (1902–04) in the Museo de La Plata, Argentina	2022
Prof. Francisco Javier Iglesias Rodríguez	Universidad de Oviedo, Spain	Re-usage of abandoned mines for underground laboratories, museums and showrooms.	2022
Róžański Zenon	Silesian University of Technology Gliwice	Issues related to the fire hazard on Polish mining waste dumps and methods of early detection of fires	2023

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the authority/guarantor contracting of the project/programme call	Year
prof. Ing. Jiří Zegzulka, Ph.D.	TREND, Environment for Life Programme, ZÉTA	TAČR	Since 2020
prof. Ing. Jan Nečas, Ph.D.	TREND, EPSILON	TAČR	Since 2020
prof. Dr. Ing. Jiří Horák,	Member of the P404 Evaluation Panel Environment for Life Programme, ZÉTA, ÉTA	GAČR TAČR	2019-2023
Ing. D. Žurovec, Ph.D. a Ing. J. Hlosta, Ph.D.	TREND	TAČR	Since 2021
assoc. prof. Ing. Petr Rapant, CSc.	DOPRAVA 2020+ and DOPRAVA 2030	TAČR	Since 2020
assoc. prof. Ing. Michal Kačmařík Ph.D.	BETA2	TACŘ	2019-2022
assoc. prof. Ing. Pavel Staša, Ph.D.	TREND, ALFA, EPSILON, SECTECH 1, VEGA projects	TAČR, Ministry of the Interior, VEGA	Since 2018
assoc. prof. Mgr. Hana Vojtková, Ph.D.	VEGA projects	VEGA	2020-2021
Prof. Ing. H. Raclavská, CSc.	COST European Cooperation in Science and Technology	MEYS	Since 2018
Ing. M. Kucbel, Ph.D.	Interreg Central Europe	EU	2017-2020

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research²²) that it has implemented or participated in during the evaluation period²³. This should be done from the full list in annex tables (Table 3.3.1-3.3.2)²⁴, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

²² For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

²³ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

²⁴ The evaluated unit shall only fill tables that are relevant to it.

The Faculty of Mining and Geology (FMG) is actively involved in the implementation of research projects that have a significant scientific as well as application impact. Key areas include the mining of mineral resources, environmental engineering, geoinformatics, and modern technologies in industry.

During the last evaluated period, the faculty carried out a number of prestigious projects and research activities within contract research that supported its mission and strategic goals.

1. Competence Centre for Effective and Ecological Mining of Mineral Resources (TAČR, TE02000029)

The project contributes to developing innovative mining methods that emphasise sustainability and minimise environmental impact. The results help reduce the negative environmental impacts of mining and support safer and more efficient resource utilisation.

- **Project Objective:** Review the reserves of selected non-energy resources and develop innovative methods and technologies for resource extraction with minimal negative environmental impact.
- **Results:** Introduction of predictive risk analysis methods in mining processes, optimising geotechnical solutions for mine reclamation.
- **Application Potential:** Use in the mining industry, ecological footprint reduction, and work safety improvement.

2. Development of autonomous driving smart air cleaner and safety control services platform for improving indoor air quality (IAQ) in industrial and public sites (TAČR, TM04000003)

The project focuses on improving air quality in urban and industrial spaces. The development of advanced filtration systems increases public health protection and reduces air pollution, especially for use in public transport.

- **Project Objective:** Improve air quality in industrial and public spaces.
- **Results:** Development of advanced filtration systems with automatic regeneration.
- **Application Potential:** Possibility of implementation in urban transport and industrial enterprises. The project, which is still in progress, reflects the department's focus on ecological and technological innovations. The contribution of FMG consists mainly of testing sensor modules and designing and developing functional prototypes, especially regarding the detection of the number of people in a given area, which contributes to the sustainability and energy efficiency of the solution. An interdisciplinary approach involves collaboration among environmental, electrical, and material technologies specialists. Cooperation with Czech Technical University in Prague, GABEN, EnviTech, and Korean partners enables the development of sensor prototypes and a filtration system. A significant result of the project will be new functional prototypes and modules that can be used in public transport and industry.

3. Accessibility modelling for seniors, perception of accessibility and determinants of their spatial mobility (GAČR, GA21-22276S)

The project's goal is to increase the mobility of seniors in urban areas through better urban planning. The results enable the optimisation of public transport and increased accessibility of services for the older population.

- **Project Objective:** Analysis and optimisation of transport infrastructure for seniors.

- **Results:** Development of accessibility assessment methods using AI and GIS.
- **Application Potential:** Use in urban planning and optimisation of public transport.

4. Research of the composition of air at mining activities and activities carried out by mining method for determination of minimum volumetric flow of winds (TAČR, TITSCBU701)

The project helps improve working conditions in mines by optimising ventilation and reducing dust risks. This reduces health risks for miners and increases the efficiency of mining operations.

- **Project Objective:** Improve working environments in mines.
- **Results:** Development of methodologies for optimising ventilation and reducing dust.
- **Application Potential:** Implementation in underground mining and industry.

5. Inventory Control Platform Using AI based Drone with inventory exploration and recognition (TAČR, TM02000071)

The project focused on introducing modern technologies into logistics, which has led to more efficient inventory management and lower operating costs. The results have contributed to increased automation and digitisation of logistics processes.

- **Project Objective:** Automation and optimisation of warehouse management using advanced technologies.
- **Results:** Development of a compact RFID reader for drone implementation, design and testing methodologies for optimal placement of RFID tags in logistics warehouses.
- **Application Potential:** Increasing inventory management efficiency, automating inventory counts, and reducing operating costs in warehouse facilities. The project contributed to fulfilling the mission and vision of the faculty, particularly in applied research aimed at industrial systems and logistics. Developing a compact RFID reader with drone implementation represents an innovative approach to automation in warehouse management. The research team contributed mainly to designing and testing the reading device, creating optimal RFID tag placement methodologies, and integrating them into information systems. Key interdisciplinary aspects of the project include linking electronics, automatic identification, and drones, with overlaps to IoT and logistics. The project results include not only functional prototypes but also scientific publications that increase the institution's international visibility. Collaboration with GABEN was crucial for developing the hardware part of the solution.

6. Investigation of the possibilities of using closed underground mines in the Czech Republic for energy purposes and as a potential of water resources (TAČR, TIRSMPO906)

The project examines the possibilities of converting closed mines into renewable energy sources. The results contribute to the sustainable use of abandoned infrastructure and the energy self-sufficiency of regions.

- **Project Objective:** Develop options for using abandoned mines as energy sources.
- **Results:** Studies on the use of mine water for geothermal heating and energy storage.
- **Application Potential:** Renewable energy sources, regional development.

7. Research on Biodegradation and Ecological Impacts of Microorganisms on Mining Sites (ECOCOAL, s.r.o.)

The project involves using microorganisms to ecologically remediate mining areas. The results lead

to more effective reclamation of affected sites and reduced environmental burden.

- **Project Objective:** Identify microorganisms capable of natural remediation of contaminated sites.
- **Results:** Developed biological remediation methods for mining and industrial waste.
- **Application Potential:** Environmental protection, ecological mining.

8. Development of the play-fairway system for the low-temperature geothermal system exploration in sedimentary basins; with application to the Vienna Basin (TAČR, TK05020137)

The project supports the identification and use of new geothermal energy sources, contributing to the development of sustainable energy solutions and reducing the carbon footprint.

- **Project Objective:** Identification of new geothermal sources.
- **Results:** Advanced modelling of geothermal potentials using GIS and remote sensing.
- **Application Potential:** Sustainable energy sources, urban planning.

9. Earth Observation Automated Monitoring Open Platform (ESA, CGI IT Czech Republic)

The project focuses on automated landscape change monitoring using satellite data. The results enable efficient crisis management and better urban development planning.

- **Project Objective:** Automated monitoring of landscape changes using satellite data.
- **Results:** Development of a platform for monitoring floods, landslides, and urban changes.
- **Application Potential:** Crisis management, territorial development planning.

10. Rock Environment and Natural Resources (TAČR, SS02030023)

The “Rock Environment and Natural Resources” project focuses on the research of geological risks, the protection of water resources, and the identification of strategic resources in the Czech Republic. The results contribute to improved territorial planning, environmental protection, and optimisation of mining processes.

- **Project Objective:** The project aims to research the rock environment, geological risks, and strategic mineral resources in the Czech Republic. It focuses on protecting water resources in karst areas and predicting slope movements, thus supporting the effective management of natural resources and spatial planning.
- **Results:** Identification and classification of strategic resources and their usability. Development of methodologies for protecting karst water sources. Modelling geological risks and slope movements. Implementing modern technologies (GIS, remote sensing, geophysics) to analyse the rock environment. Recommendations for state administration and industrial partners in the area of mining and land protection.
- **Application Potential:** Support for state administration – results contribute to better regulation of mining and protection of water resources. Damage reduction – prediction of geological risks helps minimise costs for site stabilisation. Innovation in exploration – using modern technologies increases the accuracy of geological analyses. Collaboration with industry – results help mining and geotechnical companies optimise processes. VSB-TUO (FMG) contributes to the solution in resource identification, hydrogeological analyses, and geological risk modelling. The project connects geology, hydrogeology, and geotechnics in cooperation with the Czech Geological Survey (main coordinator), DIAMO, G E T s.r.o., and the Institute of Geonics of the Czech Academy of Sciences. The project results support the sustainable management of resources and landscape protection. The contribution of

Research Projects to the Mission of the Faculty.

FMG projects contribute to the development of science and innovation, which has direct impacts on the economy and the environment. The faculty focuses on interdisciplinary research, connects academia with industry, and supports the application of modern technologies. A significant part of the research activities is carried out within the framework of international projects, which strengthens global collaboration and enables the sharing of the latest scientific knowledge with partners from various countries. Collaboration with prestigious foreign institutions and participation in EU and ESA research programs confirm the faculty's excellent research skills. The project results are applicable not only in the academic environment but also directly impact industry, public administration, and the sustainable development of society.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ²⁵	Project name	Support (in thousands CZK/EUR) ²⁶				
		2019	2020	2021	2022	2023
TACR	Competence Centre for Effective and Ecological Mining of Mineral Resources (TE02000029)	7 654/ 301 932,94				
TACR	Investigation of the possibilities of using closed underground mines in the Czech Republic for energy purposes and as a potential of water resources (TIRSMPO906)		3 171/ 125 088,76	2 629/ 103 708,09	162/ 6 390,53	
MEYS	Institute of clean technologies for mining and utilization of raw materials for energy use - Sustainability program (LO1406)	7 031/ 277 357				
Ministry of the Interior	Finding unexploded aerial ammunition of World War II (VI20192021160)	241/ 9 506,9	653/ 25759,37	565/ 22 287,97		
GACR	Accessibility modelling for seniors, perception of accessibility and determinants of their spatial mobility (GA21-22276S)			1 006/ 39 684,42	1 040/ 41 025,64	1 027/ 40 512,82
TACR	Sensor measurements of urban footways to support mobility of disabled people (CK01000190)		1 035/ 40 828,4	1 169/ 46 114,4	555/ 21 893,49	881/ 34 753,45
TACR	Research of the composition of air at mining activities and activities carried out by mining methodology	1 176/ 46 390,53				

²⁵ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

²⁶ Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

	for determination of minimum volumetric flow of winds (TITSCBU701)					
TACR	Development of the play-fairway system for the low-temperature geothermal system exploration in sedimentary basins; with application to the Vienna Basin (TK05020137)					1 991/ 78 540,43
GACR	Petrogenesis and emplacement of deep-marine alkaline basaltoids: a case of Early Cretaceous magmatism in the northern Tethys region (GA21-30043S)			1 435/ 56 607,5	1 629/ 64 260,35	990/ 39 053,25
Visegrad grants	Geological and Montane Heritage in the Border Area of the Upper Silesian Basin - Pictorial Guide			104,06/ 4 104,93	190,13/ 7 500,2	
MEYS	Mining the European Anthroposphere (LTC17051)	725/ 28 599,6	143/ 5 641			
MEYS	Metal-microorganisms' interactions as a basis for progressive biotechnological processes		125/ 4 900	125/ 4 900		
Foreign grants	Neutron Activation Analysis and Atomic Absorption Spectrometry for Soil and Vegetation Pollution Studies in post - mining landscape in the Moravian-Silesian Region in the Czech Republic		272/ 10 700	469/ 18 500		
Foreign grants	Instrumental neutron activation analysis and other analytical methods for determination of the influence of saline mine water on the vegetation (<i>Phragmites australis</i>)		99/ 3 900			
Interreg Czechia - Poland	Resource and Risk Assessment Associated with Invasive Plant Species in the Border Area	1 144/ 45 000				
INTERREG V-A Czechia - Poland	TERDUMP Cooperation of VŠB-TUO/GIG Katowice on the survey of burning heaps on both sides of the common border	3 230/ 127 416				
Total		21 201/ 836 202,97	5 498/ 216 817,53	7 502,06 295 907,31	3 576,13/ 141 070,21	4889/ 192 859,95
In the role of another participant						
Provider²⁷	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023

²⁷ Ibid.

TACR	IoT Based Intelligent Store (TF03000053)	1 170/ 46 153,85				
MEYS	U Health – Auto-ID technology and the Internet of Things to enhance the quality of health services (LTE117005)	1 130/ 44 575,94	665/ 26 232,74			
MPO	Hybrid solution based on advanced image analysis and RFID technologies in Industry 4.0. (EG16_084/0010285)	*603/23 78 7 **596/23 510,85	*737/ 29 072,98 **913/ 36 015,78			
TACR	Inventory Control Platform Using AI based Drone with inventory exploration and recognition (TM02000071)			1 720/ 67 850	1 938 76 449,7	1 836/ 72 426
TACR	Development of autonomous driving smart air cleaner and safety control services platform for improving indoor air quality(IAQ) in industrial and public sites (TM04000003)					1 466/ 57 830,37
GACR	Cretaceous-Paleogene boundary in Carpathians - multidisciplinary search for local variations in global cataclysm event (GA19-07516S)	432/ 17 041,42	439/ 17 317,55	447/ 17 633,14		
GACR	Leading edge instrumental methods in high resolution global Jurassic-Cretaceous boundary correlations (GA20-10035S)		477/ 18 816,57	671/ 26 469,43	647/ 25 522,68	
INTERREG Czech R. – Saxony cooperation program	GeoMap - Geological, hydrogeological and geomechanical modeling tools for the purpose of mitigating the consequences of mining activities and restoring areas affected by mining	2064,76/ 81 450	1 456,36/ 57 450			
INTERREG Czech R. – Saxony cooperation program	VODAMIN II Hazard potentials and use of mine waters for improving transboundary water protection in northern Bohemia and the Ore Mountains in the Elbe River basin	2 871,592/ 113 277,8	6 513,274/ 256 933,9			
TACR	Rock Environment and Natural Resources (SS02030023)		704/ 27 771,2	2 356/ 92 938,86	2 326/ 91 755,42	2 183/ 86 114,4
EU (EIT Raw Materials)	LIMBRA: Decreasing the Negative Outcomes of Brain Drain in the Raw Material Sector	922,185/ 36 378	665,643/ 26 258	1 051,215 41 468		
TACR	The Czech Academic Phrasebank and its use in research and teaching of academic writing (TL05000309)			118/ 4 700	236/ 9 300	321/ 12 600
EU	IP LIFE for Coal Mining Landscape				1 397/ 1 397/	

co-financed by the European LIFE programme, sub-programme Climate action	Adaptation (LIFE20 IPC/CZ/000004)				55 100	55 100
EU Research Fund for Coal & Steel	New technology for hydrogen and geopolymer composites production from post-mining waste					2 162/ 85 300
TACR	CO2 Storage Pilot in a Carbonate Reservoir (TO01000112)			*137/ 5 440,34 **774/ 30 532,54	1 195/ 47 140	1 168/ 46 074,95
Horizon 2020 EU	REWAISE Resilient Water Innovation for Smart Economy ; No 869496		2 648/ 104 457,59			
Ministerstvo vnitra	Mobile personal protective Respirator (VI04000041)			8 363/ 329 901,38	5 603/ 221 025,64	
EU RFCS Project	RECOVERY of degraded and transformed ecosystems in coal mining-affected areas	1 144/ 45 100	2 314/ 91 300	2 314/ 91 300	2 314/ 91 300	1 144/ 45 100
EU (EIT Raw Materials)	ProSkill Development of a Skill Ecosystem in the Visegrád Four countries		858/ 33 800	936/ 36 900	858/ 33 800	
Total		10 933,54/ 431 274,86	18 390,28/ 725 426,31	18 887,22/ 745 133,69	16 514/ 651 393,44	11 677/ 460 545,72

* Support from national funds

** Support from international funds

Table 3.3.2 - Contract research activities

Client ²⁸	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
DIAMO, s.p.	The summary of all contract research; can be referred to as: 'Analysis and Economic Models of Mineral Resource Extraction.'	360/ 14 201,18	777/ 30 650,9	1 513/ 59 684,42	1 022/ 40 315,58	2 695,6/ 106 335,3
Sdružení Velký metan - GEOSAN GROUP a. s., Energie - stavební a báňská a. s.	Contract for the Provision of Services for the Remediation of Environmental Damage	1 963/ 77 435,9	0	0	0	0
Třinecké železářny, a.s.	The summary of all contract research; can be referred to as: "Research and Application of Steel Slag and By-Products of Metallurgical Processes in Concrete Materials."	1 105/ 43 589,74	330/ 13 017,75	0	350/ 13 806,7	228/ 8 994
ORGREZ, a.s.	The summary of all contract research; can be referred to as: "Testing the Properties of Rocks and Materials."	371/ 14 635,1	245/ 9 664,7	372/ 14 674,56	265/ 10 453,65	469/ 18 500,99
SPP Storage, s.r.o.	The summary of all contract research; can be referred to as: "Laboratory Measurement and Evaluation of Geological Samples."	665/ 26 232,74	669/ 26 390,53	0	0	0
Palivový kombinát Ústí, státní podnik	The summary of all contract research; can be referred to as: "Studies and Methodologies for the Reclamation and Utilization of Water Bodies in Mining Areas."	988/ 38 947,36	404/ 15 936,9	0	0	0
CGI IT Czech Republic s.r.o (European Space Agency, Italy)	Earth Observation Automated Monitoring Open Platform	0	1 553/ 61 262,33	726/ 28 639	700/ 27 613,4	0
PressMetal	Innovation of production process; CZ.01.1.02/0.0/0.0/17_205/0014851	150/ 5 917,16	0	0	0	0
SUDOP PRAHA a.s.	The summary of all contract research; can be referred to as: "Geological and Structural-Technical Survey of Bridges and Culverts."	198 178/ 7 817,67	1 587,909/ 62 639,4	189,455/ 7 473,57	0	0
MND a. s.	The summary of all contract research; can be referred to as: "Verification of Possible Groundwater Contamination."	27/ 1 065	0	28/ 1 104,53	24/ 946,75	43/ 1 696,25
TATRA TRUCKS a.s.	The summary of all contract research; can be referred to as:	0	209,95	0	0	0

²⁸ If the client is from abroad, indicate in brackets the country of origin of the client.

	"Conducting Hydrogeological and Geophysical Surveys in the Wider Area of the Větkovice Reservoir."		8 282			
RWE Gas Storage CZ,s.r.o.	The summary of all contract research; can be referred to as: "Technical Work on Gasometric Probes in Underground Gas Storage Facilities."	0	0	258,812/ 10 209,55	403,398 15 913,14	255,915/ 10 095,27
Severočeské doly a.s.	Feasibility Studies and Assessments of Mining Projects.	1 265/ 49 901,38	0	0	0	0
K-GEO s.r.o.	The summary of all contract research; can be referred to as: "Technical Survey and Modernization of Railway Tracks."	300/ 11 834,32	44/ 1 735,7	225,42/ 8 892,3	0	0
Green Gas DPB, a.s.,	The summary of all contract research; can be referred to as: "Expert Assessment of the Implementation of Large-Diameter Drilling."	0	0	0	0	740,35/ 29 205,13
Liberty	Conducting Research Work for CO2 Storage in the Upper Silesian Basin.	0	0	1 501,352/ 59 224,93	0	0
ESAP Consult, s. r. o.	The summary of all contract research; can be referred to as: "Analysis, Measurement, and Certification of Material Samples."	4 407/ 173 846,15	1 998,9/ 78 852	0	0	0
Považská cementáren	Determination of the Properties of Steel Slag.	63/ 2 485,2	0	0	0	0
OKD, a. s.	The summary of all contract research; can be referred to as: "Geodetic Measurements and Ventilation Studies in Mines."	761/ 30 019,72	668/ 26 351	456/ 17 988,17	190/ 7 495	250/ 9 861,93
AARSLEFF	Technical Survey Work.	107,690/ 4 248,13	0	0	0	0
EVECO	Analysis	0	0	0	105,270/ 4 152,66	0
Univerzita Jana Evangelisty Purkyně, Ústí n.L.	Magnetic Separation of Civaldit Concentrate from Waste after Mining and Processing Sn-W Ores.	80/ 3 155,82	0	0	0	0
AARSLEFF Sp. z.o.o.	Conducting Drilling Work, Sampling.	89/ 3 510,85	0	0	0	0
Moravia Gas Storage, a.s.	Conducting Gasometric Drilling.	46/ 1 814,6	0	0	0	0
ŽDB DRÁTOVNÁ a.s.	Solidification of Phosphating Sludge.	148/ 5 838,26	0	0	0	0
GEMEC-UNION, a. s.	Drilling of 4 Boreholes to a Depth of Approximately 10m for Geological Profiling and Equipping Two for	0	43/ 1 696,25	0	0	0

	Long-Term Monitoring.					
EXprojekt s.r.o.	Conducting Core Drilling on the Bridge in Milotice nad Opavou.	0	49/ 1 932,94	0	0	0
VÁPENKA VITOŠOV s.r.o.	Geotechnical Monitoring, Measurement, and Evaluation of Inclinator Boreholes.	0	0	0	0	45/ 1 775,15
ČEZ	Heat Storage in Geological Structures.	0	0	0	0	215/ 8 481,26
ENERGETIKA TŘINEC, a.s.	Conducting Laboratory Tests for the Beneficiation of Hematite Ore.	0	0	250/ 9 861,93	0	0
EUROTALC s.r.o.	Geomechanical Assessment of the Mining Method at the EuroTalc Talc Mine in Gemerská Poloma.	0	0	0	0	343/ 13 530,57
OKK Koksovny, a.s.	Conducting Laboratory Tests – Chemical Assessment, Fusibility, Analytics, Determination of Ash Content, etc.	0	0	0	0	972/ 38 343,2
TRATEC s.r.o.	Creation of the POPD for the Ladce Cement Plant.	1 175/ 46 351	0	0	0	0
Veolia Energie ČR, a.s.	Technical assessment of the suitability of the existing coal handling system of the heating plant.	0	0	0	0	290/ 11 439,85
WISTA s.r.o.	Testing the functional properties of the prototype blasting device line and validation of the measured parameters in relation to Industry 4.0.	0	0	0	0	670/ 26 429,99
AŽD, s.r.o.	Creating track maps and verifying conditions for GNSS train locators.	233/ 9 191,32	171/ 6 745,56	374/ 14 753,45	0	0
Blumenbecker Prag, s.r.o.	Measurement of the geometry of the welding center TAF Olomouc.	25/ 986,19	0	0	0	0
Rizzo Associates Czech, s.r.o.	Preparation of a study on the suitability of the area for the placement of a nuclear source.	0	0	750/ 29 585,8	0	0
ITS – Intelligent transport, s.r.o.	Consulting and advisory services for DTMŽ; pilot study.	0	0	0	0	5 450/ 214 990,14
Správa železnic, s.o.	Creation of the SŽ M22 regulation.	0	0	0	0	360/ 14 201,18
Tomáš STRAUB s.r.o.	Application of construction recycled material and lime corrections in concrete production.	0	0	0	280/ 11 045,36	70/ 2 761,34
IN-EKO TEAM s.r.o.	Determination of qualitative parameters in treated wastewater.	0	0	200/ 7 889,55	0	200/ 7 889,55
ECOCOAL, s.r.o.	Research in the field of biodegradation properties of	0	120/ 4 733,73	0	0	0

	microorganisms.					
	Pyrolysis processing of samples and analysis of pyrolysis products.	0	0	0	100/ 3 944,77	0
Total		14 526,86/ 573 051	8 869,759/ 349 891	6 844,039/ 269 981,81	3 439,668/ 135 687,1	13 296,865/ 524 531,16

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the evaluated period, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts²⁹, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

The Faculty of Mining and Geology (FMG) is actively involved in transferring research results into practice, emphasising their applicability and societal impact. The research results are reflected in patented technologies, industrial innovations, certified methodologies, and expert analyses applicable to public administration and the private sector.

1) International Patent WO2023109987A1 – BULK BATTERY (2023)

- **Annotation:** The patent represents an innovative solution for efficient energy storage using the potential and kinetic energy of bulk material. The system enables a reversible conversion of electrical energy into mechanical and then back into electrical energy through a sophisticated system of conveyors, generators, and a control unit.
- **Impact:** The technology has broad industrial applications in energy storage and the optimisation of energy system operations. Its application contributes to higher efficiency in the renewable energy sector, increasing the efficiency of renewable energy sources and reducing electrical grid overload. It supports sustainable technologies with a minimal environmental footprint. It is possible to use it in industrial applications and as a decentralised energy source for emergency situations.
- **Sustainability:** The patent supports the development of low-carbon technologies and improves the possibility of storing excess energy from renewable sources.

2) Patent CZ308289 – Method of filling the mould for the manufacture of multi-casing tubes and equipment to carry out this method (2022)

- **Annotation:** An innovative method for the efficient production of multi-layer pipes aimed at reducing material losses and increasing the quality of products. License sold, addressed within the Sigma TAČR program.
- **Impact:** Reduction of material losses and lower production costs. Increase in the quality

²⁹ See Terms definition.

and longevity of the final products. Strengthening the competitiveness of industrial companies using this technology. Implementation in industrial production led to higher production efficiency and lower consumption of raw materials.

- **Sustainability:** Reduction of material waste in production.

3) Compact RFID reader for drones (Functional Prototype)

- **Annotation:** A lightweight and highly sensitive reader that allows drones to identify objects in logistics and warehouse management efficiently.
- **Impact:** Automation of inventory and reduction of operating costs. Increased efficiency of logistics operations, reduced costs, and time required for inventory. Minimisation of human error in logistics processes. Potential application in industrial areas and distribution centres.
- **Sustainability:** Minimization of human labour and energy efficiency in logistics processes.

4) System for Continuous Identification (Utility Model)

- **Annotation:** This is a technical solution of a system for continuous identification of an object equipped with a UHF RFID tag, containing an information display provided with an information system for reading and recognising UHF RFID tags, and also containing a conveyor, whose essence lies in the conveyor being equipped with an identification tunnel whose interior surfaces are fitted with at least one identification antenna adapted to transmit a signal into the space of the identification tunnel perpendicularly to its longitudinal axis.
- **Impact:** Increased accuracy and reliability of object identification.

5) Pilot-Scale Technology for Purifying Wastewater from Electroplating

- **Annotation:** An innovative method of removing RAS (chlorides) that significantly reduces wastewater pollution.
- **Impact:** The technology was tested on an industrial scale with up to 90% efficiency. It can reduce the environmental burden of industrial production, allow water recycling, and limit the consumption of primary resources. It can also improve the quality of discharged wastewater into the environment.
- **Sustainability:** Reduction of the impact of industrial wastewater on the environment.

6) EU Patent EP2339323: The method of simulation of kinetics movement of bulk solid particles and facilities to carry out the method (2019)

- **Annotation:** An advanced method for simulating the kinetics of bulk solid particles to analyze their movement and interactions under various conditions. The method utilizes a box model with adjustable tilt angles, vibration effects, and multiple process variations to achieve realistic particle flow simulations. The developed system enables precise modeling of stress transitions, particle behavior, and engineering parameter adjustments.
- **Impact:** Enhanced accuracy in predicting bulk material behavior, leading to optimized industrial processes. Improved efficiency in material handling, storage, and transportation systems. Reduction of operational risks and material losses in industrial applications.
- **Sustainability:** Minimization of material waste through precise simulation and optimization of bulk solid handling. Reduction of energy consumption in industrial processes by optimizing particle movement and flow dynamics.

7) Functional Prototype: Lightweight Concrete Based on Rubber Recyclate

- **Annotation:** An innovative building material with improved thermal insulation properties.
- **Impact:** Increased use of recycled materials in construction, reduction of the environmental footprint of construction projects, and improvement of the energy efficiency of buildings.
- **Sustainability:** Recycling of waste reduces environmental burden.

8) Methodology for the Identification and Assessment of Safety-Risk Locations in a City

- **Annotation:** The developed system combines objective criminal data with the perception mapping of residents. It has been implemented in Ostrava, Olomouc, and other cities to improve safety policies.
- **Impact:** Improved security in urban areas. Possibility of targeted planning of security measures. Minimisation of financial costs for security measures in cities.
- **Sustainability:** Increases residents' quality of life through targeted preventive measures.

9) Methodology for Processing Heterogeneous Transport Data Using GIS

- **Annotation:** The system enables efficient management of transport infrastructure and maintenance planning.
- **Impact:** Increased efficiency of transport infrastructure maintenance. Savings in public finances through optimisation of waste collection routes and road maintenance. Reduction of the environmental impacts of transport system operations.
- **Sustainability:** Reduces fuel consumption and CO₂ emissions.

10) Patent CZ 308764: Device for controlled separation of bulk materials (2021)

- **Annotation:** The patented device allows precise dividing and sampling of bulk materials.
- **Impact:** A project result of TAČR, included in the production program of the Orgres company. Increased accuracy in the analysis and processing of materials. Possibility of implementation in the mining and construction industries. Optimisation of production processes and waste reduction.
- **Sustainability:** Minimization of material waste and optimisation of resource use. Contribution of Research Results to Sustainability and the Gender Dimension. Most results contribute to sustainability by reducing the environmental impact of industrial processes, promoting recycling, and optimising resource utilisation.

These applied solutions significantly contribute to increasing the efficiency of industrial and environmental processes, supporting sustainability, and strengthening the competitiveness of Czech research internationally.

Contribution of Research Results to Sustainability and Gender Dimension

Most results contribute to sustainability by reducing the environmental impact of industrial processes, promoting recycling, and optimising resource utilisation. These applied solutions significantly enhance the efficiency of industrial and environmental processes, support sustainability, and strengthen the competitiveness of Czech research at the international level. The gender dimension has been explicitly considered in methodologies focused on urban safety, where differences in the perception of safety between men and women were analysed, enabling more targeted preventive measures. The faculty continues to support the development of innovations with high application potential, which positively impact society and industrial practice.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ³⁰	Year of application	Name
EU Patent https://register.epo.org/application?number=EP09466006 https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27730%2F19%3A10242016?query=xc5yaadvvyka	2019	The method of simulation of kinetics movement of bulk solid particles and facilities to carry out the method Output of the project: Sustainable Development of Center ENET (LO1404)
Functional prototype https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F20%3A10244299?query=5mmaaados56a	2020	Lightweight Concrete Based on Rubber Recyclate
Certified methodology https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F20%3A10245695?query=7iviaadopfng	2020	Methodology for the Identification and Assessment of Safety-Risk Locations in a City Output of project: Effective Methods of Identification, Assessment and Monitoring of Safety Risk Areas Using Spatial Micro-data (TJ01000465)
Utility model https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F21%3A10247150?query=qjwqaadwdk7q	2021	System for Continuous Identification Output of the project: IoT Based Intelligent Store (TF03000053)
Certified methodology https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F21%3A10246735?query=rjdaadwbmha#result-main	2021	Methodology for Processing Heterogeneous Transport Data Using GIS Output of the project: Effective approaches to economical and adaptable systems of maintenance and operation of transport networks (TH02010930)
Patent CZ https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F21%3A10249631?query=tpmyadv47ba	2021	Device for controlled separation of bulk Output of the project: Innovative development of a divider for powders effective analysis (TH02010028)
Patent https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F20%3A10246531?query=y26qaadvsh6q	2022	CZ308289 Method of filling the mould for the manufacture of multi-casing tubes and equipment to carry out this method Output of the project: Sustainable Development of Center ENET (LO1404)
Certified methodology https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F22%3A10251050?query=zjeaado3b6a	2022	Prediction of unexploded ordnance findings from aerial photographs. Output of the project VI20192021160 - Finding unexploded aerial ammunition of World War II

³⁰ Specify the specific type of result. Add rows as needed.

Pilot scale https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F22%3A10251225?query=v66yaadvyaba	2022	Pilot-Scale Technology for Purifying Wastewater from Electroplating Output of the project: Innovative technology of the closed loop water circulation in the electro-galvanizing process and processing of metal waste – sludges and filtration cakes from the galvanizing plant (SS01020312)
Functional prototype https://www.isvavai.cz/riv?s=rozsirene-vyhledavani&ss=detail&n=0&h=RIV%2F61989100%3A27350%2F23%3A10253120%21RIV24-TA0-27350 https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F23%3A10253120?query=2zsiaadovyxq	2023	Compact RFID reader for drones Output of the project: Inventory Control Platform Using AI based Drone with inventory exploration and recognition (TM02000071)
International patent https://worldwide.espacenet.com/patent/search/family/086774916/publication/WO2023109987A1?q=pn%3DWO2023109987A1	2023	WO2023109987A1 BULK BATTERY

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)³¹, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).³²

Additionally, the evaluated unit shall briefly comment on the funds received during the evaluation period from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

The Faculty of Mining and Geology (FMG) systematically transfers research results into practice through collaboration with industrial partners, public administration, and foreign entities. The main tools of this transfer are contract research, applied research funded by grants and project

³¹ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

³² If the commercialisation of R&D&I results is carried out in this way.

resources, the creation of methodologies and technological solutions, and the licensing of patented results.

The faculty also utilises university support mechanisms for technology transfer and intellectual property protection.

Typical users of results and collaboration

Industrial companies (OKD, ČEZ, DIAMO, Třinecké železárny, Precheza, Veolia, etc.)

- Collaboration on optimising mining processes, mine ventilation, tailings stabilisation, and circular economy in the energy sector.
- Research results have led to the implementation of more efficient and safer technologies in the mining and energy sectors.

Public administration and local government

- Providing professional methodologies and recommendations for revitalising post-mining areas, environmental management, and safety measures.
- For example, Ostrava and Olomouc successfully implemented a methodology for identifying safety risks in cities.

Healthcare sector

- Development of modular respiratory protective equipment used to prevent the spread of COVID-19 and other respiratory diseases.
- Transfer of know-how in the field of safety measures and the use of modern materials.

Academic and research community

- Collaboration on international research projects and sharing know-how in the field of innovative mining technologies and environmental solutions.
- Participation in European research alliances (EERA or COST) enables broader validation of research results.

Logistics and processing industry

- Development and testing of RFID and IoT solutions for automated identification and tracking of products in supply chains.
- Collaboration with companies on the application of intelligent sensors and the optimisation of logistics processes.

Searching for new users of results

The faculty actively seeks new partners through:

- Participation in professional conferences and exhibitions.
- Organisation of workshops and seminars for industrial partners and the public sector.
- Collaboration with professional associations and scientific consortia.
- Direct outreach to companies and searching for opportunities to apply results in practice.

Commercialisation and valorisation of R&D&I results

The Faculty of Mining and Geology focuses on patent licensing, contract research, and the sale of

methodologies. For example:

- Patent CZ308289 – license sold.
- Pilot-scale testing of pyrolytic processing of plastic waste – a solution developed for processing industrial waste.
- Certified methodology for selective demolition of construction objects – used free of charge by state administration and companies to support the circular economy.
- Development of a compact RFID reader for drones – successfully tested in logistics; negotiations with partners for implementation are ongoing.
- Mine ventilation optimisation methodologies – used in the underground mining industry to improve safety and reduce costs.

Evaluation of the effectiveness of knowledge transfer and commercialisation

FMG effectively transfers research results into practice, primarily through contract research, industrial partnerships, and participation in international projects. A significant aspect of the faculty is the ability to connect theoretical knowledge with industrial applications and provide benefits for the public sector. To improve economic sustainability, the faculty plans to:

- Increase the share of revenue from licensing and contract research.
- Support the establishment of spin-off companies focused on the development of innovative technologies.
- Strengthen collaboration with foreign entities in the commercialization of research results.

Funding from non-public sources

In the evaluated period, the faculty obtained funding from contract research, patent licensing, and the sale of methodologies. For example:

- Licensing of patent CZ308289 – income of 157,300 CZK.
- Contract research for DIAMO, s.p. – projects focused on mine stabilisation and geotechnical monitoring.
- Consulting services for ČEZ, a.s. – analysis of by-products from energy production.

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
Licences sold				130/ 5 128,21	
Gifts	287/ 11 321,50	15/ 591,72	20/ 788,96	245/ 9 664,69	27,3/ 1 076,92
Total	287/ 11 321,50	15/ 591,72	20/ 788,96	375/ 14 792,90	27,3/ 1 076,92

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF R&D&I

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the evaluated period and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

The Faculty of Mining and Geology (FMG) has long been popularising science, research, and innovation and actively communicating with the public. These activities aim to bring scientific findings closer to the general public and support young people's interest in technical and natural sciences. Popularisation activities include lectures, workshops, participation in university-wide events, collaboration with secondary schools, presentations at conferences and professional fairs, and communication through social networks and the media.

Main activities in the area of RDI popularisation

University-wide popularisation events

- Open Day
- Art & Science Festival
- Improve Your Technology
- Night of Scientists
- Other events organised by VSB-TUO

As part of these events, the faculty presents its research activities to the general public, offers interactive demonstrations of experiments, and showcases interesting applications of scientific knowledge in practice.

Popularisation conferences and expert lectures

- The international conference Advances in Environmental Engineering (AEE) held in 2019, 2021, and 2023, where the latest scientific results are presented.
- 22nd Czech – Polish – Slovak Palaeontological Conference – 17-19, October 2023
- https://www.hgf.vsb.cz/export/sites/hgf/541/.content/galerie-souboru/cirkular_1.pdf
- Popularization lectures by Faculty staff for secondary school students focusing on mineral extraction, geology, environmental engineering, the economics of raw materials, and geoinformatics.
- Collaboration with the media, for example, appearances by staff from the Department of Geoinformatics on Czech Television regarding expert topics (Assoc. Prof. Kačmařík in 4/2021, 11/2023; Assoc. Prof. Švec in 8/2023; Prof. Ivan for the Refresh project). Prof. Hevianková appeared on the Good Morning program on the topic of water quality in 8/2023. Assoc. Prof. Iva Janáková 3/2019.

Collaboration with secondary schools

- The Faculty of Mining and Geology works in partnership with 23 faculty-affiliated secondary schools in the region
- The faculty collaborates with secondary schools, especially in the Moravian-Silesian Region

and across the border (in Slovakia), where it organises specialised seminars and workshops directly at the schools or in the faculty's laboratories.

- Every year, it conducts 15 to 20 popularisation events for secondary school students.
- Popularisation of the economics of raw materials and geoinformatics through interactive demonstrations and lectures.

Presentation of research results at conferences and science fairs

- Faculty employees regularly participate in scientific and technological fairs and present applied research results at professional conferences.
- For example, organising the GISáček conference, held annually, allows Czech Republic and Slovakia students to present their bachelor's and master's theses to professionals from the field. In 2024, the 27th edition took place.

Communication through social networks and the media

The faculty and individual departments actively manage their profiles on Facebook, Instagram, and LinkedIn, where they share news, the achievements of employees and students, and information about popularisation events. The faculty also has its profile on the X network. The websites of individual departments contain offers of expert lectures for the public.

- Popularization of research in the field of sustainability and the circular economy.
- Experts from the faculty publish popularisation articles focused on recycling, mineral extraction, and renewable energy sources.
- The certified methodology "Improving Selective Demolition Procedures as Part of Waste Prevention and Further Use of Construction and Demolition Waste" is available free of charge to the public and increases awareness of sustainable construction.

The most significant examples of popularisation activities

- **Night of Scientists:** A university-wide event where the faculty interactively presents scientific projects and technologies to the public. In 2023, Oldřich Motyka participated in the national science popularisation competition, Český VŠEVĚD, winning first place.
- <https://www.vsb.cz/en/news-detail/?reportId=46445>
- Workshops focused on geology, raw materials extraction, environmental engineering, commodity economics and investment (the lecture series "Be Your Financial Manager"), and geoinformatics.
- Mineralogical Gathering
- **Expert lectures for secondary school students:** Lectures focused on modern industrial technologies, technologies in geoinformatics, environmental engineering, and sustainable mining. More than 20 events per year, which help motivate students to study technical and scientific fields.
- **GISáček Student Competition Conference:** This traditional competition for geoinformatics students connects the academic environment with industry professionals. Students from the Czech Republic and Slovakia participate every year. (see above)
- **Media outputs and collaboration with Czech Television:** Popularization of current research topics in Czech Television programs. For instance, Assoc. Prof. Kačmařík and Assoc. Prof. Švec presented the faculty's results on environmental monitoring and geoinformation systems. (see above)

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

Based on the recommendations from the previous evaluation, the following measures were adopted:

- Increased collaboration with industrial partners, with an effort to implement research results into practice more quickly.
- Expansion of research activities into new areas.
- Greater involvement of students in research projects, which improved their practical skills and readiness for the labour market.
- Students in all forms of study programs actively participate in the solution of scientific projects and are involved in research teams when conducting contract research.
- Student Scientific Professional Activities – students' competition with international participation of three countries.
- Involvement and preparation of projects with significant international impact, strong social relevance, a focus on sustainability, and active student participation in research and problem-solving:
 - Involvement in preparing prestigious scientific projects (Refresh, Cirk Arena).
 - Preparation of Horizon projects in Finland (involving many foreign partners).
 - Preparation of ERA-MIN and ERA-NET projects with FIP partners.
 - Participation in the OP JAK Matur project.

Involvement in the preparation and execution of these significant scientific projects allows us to participate in excellent research. The direct link between these projects and industrial partners enables us to increase the application potential of the achieved results.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
Oldřich Motyka Competition Czech POLYMATH	Tab. 3.2.1	https://www.vsb.cz/en/news-detail/?reportId=46445
Pavel Staša (CINEST Symposium)	Tab. 3.2.1	https://mine.kyushu-u.ac.jp/cinest/committees/
Marian Marschalko – Inclusion among the top 2% of the world's best scientists	Tab. 3.2.1	https://www.vsb.cz/veda/en/news-detail/?reportId=42675&linkBack=%2Fveda%2Fen%2Fnews%2Findex.html
Jan Nečas (Elected Member)	Tab. 3.2.1	https://efce.info/Scientific+Groups/Mechanics+of+Particulate+Solids/Members/Elected+Members.html
Jiří Zegzulka (Degate)	Tab. 3.2.1	https://efce.info/Scientific+Groups/Mechanics+of+Particulate+Solids/Members/Delegates.html
Archives of Mining Sciences (0860-7001)	Tab. 3.2.2	http://archives.pl/about-the-journal/

Geologos (1426-8981)	Tab. 3.2.2	http://www.geologos.com.pl/editors.php
Inżynieria Mineralna – Journal of the Polish Mineral Engineering Society (1640-4920)	Tab. 3.2.2	http://www.potopk.com.pl/an_czlonkowie.html
Geological Society Special Publication (0305-8719)	Tab. 3.2.2	http://michalnemcok.sk/cv/
Geographia Cassoviensis (1337-6748)	Tab. 3.2.2	https://gcass.science.upjs.sk/redak%C4%8Dn%C3%A1-rada
Competence Centre for Effective and Ecological Mining of Mineral Resources (TE02000029)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/TE02000029?query=4b4qaadvl2xq
Investigation of the possibilities of using closed underground mines in the Czech Republic for energy purposes and as a potential of water resources (TIRSMPO906)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/TIRSMPO906?query=3rfiaackrkia#project-main
Institute of clean technologies for mining and utilization of raw materials for energy use - Sustainability program (LO1406)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/LO1406?query=qg7iaadwdgrq
Finding unexploded aerial ammunition of World War II (VI20192021160)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/VI20192021160?query=quwqaadwcveg
Accessibility modelling for seniors, perception of accessibility and determinants of their spatial mobility (GA21-22276S)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/GA21-22276S?query=2pcyaadvpalq
Sensor measurements of urban footways to support mobility of disabled people (CK01000190)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/CK01000190?query=wpiaadvxaba
Research of the composition of air at mining activities and activities carried out by mining method for determination of minimum volumetric flow of winds (TITSCBU701)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/TITSCBU701?query=uemiaacladyq
Development of the play-fairway system for the low-temperature geothermal system exploration in sedimentary basins; with application Tab. 3.3.1 to the Vienna Basin (TK05020137)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/TK05020137?query=y2ggaadvskfa
Petrogenesis and emplacement of deep-marine alkaline basaltoids: a case of Early Cretaceous magmatism in the northern Tethys region (GA21-30043S)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/GA21-30043S?query=ysqaadvstg
Mining the European Anthroposphere (LTC17051)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/LTC17051?query=zgijyadvrr7q
Metal-microorganisms' interactions as a basis for progressive biotechnological processes	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/8X20009?query=5woiaacog5za

Neutron Activation Analysis and Atomic Absorption Spectrometry for Soil and Vegetation Pollution Studies in post - mining landscape in the Moravian-Silesian Region in the Czech Republic	Tab. 3.3.1	http://www.sujv.cz/en/index.php?Ns=105&id=1000881
Resource and Risk Assessment Associated with Invasive Plant Species in the Border Area	Tab. 3.3.1	https://keep.eu/projects/22006/RESOURCE-AND-RISK-ASSESSMEN-EN/
IoT Based Intelligent Store (TF03000053)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/TF03000053?query=3lrqaacnjhda
U Health – Auto-ID technology and the Internet of Things to enhance the quality of health services (LTE117005)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/LTE117005?query=sypaadvz3aa
Hybrid solution based on advanced image analysis and RFID technologies in Industry 4.0. (EG16_084/0010285)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/EG16_084%2F0010285?query=y25iaadvjsdq
Inventory Control Platform Using AI based Drone with inventory exploration and recognition (TM02000071)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/TM02000071?query=3hziaaditidq
Development of autonomous driving smart air cleaner and safety control services platform for improving indoor air quality (IAQ) in industrial and public sites (TM04000003)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/TM04000003?query=w4pyaadi36xq
Cretaceous-Paleogene boundary in Carpathians - multidisciplinary search for local variations in global cataclysm event (GA19-07516S)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/GA19-07516S?query=7dmiaadvfygq
Leading edge instrumental methods in high resolution global Jurassic-Cretaceous boundary correlations (GA20-10035S)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/GA20-10035S?query=2ohiaadvpbsa
Rock Environment and Natural Resources (SS02030023)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/SS02030023?query=2pqiaackusva
LIMBRA: Decreasing the Negative Outcomes of Brain Drain in the Raw Material Sector	Tab. 3.3.1	https://limbra-project.eu/
The Czech Academic Phrasebank and its use in research and teaching of academic writing (TL05000309)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/TL05000309?query=2araaadvp5aq
IP LIFE for Coal Mining Landscape Adaptation (LIFE20 IPC/CZ/000004)	Tab. 3.3.1	https://webgate.ec.europa.eu/life/publicWebsite/project/LIFE20-IPC-CZ-000004/ip-life-for-coal-mining-landscape-adaptation
New technology for hydrogen and geopolymer composites production from post-mining waste	Tab. 3.3.1	https://h2geo.komag.eu/
CO2 Storage Pilot in a Carbonate Reservoir (TO01000112)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/TO01000112?query=3asaaconcaq

REWAISE Resilient Water Innovation for Smart Economy; No 869496	Tab. 3.3.1	https://rewaise.eu/
Mobile personal protective Respirator (VI04000041)	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/VI04000041?query=vztyaadvyk2q
RECOVERY of degraded and transformed ecosystems in coal mining-affected areas	Tab. 3.3.1	https://starfos.tacr.cz/en/projekty/SL%2F640%2F10%2F03?query=tnyaaadpgvhq
ProSkill Development of a Skill Ecosystem in the Visegrád Four countries	Tab. 3.3.1	https://proskillproject.eu/
EU Patent EP2339323 - The method of simulation of kinetics movement of bulk solid particles and facilities to carry out the method	Tab 3.4.1	https://register.epo.org/application?number=EP09466006 https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27730%2F19%3A10242016?query=xc5yaadvvyka
Functional Sample Lightweight concrete based on recycled rubber	Tab 3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F20%3A10244299?query=5mmaaad56a
Methodology certified by the authorised body Methodology of identification and evaluation of safety risk areas in the city	Tab 3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F20%3A10245695?query=7iviaadopfng
Utility Model Continuous identification system	Tab 3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F21%3A10247150?query=qjwqaadwdk7q
Methodology certified by the authorised body Processing of inhomogeneous input data using GIS	Tab 3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F21%3A10246735?query=rjdaaadwbmha#result-main
Patent Device for controlled separation of bulk materials	Tab 3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F21%3A10249631?query=tpmyaad47ba
Patent Method of filling the mould for the manufacture of multi-casing tubes and equipment to carry out this method	Tab 3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F20%3A10246531?query=y26qaadvsh6q
Methodology certified by the authorised body Prediction of unexploded ordnance findings from aerial photographs	Tab 3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F22%3A10251050?query=zjeaaado3b6a
Verified technology Treatment of electrogalvanizing wastewater	Tab 3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F22%3A10251225?query=v66yaadvyaba
Functional sample Compact RFID reader for drones	Tab 3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27350%2F23%3A10253120?query=2zsiaadoyyxq
EU Patent BULK BATTERY	Tab 3.4.1	https://worldwide.espacenet.com/patent/search/family/086774916/publication/WO2023109987A1?q=pn%3DWO2023109987A1

22nd Czech – Polish – Slovak Palaeontological Conference	Tab. 3.6	https://www.hgf.vsb.cz/export/sites/hgf/541/.content/galerie-souboru/cirkular_1.pdf
Oldřich Motyka Competition Czech POLYMATH	Tab. 3.2.1	https://www.vsb.cz/en/news-detail/?reportId=46445

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Faculty of Materials Science and Technology (FMST)

FORD: 2 - Engineering and technology

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.³³ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

The Faculty of Materials Science and Technology plays an irreplaceable role in addressing the challenges currently facing society, not only at the regional level but also nationally and internationally; the Faculty is capable of responding appropriately and flexibly to emerging trends including digitalization, green technologies, developments in transportation, sustainable energy and other eco-focused trends, Industry 4.0, and innovative medical technologies. The Faculty's technological profile (focusing on materials engineering, metal production and treatment technologies, environmental technologies and secondary raw material recycling, nanotechnologies and thermal power engineering, all with logical connections to economic management and quality control in industry) reflects the societal importance of technological growth when building a high added-value economy. In the disciplines listed above, this fundamental concept is closely connected with innovative activities generating a range of practical outputs which provide an additional source of income to the Faculty. The Faculty's academic staff (involved in both research activities and educational provision) consists of 24 professors, 35 associate professors and 54 assistant professors, with 111 staff members in the category of researchers.

The Faculty's core vision is to build a widely renowned centre of excellence that offers ideal conditions for study and research in the disciplines outlined above. The Faculty makes maximum use of the potential offered by its collaboration with partners in the Czech Republic and abroad (both from industry and the research sector), and it continues to systematically develop and strengthen this collaboration. The Faculty's network of collaborative links serves as an important stimulus for new directions of research – particularly the interdisciplinary projects that are increasingly valued within the European Research Area. There is a strong emphasis on applied research and technology transfer, which are essential preconditions for a successful economy, and the Faculty has several sub-units dedicated to specific areas of technology, which have been established specifically for the purpose of collaborating with external partners on practical applications. The Faculty comprises seven departments and two research centres.

One of the Faculty's main priorities is to strengthen the motivational tools targeted at

³³ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

young researchers; this will boost creativity and encourage novel approaches to research tasks, bringing positive impacts on results. The Faculty is an open workplace, welcoming collaboration with a range of partner institutions from universities and research institutes in the Czech Republic (including institutes of the Czech Academy of Sciences) and abroad; this open approach has enabled the Faculty to obtain funding as the coordinator of several large-scale research projects in recent years, including [CirkArena](#), [MATUR](#) (from the OP Comenius) and [Refresh](#).

The Faculty's research activities and educational provision are planned in seven-year periods and are currently covered by its Strategic Plan for 2021-2027 – a framework document that forms the basis of more detailed implementation plans that are elaborated for each year. The implementation plans are evaluated annually by the Faculty's Scientific Council, which reports on its evaluation in the Faculty's Annual Report and also in a specific document, the Faculty's Report on the Results of Research and Development Activities (which is also approved at sessions of the Scientific Council).

 Table 3.1.1 - Staffing per FTE³⁴

Academic/ Professional position	Total / Of which women					
	2019	2020	2021	2022	2023	Total
Professor	22,5/6,2	24,5/7,6	23,3/7,0	16,7/6,2	12,2/4,8	24/7
Associate Professor	34,5/14,8	35,1/14,2	33,3/14,2	27,1/12,7	20,3/11,9	35/14
Assistant Professor	48,4/17,3	50,6/18,8	54,9/22,3	52,4/20,2	36,3/12,7	54/22
Assistant	0,2/0,2	0,0/0,0	0,0/0,0	0,0/0,0	0,0/0,0	0,2/0,2
R&D Personnel ³⁵	10,6/3,2	9,8/1,2	7,6/2,1	6,0/2,1	3,8/2,4	10/3
Researchers in other categories ³⁶	29,42/11,45	31,44/10,71	28,26/8,77	26,7/9,48	16,1/4,6	31/11
Technical and economic staff ³⁷	49,13/31,61	45,768/32,43	44,74/32,84	37,64/26,58	30,5/19,9	49/32
Scientific, research and development staff involved in teaching activities	105,7/38,5	110,1/40,54	111,77/43,64	96,23/39,08	68,81/29,46	111/43
Early career researchers ³⁸	13,9/9,05	15,98/10,45	15,63/11,24	15/10,8	10,15/7,25	15/11
Total ³⁹	194,75/84,76	197,21/84,95	192,1/87,21	166,54/77,26	119,2/56,3	194/87

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported

³⁴ The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

³⁵ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

³⁶ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

³⁷ Who participates in the management and support of R&D&I in the institution.

³⁸ See Definition of Terms in Methodology HEI2025+.

³⁹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 (numbers of physical employees and personnel)⁴⁰

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor					3	1	4	3	11	4	13	
Associate Professor			1		26	13	5	2	7	1	5	2
Assistant Professor	4		26	11	27	12	3		1			
Assistant												
R&D Personnel ⁴¹	4		2	1	1		1					
Researchers in other categories ⁴²	18	9	15	8	7	2	3		2		3	
Technical and economic staff ⁴³	4	1	8	3	12	9	16	15	11	6		
Scientific, research and development staff involved in teaching activities	3		27	11	56	26	12	5	19	5	18	2
Early career researcher ⁴⁴	1	1	6	3	5	4						
Total⁴⁵	30	10	52	23	76	37	32	20	32	11	21	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

⁴⁰ The total number of employees/workers as of 31st December of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

⁴¹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

⁴² The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

⁴³ Who participates in the management and support of R&D&I in the institution.

⁴⁴ See Definition of Terms in Methodology HEI2025+.

⁴⁵ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2023 (numbers of physical employees and personnel)⁴⁶

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor					5	1	3	1	5	2	1	
Associate Professor			1	1	13	6	8	6	1			
Assistant Professor	1	1	18	8	18	7	3	1				
Assistant												
R&D Personnel ⁴⁷	4	3	3	2	1							
Researchers in other categories ⁴⁸	5	4	11	2	5	2	5	1	3	1	2	
Technical and economic staff ⁴⁹			2	1	8	5	11	9	4	3		
Scientific, research and development staff involved in teaching activities	1	1	19	9	36	14	14	8	6	2	1	
Early career researcher ⁵⁰	1	1	8	4	7	5						
Total ⁵¹	10	8	35	14	50	21	30	18	13	6	3	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	577	167	437	122	454	148	432	138	425	117	2325	692
Master's ⁵²	338	137	331	123	273	99	272	96	259	83	1473	538
Doctoral	144	47	169	58	183	64	156	56	138	46	790	271

⁴⁶ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

⁴⁷ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

⁴⁸ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

⁴⁹ Who participates in the management and support of R&D&I in the institution.

⁵⁰ See Definition of Terms in Methodology HEI2025+.

⁵¹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

⁵² All master's degree students are listed, regardless of the length of their programme of study.

Lifelong Learning Courses	163		170		173		174	78	267	113	949	192
Total	1222	351	1107	303	1083	311	1034	368	1089	359	5537	1693

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ⁵³ / Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate	13/1		13/1		13/1		12/1		13/2	2/0	15/2	2/0
Master's	12/8		13/8		13/8		10/5		10/5		13/5	
Doctoral	10/10		11/11		12/11		12/12		12/12		12/8	
Lifelong Learning courses	6/0	4/0	9/0	4/0	18/0	1/0	18/0	1/0	27/0	1/0	27/0	
Total	41/19	4/0	46/20	4/0	56/20	1/0	52/18	1/0	62/19	3/0	57/15	2/0

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	0		22,83
	1.2 Computer and information sciences	1,41	Applied Research	
	1.3 Physical sciences	11,35	Applied Research	
	1.4 Chemical sciences	7,88	Applied Research	
	1.5 Earth and related environmental sciences	2,19	Applied Research	
	1.6 Biological sciences	0		
	1.7 Other natural sciences	0		
2. Engineering and Technology	2.1 Civil engineering	0,81	Applied Research	67,28
	2.2 Electrical engineering, Electronic engineering, Information engineering	1,84	Applied Research	
	2.3 Mechanical engineering	12,30	Applied Research	
	2.4 Chemical engineering	13,21	Applied Research	
	2.5 Materials engineering	21,93	Applied Research	
	2.6 Medical engineering	1,66	Applied Research	
	2.7 Environmental engineering	7,27	Applied Research	
	2.8 Environmental biotechnology	0		

⁵³ The total number of study programmes for which admissions have been announced in a given academic year.

	2.9 Industrial biotechnology	0		
	2.10 Nanotechnology	1,75	Applied Research	
	2.11 Other engineering and technologies	6,51	Applied Research	
3. Medical and Health Sciences	3.1 Basic medicine	0		1,31
	3.2 Clinical medicine	0		
	3.3 Health sciences	1,31	Applied Research	
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries	0		
	4.2 Animal and Dairy science	0		
	4.3 Veterinary science	0		
	4.4 Other agricultural sciences	0		
5. Social Sciences	5.1 Psychology and cognitive sciences	0		4,47
	5.2 Economics and Business	2,45	Applied Research	
	5.3 Education	2,02	Applied Research	
	5.4 Sociology	0		
	5.5 Law	0		
	5.6 Political science	0		
	5.7 Social and economic geography	0		
	5.8 Media and communications	0		
	5.9 Other social sciences	0		
6. Humanities and the Arts	6.1 History and Archaeology	0		4,11
	6.2 Languages and Literature	0		
	6.3 Philosophy, Ethics and Religion	0		
	6.4 Arts (arts, history of arts, performing arts, music)	4,11	Applied Research	
	6.5 Other Humanities and the Arts	0		
Total		100 %	100 %	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the period of 2019–2023 based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

The Faculty of Materials Science and Technology covers a range of disciplines that anchor it firmly within the Czech Republic's higher education system, and the Faculty's research focus gives it an entirely unique position in fields specializing in metal production and treatment technologies. This position is clearly reflected in the demand by other Czech technical universities and research institutions for experts from the Faculty to investigate the impacts of production and treatment technologies on the final properties of metals and their technical applications. This demand ultimately leads to various forms of collaboration in research and development projects. Ten of the Faculty's staff hold prestigious professorships, clearly indicating that their work is highly respected by their peers – not only in the European research community, but also among scientists in Japan. The professional renown of the Faculty's research teams, and the excellence of their results, is reflected in both the volume and quality of their publications as well as their membership in the editorial boards of high-quality scientific journals. Close collaboration with scientists from Japan, the UK, Germany, Poland and Slovakia has created favourable conditions for and interest in organizing various lectures and similar events which have become effective communication platforms for sharing knowledge. Another essential and highly successful component of the Faculty's activities is the transfer of new technological findings from its research centres into practical applications. Besides generating increased levels of funding from contractual research, this has also been reflected in the growing number of industrial partners who are keen to collaborate on research projects. Full details are given in the annual reports on the results of research and development activities for the period 2019–2023.

Staff at the Faculty are involved in a range of long-term research projects involving active collaboration with partner institutions abroad, and the results of this research are systematically disseminated through various publication outlets and other communication platforms. This has brought a number of prestigious awards conferred by professional institutions (such as the American Society of Mechanical Engineers, the Japan Society for Heat Treatment, the International Association of Advanced Materials, the Japan Institute of Light Metals, and the Eurobusiness-Haller & Pro Inventio Foundation of Poland), as well as state honors – for example, [Japan's Order of the Rising Sun with Gold Rays and Neck Ribbon](#) awarded to Professor Strnadel – and awards recognizing excellent publications and innovations, such as the [gold medal received by a Faculty research team at Taiwan Innotech Expo 2023](#). Staff from the Faculty sit on the editorial boards of various professional journals reflecting the Faculty's main areas of focus, i.e. materials engineering (Materials, Archives of Foundry Engineering), metal production and treatment technologies (Acta Technologia, Journal of Pressure Vessel Technology), as well as related fields such as management (Economics Management Innovation), quality control (Quality Innovation Prosperity) and energy (Sustainability, Acta Energetica). Numerous researchers from the Faculty have presented their work in lectures given at major institutions in Japan, the USA, Portugal, Poland and Ukraine, and the Faculty has welcomed experts from universities in several countries (Japan, Turkey, Germany, Slovakia, Poland, the UK) to lecture at gatherings organized by the Faculty. Four staff members are involved in evaluating the results of research programmes funded by the Czech Republic Technology Agency, the Czech Science Foundation, the Ministry of Industry and Trade, and the National Committee for the Evaluation of Research Programme Results.

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname, and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
Bohumír Strnadel, prof. Ing. DrSc.	The Order of the Rising Sun, Gold Rays with Neck Ribbon" Řád	2020 State honors of Japan

	vycházejícího slunce se zlatými paprsky a stuhou.	
Kunio Hasegawa, Ph.D.	Pressure Vessel Piping (PVP) Outstanding Service Award	The S.S. Chen American Society of Mechanical Engineers (ASME), 2019
Osamu Umezawa, prof.	Scientific Achievement Award (Hayashi Prize), Scientist Medal, Structural & Engineering Materials	The Japan Society for Heat Treatment, International Association of Advanced Materials (IAAM)
Kobayashi, prof.	19th Light Metal R&D Furtherance Medal	Japan Institute of Light Metals
Jiří Burda, Ing. Ph.D., Jakub Korpas, Jiří Fiedor, Ing. Ph.D., Marek Velička, doc. Ing. Ph.D., Mario Machů, Ing. Ph.D., Petr Jirsa, René Sommr, Jozef Vlček, prof. Ing. Ph.D.	Silver Medal – The Award from Polish Chamber of Patent Attorneys. Technology for energy utilization of used polymeric parts from discarded cars. Verified technology No. 011/08-12-2022_OT.	Eurobusiness & Eurobusiness-Haller & Pro Inventio Foundation, Poland.
Vlastimil Matějka, prof. Ing. Ph.D., Kryštof Foniok, Ing. Ph.D., Petra Maierová, Ing. Jozef Vlček, prof. Ing. Ph.D.	Gold Medal – ECO AWARD. Izba Ekologii, 2023. Method for obtaining iron concentrate from metallurgical slags. Patent – application: WO202223061A1.	Eurobusiness & Eurobusiness-Haller & Pro Inventio Foundation, Poland.
Jozef Vlček, prof. Ing. Ph.D., Jiří Burda, Ing. Ph.D., Kateřina Pacultová, Dalibor Jančar, Ing. Ph.D., Marek Velička, doc. Ing. Ph.D.	Gold Medal INTARG 2022 v Katowicích „Technology for reduction of nitrogen oxides by ammonia in the presence of an iron oxide additive	Eurobusiness & Eurobusiness-Haller & Pro Inventio Foundation, Poland.
Sabovčík, Tomáš, Gryžbon, Luděk, Jozef Vlček, prof. Ing. Ph.D., Vlastimil Matějka, prof. Ing. Ph.D., Michaela Topinková, Ing. Ph.D., Petra Maierová, Ing., František Šoukal, Jiří Másilko, Jan Koplík	Silver Medal INTARG 2022 v Katowicích „Solidified waste prepared with ladle slag as a binder with suppressed leachability of heavy metals.	Eurobusiness & Eurobusiness-Haller & Pro Inventio Foundation, Poland.
prof. Ing. Bedřich Smetana, Ph.D.	APDIC – The Alloy Phase Diagram International Commission Best Paper AWARD, 2019	The Alloy Phase Diagram International Commission
Monika Kinga Michalska, Dr.	Best Researcher Award For the contribution and honourable achievement in innovative Research, Given under seal of the company, 2023	International Conference on Advanced Nanomaterials and Nanotechnology

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname, and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Kunio Hasegawa, Ph.D.	Journal of Pressure Vessel Technology, ISSN 0094-9930, Reviewers of the Year Award, Trans. ASME
Hiroshi Fukutomi prof.	Journal of Safety Engineering, p-ISSN: 2325-0003, Chairman from 2019
Radim Kocich, prof. Ing. Ph.D.	Materials, ISSN 1996-1944 (člen redakční rady), Computer Modeling in Engineering & Sciences, ISSN 1526-1492 (Guest Editor), Materials, ISSN 1996-1944 (Guest Editor) – 2x
Petr Lichý, doc. Ing. Ph.D.	Archives of Foundry Engineering, ISSN 1897-3310 (člen redakční rady),

	Materials, ISSN 1996-1944 (Guest Editor)
Lenka Kunčická, doc. Ing. Ph.D.	Materials, ISSN 1996-1944 (Guest Editor) – 3x
Vlastimil Vodárek, prof. Ing. CSc.	Journal AMME, ISSN 1734-8412
Šárka Vilamová, doc. Ing. Ph.D.	Acta Montanistica Slovaca, ISSN 1335-1788
Petr Besta, prof. Ing. Ph.D.	Acta Logistica, ISSN 1339-5629, Acta Technologia, ISSN 2453-675X
Adam Pawliczek, doc. Ing. Ph.D.	EMI (Economics Management Innovation), ISSN 1804-1299 (Print) ISSN 1805-353X (Online), Journal of Lviv Polytechnic National University. Series of Economics and Management Issues, ISSN 2522-1639 (Print) ISSN 2663-0257 (Online)
Jaroslav Nenadál, prof. CSc. Jiří Plura, prof. CSc. Darja Noskiewiczová, prof. CSc.	Quality Innovation Prosperity, Online ISSN: 1338-984X Print ISSN: 1335-1745

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
Bohumír Strnadel, prof. Ing. DrSc.	Geometrical characteristics of ductile fracture surfaces in steels	Tokyo Institute of Technology, Japan	2022
Makoto Hasegawa, prof.	Advances in Thermal Barrier Coatings: Current Status and Future Perspectives	20th International Metallurgy and Materials Congress (IMMC2021)	2021
Kobayashi prof.	Key speaker	16th International Symposium on Novel and Nano Materials (ISNNM2020)	2020
Adam Pawliczek, doc. Ing. Ph.D.	Business Planning	Lviv Polytechnic National University, Ukraine	2023
Adam Pawliczek, doc. Ing. Ph.D.	Management basics focused on strategic planning	The Maharal Institute Prague, Czech Republic	2022, 2023
Omar Ameir, Ing. Ph.D.	Comparison of Anchoring Effect Application in Employee Management in Silesian Voivodeship with Prague, Moravian-Silesian Region and Vysočina Region	Reichman University, Israel	2023
Omar Ameir, Ing. Ph.D.	Money and Human Conduct	The Maharal Institute Prague, Czech Republic	2023
Omar Ameir, Ing. Ph.D.	Behavioural economics	Saint Petersburg State University of Economics, Russia	2022
Omar Ameir, Ing. Ph.D.	International management	Polytechnic Institute of Guarda, Portugal	2019
Omar Ameir, Ing. Ph.D.	Selected Behavioural Management Tools	Lviv Polytechnic National University, Ukraine	2023

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Kunio Hasegawa, Eng. Ph.D.	The American Society of Mechanical Engineers - ASME	Lesson Learned from Fractures - Accidents and New Technologies; Fracture Mechanics and Flaw Evaluation Rules	2023
Osamu Umezawa, prof. Ph.D.	Yokohama National University	Mechanical properties at cryogenic temperatures	2023
Tomoyuki Shimono, Ph.D.	Yokohama National University	Damage Analysis of Surgical Drill Bar Based on Force Sensing Technology	2022
Mehmet Eroglu, prof. Dr.	University of Firat, Faculty of Engineering, Turkey	Advanced High-Strength Steel (AHSS) for the automotive industry	2019
Pavol Hvizdoš, RNDr. Ph.D.	Institute of Materials Research, Slovakia	Development of composites based on silicon nitride and silicon carbide with increased electrical conductivity	2019
Zoltán Lenčéš, doc. Ing. Ph.D.	Institute of Inorganic Chemistry SAS, Slovakia	Microstructure and properties of technical ceramics	2019
Pavol Hvizdoš, RNDr. Ph.D.	Institute of Materials Research, Slovakia	Microstructure characterization of advanced nanocomposites	2019
Piotr Szperlich, dr.	Centre for Science and Education Silesian University of Technology, Gliwice, Polsko	Application of transmission electron microscopy	2020
Richard Guy Compton, prof.	University of Oxford, Oxford, UK	Fundamental and applied electrochemistry	2023
Vladislav Kolarik, assoc. prof.	Fraunhofer institute, ICT, Germany	Materials for energy operating at high temperatures	2022

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname, and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the authority/guarantor contracting of the project/programme call	Year
Šárka Vilamová, doc. Ing. Ph.D.	Project nr. TITSMPO305 Creation of methodologies for analysis of operations with the proposal of measures aimed at applying the principles of circular economy (Circular Audit I) and for assessing projects in subsidy programs for the area of circular economy (Circular Audit II)	Technology Agency of the Czech Republic	2023 - 2024
Martin Lampa, Ing. Ph.D.	Project no. Research and development of technology for the production of solid alternative fuel (TAP) from waste	Ministry of Industry and Trade	2022-2023

	components of car wrecks and electrical equipment, or other waste for ecological combustion in external energy installations		
Martin Lampa, Ing. Ph.D.	Project no. SS02030008 Centre of Environmental Research: Waste management, circular economy and environmental security	Technology Agency of the Czech Republic	2023
Bohumír Strnadel, prof. Ing. DrSc.	Member of the Commission for the Evaluation of Research Organizations and Completed Programs	Council for Research, Development and Innovation of (RVVI), Government of Czech Republic	2022 -
Bohumír Strnadel, prof. Ing. DrSc.	Member of the evaluation panel 107	GAČR Czech Science Foundation	2021-
Jana Kukutschová, prof. Mgr. Ph.D.	Member of evaluation panel 108	GAČR Czech Science Foundation	2023-
Petr Praus, prof. Ing. Ph.D.	Member of the company Board of Directors	Czech National Clay Group	2014-

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research⁵⁴) that it has implemented or participated in during the period of 2019–2023⁵⁵. This should be done from the full list in annex tables (Table 3.3.1-3.3.2)⁵⁶, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

During the evaluation period 2019–2023, the Faculty was involved in 42 research and development projects funded by national public sources (the Czech Republic Technology Agency, the Ministry of Industry and Trade, the Czech Science Foundation, the Ministry of Education); a full list of these projects is given at <https://www.fmt.vsb.cz/en/research/projects-and-grants>. The total funding for these projects was **17 263 000 EUR**. The Faculty was the coordinator of 19 projects, and in the remaining 23 projects it was the co-investigator.

In the evaluation period, the Faculty was involved in three projects as part of the Ministry of Education's call for long-term inter-sector collaboration projects (funded via the OP Research, Development and Education).

1. The aim of the project **Development of inter-sector cooperation of RMSTC with the application sphere in the field of advanced research and innovations of classical metal materials and**

⁵⁴ For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

⁵⁵ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

⁵⁶ The evaluated unit shall only fill tables that are relevant to it.

- technologies using modelling methods**, was to strengthen research, technological development and innovation in the field of metallurgy. The project was implemented by the Regional Materials Science and Technology Centre (RMSTC) in conjunction with the company Třinecké železářny, a.s. The company has a stable position in the steel and metallurgical products market and exports to numerous countries around the world, giving the research a strong international dimension. The project involved experimental studies of the thermophysical, thermodynamic, kinetic and physical-chemical properties of metallic materials and oxides and the management of the metallurgical production process to bring energy savings and reduce ecological burdens.
2. The project **Research on the management of waste, materials and other products of metallurgy and related sectors** involved several partners (ArcelorMittal Ostrava, a.s., Královopolská, a.s., Materiálový a metalurgický výzkum, s.r.o., SMOLO, a.s. and Třinecké železářny, a. s.). The project focused on the material utilization of high-volume waste products from metallurgical production such as slags, dry and wet products from the cleaning of waste gases in iron and steel production, products from associated technological processes such as fly ash from energy generation facilities, and solid waste products from casting. The project generated original findings which are currently already being applied to eliminate undesirable environmental impacts of metallurgical production.
 3. The project **Innovative therapeutic methods of musculoskeletal system in accident surgery** involved collaboration with MEDIN, a.s. and the Ostrava University Hospital. Its aim was to create a leading research and development centre with comprehensive coverage of fracture treatments including biomechanical motion analysis, research into the musculoskeletal system, and proposals for new rehabilitation methods with a primary focus on the lower limbs. The project also involved researchers from Yokohama National University and the Tokyo Institute of Technology.
 4. Also working alongside the Tokyo Institute of Technology, the Faculty launched a new collaborative project entitled **Materials and technologies for sustainable development (MATUR)**, which is funded by the Ministry of Education via the OP Comenius. The aim of the project is to create a leading research centre investigating and developing new materials and technologies for sustainable development, which will reduce energy consumption and negative environmental impacts during the production/treatment phase as well as during subsequent operations and after the disposal of the materials at the end of their planned lifespan. The project is divided into four research areas: Silicates with reduced negative CO₂ impacts on the environment; Materials for energy generation facilities; Materials with reduce negative environmental impacts; Nanostructural materials with exceptional properties. The research involves 25 partners from 15 countries.
 5. During the evaluation period, the Faculty was also actively involved in the project **Atomic design of carbon-based materials for new normal society**, funded by the Ministry of Education as part of the “Advanced Materials” component of the Visegrad Group (V4)–Japan Joint Research Programme. The main aim of the project is to advance the current state of the art in carbon materials science via the atomic-level structural design of carbon-based materials (WP1 – Japan, WP2 – Czech Republic) by accessing unique morphologies and heteroatom doping. This aim is supported by integrated experimental (WP3 – Hungary) and theoretical studies (WP4 – Slovakia and an external collaborator from Canada). The key deliverables (WP5 – Poland) of the findings will be connected to technology and device development.
 6. The Centre for Advanced Innovation Technologies (CAIT) was involved in the project **National contact centre for non-exhaust traffic emissions** as part of the Ministry of Education’s Interexcellence programme. The main aim of the project was to create a contact centre for emissions produced by non-combustion processes in transportation, which will provide and

disseminate information on emissions from friction materials in automotive braking systems, monitor emissions and take samples for comprehensive analysis. The project also involved the development of special experimental methods for investigating the impact of nanoparticles on the human organism.

7. During the evaluation period, the Ministry of the Interior's public safety research programme provided funding for the project **Equipment for testing of antivirus protection devices**, which was implemented at the Centre for Advanced Innovation Technologies (CAIT). The project focused on developing devices for testing personal protective systems, primarily antivirus protection. Its interdisciplinary scope encompassed experimental design, microbial testing, materials research and advanced 3D printing applications, and it culminated in a proposed new device to prevent the spread of viral infections.
8. The project **Prediction of damage to structural materials** was implemented at the Centre for Advanced Innovation Technologies (CAIT). Its aim was to develop methods for monitoring damage to structural steel during operation. The research was financed by the Ministry of Education's pre-application research programme. It investigated micromechanisms of initiation of degradation processes (fatigue and localized plastic deformation) which lead to limit states in structures. The interim results were discussed in consultations with a renowned research centre at Seoul National University, which collaborated with the company FRONTICS to develop a special device for measuring local surface strength in structural parts using an indentation method. The project generated two international patent applications: **Measurement probe for non-destructive steel diagnostics** and **Mobile equipment for measuring the impedance spectrum of steels and measurement methods**.

The Faculty's **contractual research** accounted for **4 188 000 EUR**; the majority of this sum came from contracts with Český svářečský ústav, s.r.o. (welding), Třinecké železářny, a.s. (metallurgical production), Garrett Motion Czech Republic, s.r.o. (energy/emissions technologies), Škoda Auto a.s., Ústav aplikované mechaniky Brno, s.r.o. (Institute of Applied Mechanics), TÜV SÜD Czech s.r.o., Thyssenkrupp Steel Europe AG, European Welding Institute s.r.o., and Liberty Ostrava, a.s. (metallurgical production). The Centre for Advanced Innovation Technologies (CAIT) collaborated with Český svářečský ústav, s.r.o. in evaluating the mechanical and metallographical characteristics of welded joints. The Faculty collaborated with Třinecké železářny, a.s. on wedge rolling tests with preheating, diagrams of anisothermic decomposition of austenite, and the determination of optimum temperatures for heating and rolling AREMA steel. Garrett Motion Czech Republic, s.r.o is involved in long-term collaboration with the Faculty on research into mechanical and metallographic characteristics of alloys for high-temperature applications in turbochargers.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ⁵⁷	Project name	Support (in thousands CZK/EUR) ⁵⁸				
		2019	2020	2021	2022	2023
Ministry of the Interior	Cumulatively by provider	1 191/ 47 000	832/ 33 000	3 357/ 132 000	3 875/ 153 000	0/0

⁵⁷ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

⁵⁸ Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

Technology Agency of the Czech Republic	Cumulatively by provider	11 962/ 472 000	12 882/ 508 000	22 197/ 876 000	20 891/ 824 000	16 682/ 658 000
Ministry of Education, Youth and Sports	Cumulatively by provider	38 708/ 1 527 000	63 030/ 2 486 000	63 467/ 2 504 000	56 740/ 2 238 000	41 199/ 1 625 000
Czech Science Foundation	Cumulatively by provider	1 773/ 70 000	0	0	0	0
Moravian-Silesian Region	Cumulatively by provider	520/ 21 000	136/ 5 000	0	0	0
Total		54 154/ 2 137 000	76 880/ 3 032 000	89 021/ 3 512 000	81 506/ 3 215 000	57 881/ 2 283 000
In the role of another participant						
Provider ⁵⁹	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Technology Agency of the Czech Republic	Cumulatively by provider	8 165/ 322 000	12 389/ 489 000	7 361/ 290 000	6 098/ 241 000	6 803/ 268 000
Ministry of Industry and Trade	Cumulatively by provider	4 619/ 182 000	4 968/ 196 000	3 500/ 138 000	7 236/ 285 000	4 876/ 192 000
Ministry of the Health (MZ)	Cumulatively by provider	0/0	610/ 2400	637/ 25 000	511/ 20 000	952/ 38 000
Czech Science Foundation	Cumulatively by provider	975/ 38 000	975/ 38 000	1 000/ 39 000	1 558/ 61 000	2 887/ 114 000
Ministry of Environment	Cumulatively by provider	0/0	0/0	0/0	0/0	2 128/ 84 000
Total		13 759/ 542 000	18 942/ 747 000	12 498/ 492 000	15 403/ 607 000	17 646/ 696 000

Table 3.3.2 - Contract research activities

Client ⁶⁰	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Český svářečský ústav s.r.o., IČ 62305808, Vratimovská 24/11, 718 00	Mechanical and metallographic characteristics of welded joints	528/ 21 000	592/ 23 000	1 206/ 48 000	2 457/ 97 000	2 611/ 103 000

⁵⁹ Ibid.

⁶⁰ If the client is from abroad, indicate in brackets the country of origin of the client.

Ostrava, Kunčičky						
Třinecké železářny, a. s., IČ 18050646, Průmyslová 1000, 739 61 Třinec, Staré Město	Wedge rolling tests with preheating, Compilation of diagrams of anisotheimic decomposition of austenite, Determination of optimum temperature for heating and rolling AREMA steel, Compilation of DCCT diagrams for two sets of C86 steel samples, Analysis of the effect of the initial microstructural state on DCCT diagrams for 36CrB4 steel, Tests of thermoplastic properties of agglomerate, Metallographic analysis of surface defects originating during rolling	1 026/ 40 000	531/ 21 000	483/ 19 000	1 504/ 59 000	1 363/ 54 000
Garrett Motion Czech Republic, s.r.o., IČ 06610005, Tuřanka 387/100, 627 00 Brno, Slatina	Mechanical and metallographic characteristics of alloys for high- temperature applications in turbochargers	713/ 28 000	527/ 21 000	647/ 26 000	761/ 30 000	2 046/ 81 000
Škoda Auto a.s., IČ 00177041 t.ř. Václava Klementa 869, 293 01 Mladá Boleslav, Mladá Boleslav II,	Development of a portable charging source for electric vehicles, Construction of a model of the StudentCar E-Buggy at scale 1:4 to verify the design development process, Development work on the e-Buggy chassis platform, Research and development of a laser cleaning system for bonded joint surfaces, Testing on a brake dynamometer	1 233/ 49 000	268/ 11 000	149/ 6 000	268/ 11 000	773/ 30 000
Ústav aplikované mechaniky Brno, s.r.o., IČ 60715871 Resslova 972/3 602 00 Brno, Střed	Corrosion and metallographic characteristics of materials and components for nuclear energy, Analysis of coating adhesion	191/ 8 000	455/ 18 000	855/ 34 000	0/0	1 042/ 41 000
TÜV SÜD Czech s.r.o. IČ 63987121, Novodvorská 994/138 142 21 Praha 4	Services for destructive testing of metallic materials	10/ 400	181/ 7 000	512/ 20 000	562/ 22 000	614/ 24 000
thyssenkrupp Steel Europe AG Kaiser- Wilhelm-	Optimization of the washing oil regeneration process with regard to its variable composition	0/0	0/0	1 781/ 70 000	0/0	0/0

Strasse 100 47166 Duisburg (Německo)						
European Welding Institute s.r.o., IČ 07383207, Pikartská 1337/7, 716 00 Ostrava Radvanice	Harness and macrostructure testing	161/ 6 000	309/ 12 000	539/ 21 000	185/ 7 000	293/ 12 000
Liberty Ostrava a.s., IČ 45193258, Vratimovská 689/117, 719 00 Ostrava, Kunčice	Dilatometric localization of the ferritic nose in the ARA diagram of microalloyed steel after heating to high temperatures, Chemical analysis of deposits, Computational application, Research into temperature profiles, solid/liquid fraction, stresses and crack risks, and porosity for current casting conditions via numerical simulation, Laboratory rolling of steel bars, Metallographic analysis of a reforged billet from melt 36863 with a medium-grade defect, Research of high-temperature plastic properties of 34CrMo4 in cast and forged states	244/ 10 000	393/ 16 000	354/ 14 000	333/ 13 000	0/0
TRACTEBEL ENGINEERING S.A., Henryka Dulęby 5, 40- 833 Katowice (Polsko)	Effect of welding on residual stress in a heterogeneous weld of a nuclear reactor pressurized vessel	1 173/ 46 000	0/0	78/ 3000	0/0	0/0
Total		5 279/ 208 400	3 258/ 129 000	6 603/ 260 000	6 070/ 239 000	8 743/ 345 000

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the period of 2019–2023, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts⁶¹, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

⁶¹ See Terms definition.

The most important results of research at the Faculty during the evaluation period 2019–2023 are shown in Table 3.4.1, including (in the case of patents) links to the Industrial Property Office site giving detailed information on the patent, its ownership and the current phase of the patent process. Similar detailed information is given in the STARFOS system which registers other protected research results. The most important projects implemented during the evaluation period and listed under indicator 3.3 produced results that are not subject to protection but have a high level of societal relevance.

1. The project **Development of inter-sector cooperation of RMSTC with the application sphere in the field of advanced research and innovations of classical metal materials and technologies using modelling methods** produced the following results: Models and computational simulations of properties of metallic materials and oxides; Optimization of technological processes utilizing thermodynamic and kinetic software (Thermo-Calc and Dictra); Experimental determination of zero strength temperature and formability of material depending on deformation speed; Mathematical models of deformation resistance depending on thermomechanical forming parameters and initial material structure. All these results make a strong contribution to reducing energy consumption in metallurgical production, thus helping to reduce negative environmental impacts. As part of the project sustainability period, the results are currently being verified in metallurgical production processes at Třinecké železářny, a.s.
2. The project **Research on the management of waste, materials and other products of metallurgy and related sectors** developed methods for utilizing waste from metallurgical production (primarily iron and steel), casting processes, and energy production (e.g., fly ash). As part of the project sustainability period, the results are now being applied in production processes at Třinecké železářny, a.s., particularly in downstream production. The project results include a patent: Method for obtaining iron concentrate from metallurgical slags https://isdv.upv.gov.cz/webapp/resdb.print_detail.det?pspis=PT/2022-446&plang=CS (both mutations, Czech and English). Findings on the use of fly ash and casting slags in the production of concrete mixes were used as a basis for the project MATUR – research plan 1.
3. The project **Innovative therapeutic methods of musculoskeletal system in accident surgery** developed new biocompatible materials for fixation devices and bone replacements with excellent combinations of strength characteristics and toughness. Texture control technology was used to prepare alloys with an elasticity modulus close to that of bone tissue. The authors of the publication summarizing all the findings of the project received an award from the Japan Institute of Metals and Materials. The results are being implemented by MEDIN, a.s. in the production of implants (currently in the testing phase). These new alloys will shorten and improve the effectiveness of treatments for lower limb bone fractures.
4. The project **Materials and technologies for sustainable development** (MATUR) has now been underway for 18 months. All four research plans in the project are working towards results that will have a very high level of societal relevance. Among the most beneficial contributions to date involve reducing the energy consumption of production technologies for key groups of materials (such as metals and concrete mixes) while also reducing waste gas emissions during production, as well as research into nanoparticles with positive environmental impacts produced by automotive braking processes. The economic benefit of such solutions, and their potential contribution to the Czech Republic's competitiveness, is clearly evident.
5. The Faculty's involvement in the international project **Atomic design of carbon-based materials for new normal society** brought benefits in the form of technologies reducing the carbon footprint of basic laboratory processes for preparing special types of materials and compounds. Research findings on the constitution and morphology of various substances were used to develop methods for preparing special supercapacitors.
6. The project **National contact centre for non-exhaust traffic emissions** is highly beneficial to

- society as a whole, as it maps the environmental impacts of non-combustion-related traffic emissions at critical locations with high traffic volumes. The introduction of a monitoring system for nanoparticle dust produced by braking processes in the vicinity of large road junctions, as well as the selection of appropriate composite materials with minimal emissions of dust and gases, bring major benefits in the form of reduction in the occurrence of respiratory diseases. The methods developed on the basis of the measurements carried out in the project are currently being systematically tested by the Public Health Institute in Ostrava.
- The project **Equipment for testing of antivirus protection devices** produced a certified "Methodology for the determination of inhibition of bacteria and viruses in liquid medium". This is an entirely new approach to the technology of protective mask filters which disinfect the air breathed by the wearer and provide long-term protection. Even when used in highly challenging conditions, the filters have a substantially longer lifespan (thousands of hours) than currently used filters. This prototype can also be used to test the characteristics of other filters.
 - The project **Prediction of damage to structural materials** develops a method for monitoring the residual lifespan of structures, enabling the strength potential of structural materials to be exploited to the maximum possible extent. This makes it possible to prevent unexpected failures, reduce the weight of structures, and make maximum use of their designed lifespan capacity, thus maximizing their energy efficiency. The project results included two patents: **Measurement probe for non-destructive steel diagnostics** <https://patentscope.wipo.int/search/en/WO2022167012> and **Mobile equipment for measuring the impedance spectrum of steels and measurement methods** <https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2022167013>.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ⁶²	Year of application	Name
Patent	2022	A method of obtaining ferric concentrate from metallurgical slag. (Patent PV2022-446), https://isdv.upv.gov.cz/webapp/resdb.print_detail.det?pspis=PT/2022-446&plang=CS https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27360%2F23%3A10252935
Patent	2019	A method of the transformer load switching the transformer for carrying out the method (SK288647 (B6) — 2019-03-01) https://patents.google.com/patent/SK288647B6/en?q=SK288647+(B6)+%E2%80%95+2019-03-01
Patent	2019	A heating system using conversion of microwaves to heat. Patent nr. 307727, https://upv.gov.cz/en# https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27360%2F19%3A10244534?query=373qaadpee2q
Patent	2022	Method of controlled alloying of intermetallic alloys γ-TiAl with carbon during vacuum induction melting in graphite crucibles. Patent nr. 309263 https://upv.gov.cz/en https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27360%2F20%3A10247676?query=24sqaadphbkq#result-main
Verified technology	2019	Proven technology for the production of shaped refractory materials suitable for biomass combustion conditions. (CZ 004/24-09-2019_OT. 2019.)

⁶² Specify the specific type of result. Add rows as needed.

		https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27360%2F19%3A10242520?query=zmoiaadpkgzq
Prototype	2019	High-alumina shaped refractory material A80K-ZB (CZ 007/24-09-2019_P. 2019.) https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27360%2F19%3A10242523?query=6pyaado746a
Certified methodology	2019	Methodology of effective allocation of costs in the environment of industrial enterprises (RIV/61989100:27360/19:10252189 - isvavai.cz) https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27360%2F19%3A10252189?query=smtiaadpxz3q
Certified methodology	2022	Methodology for the determination of inhibition of bacteria and viruses in liquid medium https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27690%2F22%3A10251291?query=qcoqaadp4oba

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)⁶³, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).⁶⁴

Additionally, the evaluated unit shall briefly comment on the funds received during the period of 2019–2023 from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

The Faculty's research results are transferred into technical practice in two main ways. If a commercial (industrial) partner is a co-investigator in a research project, that partner becomes the co-owner of the results obtained via the project, and it can use these results commercially depending on the extent of its project participation. The second option is for a commercial (industrial) entity or a research/development institution to request authorization to use the Faculty's research results; this is agreed contractually, granting the contractual partner the exclusive rights to use the results. During the evaluation period, the Faculty's contractual research accounted for **4 188 000 EUR**; the majority of this sum came from contracts with Český svářečský ústav s.r.o. (welding), Trinecké železářny, a.s. (metallurgical production), Garrett Motion Czech Republic, s.r.o. (energy/emissions technologies), Škoda Auto a.s., Ústav aplikované mechaniky Brno, s.r.o. (Institute

⁶³ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

⁶⁴ If the commercialisation of R&D&I results is carried out in this way.

of Applied Mechanics), TÜV SÜD Czech s.r.o, Thyssenkrupp Steel Europe AG, European Welding Institute s.r.o., and Liberty Ostrava, a.s. (metallurgical production). Due to the Faculty's predominant focus on technology, its departments have a high success rate in securing funding for new projects, particularly from public funding providers (the Czech Republic Technology Agency, the Ministry of Industry and Trade, the Czech Science Foundation, the Ministry of Education), usually with the Faculty as a co-contributor. During the evaluation period 2019–2023, the Faculty succeeded in securing funding for 42 projects of this type, with the total volume of funding reaching **17 263 000 EUR** (a full list is given at <https://www.fmt.vsb.cz/en/research/projects-and-grants>). These projects were implemented in partnership with more than 30 institutions (including the Institute of Physics and the Institute of Nuclear Physics at the Czech Academy of Sciences, the University of Chemistry and Technology in Prague, UJP PRAHA a.s. and other major research institutions). When identifying potential industrial partners, a key consideration is the Faculty's previous experience of collaboration with the potential partner, e.g. via contractual research. Companies that have engaged in successful long-term research-based collaboration with the Faculty are typically keen to collaborate on future projects. Another option that has proved its worth is to recruit new industrial partners by holding seminars or workshops on relevant topics; several events of this type (in the fields of chemical engineering, special metallurgy or materials engineering) have met with a very positive response, ultimately leading to new agreements on research collaboration. A further tried-and-tested way of recruiting new industrial partners is by organizing expert workshops and conferences; the Faculty holds 4–6 events of this type every year, and they represent an excellent opportunity to discuss issues in a larger group, often with the participation of experts from abroad. In projects funded by the Czech Republic Technology Agency or the Ministry of Industry and Trade, and in some projects funded by the Ministry of Education, the Faculty implements a range of compulsory activities during the sustainability period that follows the completion of the project itself; this enables the results to be tested and verified in technical applications. Such activities represent a continuation of collaboration between the Faculty and co-investigators, and this often leads to further contractual research agreements or proposals for new projects. It is also possible to monetize research results by selling licences to industrial partners. This form of commercialization occurred in one case at the Faculty during the evaluation period; the certified method "Methodology for the effective allocation of costs in an industrial company environment" was purchased by the company ATACO, spol. s r.o. in 2019. The total volume of donations from institutions collaborating with the Faculty during the evaluation period was 179 470 EUR.

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
sale of certified methodology (ATACO, spol. s r.o., Ruská 83/24, 73 00 Ostrava – Vítkovice)	12/ 470	0/0	0/0	0/0	0/0
Donation contracts	1 303/ 51 000	2 363/ 93 000	346/ 14 000	217/ 9 000	297/ 12 000
Total	1 315/ 51 470	2 363/ 93 000	346/ 14 000	217/ 9 000	297/ 12 000

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF R&D&I

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the period of 2019–2023 and provide up to 10 examples that it considers the most significant. *Maximum 500 words plus 200 words for each example given.*

The primary goal of popularizing science and research is to boost young people's interest in attractive new disciplines of materials engineering, production and treatment, solid state chemistry and nanotechnology; these are all highly relevant for current industrial applications. Another key dimension of these activities is the need to disseminate new scientific research findings and promote interest in technical fields among the general public. In addition to its educational and research activities, the Faculty of Materials Science and Technology takes a targeted, proactive approach to media communication. The Faculty presents the results of its research via a range of popularizing initiatives such as public events, lectures, workshops, seminars, conferences, field trips and exhibitions targeted at the general public.

The Faculty also co-organizes and participates in a range of annual popularizing events at the university level. Among the most important nationwide events of this type are **Scientists' Night**, **the Meltingpot at the Colours of Ostrava festival**, and the **Festival in the Streets** (now rebranded as **Art and Life**). Other important popularizing events held on a regular basis are **Earth Day and Kopřivnice Technology Days**. The Faculty co-organizes the university's annual **Art and Science festival** (held in the first week of September at the university's campus), as well as participating in the university's Open Days which showcase its faculties and degree programmes to potential applicants. For a number of years, the Faculty has worked alongside the University of Ostrava's Faculty of Science and the Czech Chemical Society to organize the "**Chemistry at the Castle**" event at the castle in Slezská Ostrava, promoting and popularizing chemistry to the general public. Work by students of the Artistic Casting degree programme is regularly exhibited to the public; popular exhibitions include "**A Quarter Century of Art in Castings**" at the in-house gallery of the university's Faculty of Electrical Engineering and Computer Science.

The Faculty is also involved in the university-organized projects "**Technical Improvements**" and "**Junior University**". The core of these projects is a series of workshops and talks at secondary and primary schools (and at the university itself) throughout the year. The Faculty's core goal in its popularizing activities is to create comprehensible, interactive content that will be popular among its target audiences. Events presenting life and studies at the Faculty in a fun, attractive way include "**Could the World Function Without Castings?**", "**My First Casting**", "**Chemistry in the Kitchen**", "**Food Chemistry and Determining Water Hardness**", "**The Wonderful World of Clay**", and "**The Fascination of Magnetism**". More information about these activities and student programs are given at <https://www.fmt.vsb.cz/en>.

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

In the previous Faculty evaluation, the evaluation panel presented 28 recommendations, most of which involved suggestions for improving activities in research and innovation. All these recommendations were thoroughly analyzed and discussed by the Collegium of the Dean, and the Faculty's Scientific Council was informed of the content of the entire evaluation report at its session on March 4, 2021. Many of the panel's recommendations are simple, generally formulated suggestions; their relevance for future improvements is clear, but they are difficult to implement in terms of process management. However, all the remaining recommendations were discussed thoroughly and have been incorporated into the systematic and strategic documents that guide the Faculty's activities — for example, the Faculty's Strategic Plan for the period 2021–2027, the annually prepared Implementation Plans, and the measures outlined in the annual Reports on the Results of Research and Development Activities during the evaluation period.

Responses to recommendations in individual blocks

Recommendations 3.2, 3.3 and 3.4:

It is true that the majority of contractual research continues to originate from domestic sources. However, the Faculty has collaborated very successfully with the Belgian company Tractebel Engineering (special tests and a comprehensive report analyzing welded joints in a pressurized reactor vessel) and the Swiss companies Sulzer and Garrett (special mechanical tests of structural materials and investigation of their microstructure).

The Faculty has achieved annual increases in the volume of new research findings, and this has been reflected in the growing number of research publications on the highest-quality platforms (Q1 journals). This trend is analyzed in detail in the annual Reports on the Results of Research and Development Activities in the evaluation period. New results from across the Faculty's portfolio of disciplines are being presented with increasing frequency at conferences (some of which are directly organized by the Faculty). The Faculty co-organizes (with Yokohama National University) the conference "New Methods of Damage and Failure Analyses of Structural Parts" every two years; the iteration of this conference held in the evaluation period (in 2022) was the 9th in this series of conferences, which now occupies an established place in the calendar of research events.

At present, the Faculty is not succeeding in its efforts to substantially increase the volume of funds generated by selling licenses and rights. This situation is not caused solely by companies' lack of interest in research results, but also by the continuing lack of functional legislation on research, development, innovations and knowledge transfer in the Czech Republic.

During the evaluation period, the Faculty focused on preparing large-scale infrastructure projects (e.g. MATUR via the OP Comenius <https://www.fmt.vsb.cz/en/research/matur/>, CirkArena <https://www.fmt.vsb.cz/en/research/cirkarena/> and a major component of the Refresh project <https://www.smaragdova.cz/en/>) The majority of the funding for these projects comes from the EU, via calls organized on the national level by Czech institutions.

During the evaluation period, the Faculty succeeded in securing an increased volume of funds from non-public sources via contractual research; in 2023, the volume of contractual research was over three times more than in the previous year.

Recommendations 3.5 and 3.6:

The Faculty places particularly strong emphasis on environmental considerations in its concept for project results; alongside economic effectiveness, this is one of the decisive factors in the success of projects. All results submitted to Module M1 are subject to detailed evaluation in order to determine whether they meet both these key criteria. The majority of projects (out of 42 projects implemented during the evaluation period <https://www.fmt.vsb.cz/en/research/projects-and-grants/>) focus explicitly on environmental issues or are of substantial environmental relevance. The

large-scale OP Comenius project MATUR includes two research plans that are directly focused on environmental issues: Hybrid silicate materials and their technological applications; Materials and technologies reducing the environmental impact of used industrial products. As is evident from Table 3.4.1 in this report, which sets out the most important results of applied research at the Faculty, both these research plans will help bring environmental improvements or boost the effectiveness of research results in practical applications.

The Faculty continues to work closely with industrial partners, and it is currently investigating topics related to reductions in technological energy consumption and the introduction of new waste recycling technologies.

The Faculty is systematically involved in strengthening its relationships with partners in industry and applying new results of scientific research in technical practice. In the investigation period, the Faculty signed over 20 new memorandums on cooperation with industrial partners, including AQ PUMPY (Czech Republic, focusing on cooling technologies for rolled products), Mubea – HZP (Germany, development of structural elements), I.P.C. Refractories (Slovakia, recycling of metallurgical waste), and SOLBIEN (Czech Republic, chemical engineering computation systems).

New results achieved by research teams at the Faculty are being presented with increasing frequency at conferences, some of which are organized by the Faculty itself. Every year the Faculty participates in promotional events popularizing science (Open Science, Scientists' Night, Science and Art in the Streets). The Faculty also organizes several annual events supporting entrepreneurship and promoting the establishment of spinoff companies. Not all these activities are directly linked with teaching. Despite these efforts, the Faculty did not succeed in establishing a new company during the evaluation period. Besides the inadequate legislative framework and regulations at University level, the unfavorable economic circumstances are also a complicating factor in this regard.

The Faculty is working systematically to propose a methodology ensuring that the results of its research will be more efficiently utilized at the international level, including specific measures and steps that will lead to this goal. The Faculty is deeply involved in a number of projects funded from outside the Czech Republic (mainly EU funding), though these projects also involve many more researchers from other countries.

Recommendations 3.7, 3.8 and 3.9:

During the evaluation period, the Faculty was only involved indirectly in monetizing the results of its research; this took the form of supplementary economic activity, in which the Faculty commercially exploited these results in subsequent research or in industrial applications.

During the period under evaluation, the Faculty initiated and intensified new activities associated with the application of structural materials in clinical practice; it worked closely with a producer of medical devices (MEDIN, a.s.), the Trauma Centre at Ostrava University Hospital, the Ostrava Public Health Institute, and the Medical Faculty at the University of Ostrava to develop and apply new structural materials and design solutions in medical devices and new technologies for biocompatible surface treatments. Especially within the project "Innovative treatment methods for the musculoskeletal system in trauma surgery" https://starfos.tacr.cz/en/projekty/EF17_049%2F0008441?query=56riaadndg4q these activities also involved collaboration with researchers from Japan. In connection with this research, last year the Faculty launched a new bachelor's degree programme: Innovation and design for medical devices.

The Faculty did not establish any spinoff companies during the evaluation period. Besides the inadequate legislative framework and regulations at University level, the unfavorable economic circumstances are also a complicating factor in this regard.

Recommendations 3.10 and 3.11:

As is evident from the data for the past 5 years set out in section 3.2, staff at the Faculty received prestigious awards (from state institutions and professional organizations) recognizing their achievements in research. This has undoubtedly been reflected in the increased number of Faculty staff holding positions on editorial boards and professional institutions responsible for evaluating and planning scientific research programmes in the Czech Republic. An important contribution to this progress has been the Faculty's shift in profile and its stronger emphasis on integrating its individual departments and sections. The Faculty will continue in this trend.

Recommendation 3.12:

The Faculty expresses its agreement with all the positive remarks, including those focusing on the future. As is evident from section 3.6 of this report, the Faculty places a strong emphasis on PR activities (in terms of both their volume and their range). These activities are regularly incorporated into the Implementation Plans for the Strategic Plan (elaborated for each year in the evaluation period) and they will continue to form a major focus in the future.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
CirkaArena	3.1, 3.7	https://cirkarena.cz/en/homepage/
MATUR	3.1, 3.7	https://www.fmt.vsb.cz/matur/en
Refresh	3.1, 3.7	https://www.smaragdova.cz/en/refresh/
Awards	3.2	https://www.fmt.vsb.cz/en/detail-news/?reportId=42213&linkBack=%2Fen%2Ffaculty%2Fnews%2Findex.html
Awards	3.2	https://www.fmt.vsb.cz/en/detail-news/?reportId=46055&linkBack=%2Fen%2Ffaculty%2Fnews%2Findex.html
FMT's projects and Grants	3.3, 3.5, 3.7	https://www.fmt.vsb.cz/en/research/projects-and-grants/
Industrial Property Office of the Czech Republic	3.4, 3.4.1	https://isdv.upv.gov.cz/webapp/resdb.print_detail.det?pspis=PT/2022-446&plang=CS
The World Intellectual Property Organization (WIPO)	3.4	https://patentscope.wipo.int/search/en/WO2022167012
The World Intellectual Property Organization (WIPO)	3.4	https://patentscope.wipo.int/search/en/detail.jsf?docId=WO2022167013
Industrial Property Office of the Czech Republic	3.4.1	https://isdv.upv.gov.cz/webapp/resdb.print_detail.det?pspis=PT/2022-446&plang=CS
A method of obtaining ferric concentrate from metallurgical slag	3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27360%2F23%3A10252935
GooglePatents	3.4.1	https://patents.google.com/patent/SK288647B6/en?q=SK288647+(B6)+%E2%80%95+2019-03-01
A heating system using conversion of microwaves to heat	3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27360%2F19%3A10244534?query=373qaadpee2g
Method of controlled alloying of intermetallic alloys γ-TiAl with carbon during vacuum induction melting in graphite crucibles	3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27360%2F20%3A10247676?query=24sqaadphbkq#result-main

Proven technology for the production of shaped refractory materials suitable for biomass combustion conditions	3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27360%2F19%3A10242520?query=zmoiaadpkgzq
High-alumina shaped refractory material A80K-ZB	3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27360%2F19%3A10242523?query=6pyaaado746a
Methodology of effective allocation of costs in the environment of industrial enterprises	3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27360%2F19%3A10252189?query=smtiaadpxz3q
Methodology for the determination of inhibition of bacteria and viruses in liquid medium	3.4.1	https://starfos.tacr.cz/en/vysledky-vyzkumu/RIV%2F61989100%3A27690%2F22%3A10251291?query=qcoqaadp4oba
FMT	3.6	https://www.fmt.vsb.cz/en
Innovative therapeutic methods of musculoskeletal system in accident surgery	3.7	https://starfos.tacr.cz/en/projekty/EF17_049%2F0008441?query=56riaadndg4q

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Faculty of Mechanical Engineering (FME)

FORD: 2 - Engineering and technology

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.⁶⁵ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

The Faculty of Mechanical Engineering (FME), founded in 1950, plays a key role in technical education and research, particularly in the Moravian-Silesian Region (MSR). Its mission is to advance mechanical engineering through high-quality education, applied research, and industry collaboration. The vision is to be a leader in technological progress and innovation, shaping the future of engineering through interdisciplinary research and strong connections with industry and society.

FME focuses on Industry 4.0, automotive engineering, smart energy solutions, and advanced manufacturing. It collaborates closely with local, national, and international companies, ensuring that research outputs contribute directly to real-world applications. Through collaborative projects, commissioned research, and active engagement in public-private partnerships, the Faculty strengthens its role as a hub for knowledge transfer. Revenues from these collaborations form a significant part of its budget, demonstrating its commitment to bridging the gap between academia and industry.

Beyond industrial cooperation, FME has a strong societal impact, influencing regional and national policies in engineering, energy, transport, and innovation. Faculty members participate in expert advisory bodies and committees, contributing to strategic decision-making that shapes the technological landscape of the MSR. The Faculty also regularly organises seminars, workshops, and conferences, bringing together academics, industry representatives, and policymakers to discuss emerging challenges and opportunities in mechanical engineering.

At the national level, FME is a key partner in several research and innovation platforms, including:

- National Competence Centre for Mechanical Engineering.
- Josef Božek National Competence Centre for Land Transport.
- National Mechatronics and Smart Technology Competence Centre for Engineering.
- National Energy Centre.

⁶⁵ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

Through these initiatives, FME enhances its supra-regional and international research impact, reinforcing its reputation as a leading institution in mechanical engineering research and development.

Research Focus and Long-Term Goals

FME conducts cutting-edge research in several key areas:

- Additive manufacturing (3D printing) of metals and composite materials.
- Mechatronic systems and intelligent automation.
- Advanced materials for medical implants and industrial applications.
- Automation, robotics, and artificial intelligence in engineering.
- Innovations in the automotive and energy sectors.

The Faculty's long-term goal is to expand its research capabilities by integrating new technologies into both scientific exploration and education. This includes fostering interdisciplinary collaboration, developing new digital and smart manufacturing processes, and enhancing sustainability in engineering solutions.

Furthermore, FME is committed to attracting and developing talent, supporting young researchers and students through research internships, scholarships, and collaborative projects with industry. The Faculty also aims to strengthen its international partnerships, increasing mobility opportunities for students and researchers while engaging in global engineering challenges.

Organisational Structure and Size

FME's structure is designed to support high-quality education, research, and industry cooperation. It comprises:

- Specialised departments, covering core mechanical engineering disciplines.
- Research centres and laboratories, focused on applied research and innovation.
- Administrative units, ensuring smooth operational and academic management.

In 2023, FME had:

- 1,805 students, with enrolment numbers fluctuating between 1,762 and 1,825 over the five years (2019-2023).
- 242 employees (number of persons), including academic, research, and administrative staff, with workforce numbers ranging from 233 to 250 in recent years.
- 47 study programmes, consistently expanding to align with industry needs:
 - o 12 bachelor's programmes (in 2023).
 - o 20 master's programmes (in 2023).
 - o 15 doctoral programmes (in 2023).

The Faculty offers bachelor's, master's, and doctoral degrees, ensuring that students receive comprehensive training in mechanical engineering and related fields. Graduates are highly sought after by employers in engineering, manufacturing, automotive, and energy industries, as well as in research institutions.

With its strong industry partnerships, innovative research, and commitment to education, FME remains a driving force in technological progress, making significant contributions to both regional and global engineering advancements.

Table 3.1.1 - Staffing per FTE⁶⁶

Academic/ Professional position	Total / Of which women					
	2019	2020	2021	2022	2023	Total
Professor	15,7/2,2	15,4/2,0	17,0/2,2	16,1/1,0	17,2/1,0	17/2
Associate Professor	35,3/4,7	36,2/4,4	34,2/4,4	35,6/4,4	34,6/4,2	36/4
Assistant Professor	75,5/23,5	72,8/20,6	75,3/20,2	79,0/19,9	80,7/19,4	80/23
Assistant	1,0/0,0	0,7/0,0	0,7/0,0	0,7/0,0	1,0/0,0	1/0
R&D Personnel ⁶⁷	5,1/0,4	3,4/0,3	6,6/0,4	7,7/0,4	12,6/0,5	12/0,5
Researchers in other categories ⁶⁸	17,6/1,1	23,4/0,9	23,5/0,5	28,1/0,9	15,9/0,2	28/1
Technical and economic staff ⁶⁹	36,8/23,2	35,3/22,7	37,9/23,3	38,9/22,1	43,5/22,1	43/23
Scientific, research and development staff involved in teaching activities	127,87/30,35	125,14/26,99	127,2/26,84	132,75/25,33	133,49/24,57	133/30
Early career researchers ⁷⁰	16,35/1,63	20,76/2,86	25,72/4	27,05/2,9	32,55/3,79	32/4
Total ⁷¹	189,7/55,0	188,2/50,9	196,2/51,1	208,4/48,7	206,3/47,3	208/55

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the first year of the evaluation period (numbers of physical employees and personnel)⁷²

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor					2		4	1	8	1	3	
Associate Professor			7		15	3	7	1	11	1	1	

⁶⁶ The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

⁶⁷ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

⁶⁸ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

⁶⁹ Who participates in the management and support of R&D&I in the institution.

⁷⁰ See Definition of Terms in Methodology HEI2025+.

⁷¹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

⁷² The total number of employees/workers as of 31st December of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

Assistant Professor	10	1	29	7	27	8	17	6	2	2		
Assistant			1									
R&D Personnel ⁷³												
Researchers in other categories ⁷⁴	22	2	8		2				1		1	
Technical and economic staff ⁷⁵	3	2	7	5	12	8	7	7	9	3	1	
Scientific, research and development staff involved in teaching activities	10	1	39	7	44	11	28	8	21	4	5	
Early career researcher ⁷⁶												
Total ⁷⁷	35	5	52	12	58	19	35	15	31	7	6	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the last year of the evaluation period (numbers of physical employees and personnel)⁷⁸

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor			1		7	1	3		8		2	
Associate Professor			5		12	1	10	3	9	1	4	
Assistant Professor	8		33	3	30	10	18	4	5	3		
Assistant	1				2							
R&D Personnel ⁷⁹												
Researchers in other categories ⁸⁰	11		14		3						5	

⁷³ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

⁷⁴ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

⁷⁵ Who participates in the management and support of R&D&I in the institution.

⁷⁶ See Definition of Terms in Methodology HEI2025+.

⁷⁷ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

⁷⁸ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

⁷⁹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

⁸⁰ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

Technical and economic staff ⁸¹	2	1	8	2	13	9	8	8	4	1	1	
Scientific, research and development staff involved in teaching activities	9		39	3	51	12	31	7	22	4	4	
Early career researcher ⁸²												
Total ⁸³	21	1	61	5	67	21	39	15	26	5	12	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	1048	97	1081	78	1041	91	1041	89	1079	100	5290	455
Master's ⁸⁴	520	43	553	62	551	51	561	49	553	50	2738	255
Doctoral	171	23	191	16	176	15	177	14	175	12	890	80
Lifelong Learning Courses	0	0	0	0	38	14	45	12	23	4	106	30
Total	1739	163	1825	156	1806	171	1824	164	1830	166	9024	820

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ⁸⁵ /Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate	8/5		8/5		9/5		9/4		9/4		10/5	
Master's	7/4		12/8	1/0	13/8	1/0	13/8	1/0	14/9	1/0	20/10	1/0
Doctoral	2/1		9/9		9/9		9/9		9/9		11/10	
Lifelong Learning courses	0/0		0/0		3/0		4/0		2/0			
Total	17/10		29/22	1/0	34/22	1/0	35/21	1/0	34/22	1/0	41/25	1/0

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

⁸¹ Who participates in the management and support of R&D&I in the institution.

⁸² See Definition of Terms in Methodology HEI2025+.

⁸³ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

⁸⁴ All master's degree students are listed, regardless of the length of their programme of study.

⁸⁵ The total number of study programmes for which admissions have been announced in a given academic year.

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	4	Basic Research	6
	1.2 Computer and information sciences	2	Balanced basic and applied research	
	1.3 Physical sciences			
	1.4 Chemical sciences			
	1.5 Earth and related environmental sciences			
	1.6 Biological sciences			
	1.7 Other natural sciences			
2. Engineering and Technology	2.1 Civil engineering			94
	2.2 Electrical engineering, Electronic engineering, Information engineering	5	Applied Research	
	2.3 Mechanical engineering	74	Balanced basic and applied research	
	2.4 Chemical engineering			
	2.5 Materials engineering	10	Balanced basic and applied research	
	2.6 Medical engineering	3	Balanced basic and applied research	
	2.7 Environmental engineering	2	Balanced basic and applied research	
	2.8 Environmental biotechnology			
	2.9 Industrial biotechnology			
	2.10 Nanotechnology			
	2.11 Other engineering and technologies			
3. Medical and Health Sciences	3.1 Basic medicine			
	3.2 Clinical medicine			
	3.3 Health sciences			
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries			
	4.2 Animal and Dairy science			
	4.3 Veterinary science			
	4.4 Other agricultural sciences			
5. Social Sciences	5.1 Psychology and cognitive sciences			
	5.2 Economics and Business			
	5.3 Education			
	5.4 Sociology			
	5.5 Law			
	5.6 Political science			

	5.7 Social and economic geography			
	5.8 Media and communications			
	5.9 Other social sciences			
6. Humanities and the Arts	6.1 History and Archaeology			
	6.2 Languages and Literature			
	6.3 Philosophy, Ethics and Religion			
	6.4 Arts (arts, history of arts, performing arts, music)			
	6.5 Other Humanities and the Arts			
Total		100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the previous five-year period based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

Position of the Faculty of Mechanical Engineering at VSB-TUO in the Research Community

The Faculty of Mechanical Engineering at VSB-TUO has long been recognized as a significant research institution in mechanical engineering at both national and international levels. It contributes substantially to the advancement of scientific knowledge through publications in prestigious journals, involvement of academic staff in international research activities, participation in professional conferences, and award-winning research outputs. This standing is evidenced by numerous prestigious awards, memberships in scientific and editorial boards of leading journals, and active participation in the evaluation processes of research projects at both national and European levels. Notably, the faculty maintains collaborations with leading foreign scientists who regularly visit the faculty, bringing new perspectives and expertise. Additionally, the faculty actively participates in the evaluation of research projects and program calls at national and European levels, thereby helping to shape the research environment not only in the Czech Republic but also in the broader European context.

Prestigious Awards in Research, Development, and Innovation

Academic staff at the Faculty of Mechanical Engineering at VSB-TUO regularly receive prestigious awards for their scientific work. These awards confirm the excellence of the faculty's research and its significance in the field of engineering sciences. Award-winning research focuses on innovative approaches in materials engineering, industrial technologies, and other technical science fields. Among the most notable awards are those for best scientific articles, engineering creativity, and

contributions to Industry 4.0. A selection of these awards is presented in Table 3.2.1.

Participation of Academic Staff in Scientific and Editorial Boards

The faculty plays an important role in shaping scientific discourse through the active involvement of its academic staff in the editorial boards of international scientific journals. Membership in these boards enables faculty experts to influence research directions, assess the quality of published work, and contribute to scientific integrity within their fields. In addition to editorial roles, faculty members hold significant positions in professional societies, enhancing their international influence and prestige. A list of selected academic staff and their editorial board memberships is shown in Table 3.2.2.

Significant Invited Lectures by Academic Staff at Foreign Institutions

An indicator of the international recognition of the faculty's researchers is their invitation to deliver expert lectures at prestigious foreign universities and research institutions. Faculty academics have presented their research findings at leading European and global institutions, introducing new knowledge in fields such as materials engineering, numerical modeling, additive manufacturing, and other mechanical engineering disciplines. These lectures not only enhance the faculty's prestige but also contribute to international cooperation and the sharing of specialized knowledge. A list of the most significant invited lectures is provided in Table 3.2.3.

Notable Invited Lectures by Foreign Scientists at the Faculty

The Faculty of Mechanical Engineering regularly hosts prominent foreign scientists who present their latest research results at the faculty. These lectures are a key element of international collaboration, facilitating knowledge exchange among experts from various countries. The invited lectures cover a broad range of topics, from advanced material technologies to the optimization of manufacturing processes. The participation of foreign experts contributes to the improvement of research and education quality at the faculty. An overview of selected lectures is provided in Table 3.2.4.

Involvement of Academic Staff in the Evaluation of Research Projects

The Faculty of Mechanical Engineering actively participates in the evaluation of research projects and programs at both national and European levels. Faculty members serve on evaluation committees and expert panels assessing research proposals under programs funded by the European Commission, the Ministry of Industry and Trade, the Technology Agency of the Czech Republic, and other institutions. This involvement confirms the faculty's professional reputation and its ability to contribute to the formation of scientific policy. A list of selected academic staff members and their participation in evaluation processes is shown in Table 3.2.5.

Through its extensive research activities, prestigious awards, involvement in international professional structures, and active collaboration with leading global scientific institutions, the Faculty of Mechanical Engineering at VSB-TUO maintains a significant position within the research community. Its scientific work contributes not only to the advancement of technical sciences but also to enhancing the international prestige of Czech research and education. In the coming years, the faculty aims to continue strengthening international partnerships, promoting innovative research, and solidifying its role as a key player in the global research environment.

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
Doc. Ing. Martin Vašina, Ph.D. a kolektiv	Best article of a scientific journal MM Science for the year 2023: NEVŘELA, Martin, Martin VAŠINA, Pavel HRBÁČEK a Vladimír DEKÝŠ. Effect of geometry and surface distribution of holes on sound and light absorption properties of 3D-printed PETG materials. <i>MM Science Journal</i> [online]. 2023, vol. 2023-October, iss. N, s. 6793-6799. [cit. 2025-02-17]. ISSN 1803-1269. Available from: https://www.mmscience.eu/journal/issues/october-2023/articles .	Czech Engineering Academy
prof. Ing. Stanislav Ruzs, CSc.	Engineering creativity: Gold medal	AGH University of Science and Technology, Krakow
Ing. Kristýna Sternadelová, Ph.D.	Bronze award: The best paper, awarded by the organizer for a conference paper TEAM 2024, published in MM Science Journal: https://www.webofscience.com/wos/woscc/full-record/WOS:001350511600001 STERNADELOVA, K.; KRUPOVA, H.; SROM, D.; VONTOROVA, J. a SIOSTRZONEK, R. IMPACT OF EDGE PREPARATION ON SURFACE FINISHING PROPERTIES. Online. <i>MM Science Journal</i> . 2024, roč. 2024, č. 5, s. 7591-7596. ISSN 18031269. Available from: https://doi.org/10.17973/MMSJ.2024_11_2024083 .	VSb - Technical University of Ostrava
doc. Ing. Marek Pagáč, Ph.D. a kolektiv autorů	2023 BEST PAPER AWARD. Article: Pagac, M.; Hajnys, J.; Ma, Q.-P.; Jancar, L.; Jansa, J.; Stefek, P.; Mesicek, J. A Review of Vat Photopolymerization Technology: Materials, Applications, Challenges, and Future Trends of 3D Printing. <i>Polymers</i> 2021 , 13, 598. https://doi.org/10.3390/polym13040598	MDPI
Ing. Stefan Grushko, Ph.D.	1st place in the Industry 4.0 category, year 2021, Siemens, s.r.o.	Cena Siemens - Siemens, s.r.o.
Ing. Dominik Heczko, Ph.D.	2nd place in the Industry 4.0 category, year 2022, Siemens, s.r.o.	Cena Siemens - Siemens, s.r.o.
Ing. Petr Oščádal, Ph.D.	3rd place in the Industry 4.0 category, year 2023, Siemens, s.r.o.	Cena Siemens - Siemens, s.r.o.
doc. Ing. Robert Brázda, Ph.D. a kolektiv	Diploma and gold medal from the international innovation competition in Katowice, Poland, at the INTARG POLAND competition for the patent titled: A device for analysis of selected properties of particulate matter. https://isdv.upv.gov.cz/doc/FullFiles/Patents/FullDocuments/307/307521.pdf	INTARG POLAND, Katowice, Poland

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Doc. Ing. Martin Vašina, Ph.D.	Member of the editorial board of the journal International Journal of Modern Manufacturing Technologies, ISSN 2067-3604.
prof. Ing. Ivo Hlavatý, Ph.D.	Scientific Papers of the University of Pardubice: Series B, ISSN 1211-6610
Ing. Jakub Měsíček Ph.D.,	Member of the editorial board of the journal Applied Sciences (ISSN 2076-3417)
prof. Ing. et Ing. Mgr. Jana Petřů, Ph.D.	Member of the editorial board of the journal Applied Sciences (ISSN 2076-

	3417)
Ing. Jiří Hajnýš, Ph.D.	Member of the editorial board of the journal Applied Sciences (ISSN 2076-3417)
Ing. Jiří Hajnýš, Ph.D.	Guest Editor of the journal Polymers, EISSN 2073-4360
prof. Ing. Robert Čep, Ph.D.	MM Science Journal, ISSN 1803-1269, Member of the Control Board, Technology Agency of the Czech Republic.
prof. Ing. Jiří Tůma, CSc.	Associate editor in SAGE Publications Inc. Proceedings of the Institution of Mechanical Engineers, Part E: Journal of Process Mechanical Engineering, member of the board of directors, The International Institute of Acoustics and Vibration IIAV
prof. Ing. Petr Noskiewič, CSc.	Member of the editorial board of Journal International Journal of Fluid Power
prof. Ing. Jaroslav Zapoměl, DrSc.	Member of the international committee IFToMM Dynamics of Rotating Machines, Member of the editorial board of the journal Applied and Computational Mechanics, permanent member of the international conference committee of the SIRM conference (Dynamics of Rotating Machines), permanent member of the international conference committee of the IFToMM TMM conference (Theory of Machines and Mechanisms)

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
prof. Ing. Stanislav Ruzs, CSc.	Microstructure and mechanical properties of AlMg3 alloy subjected to DRECE method	Polish Academy of Science, Krakow	2019
doc. Ing. Zdeněk Poruba, Ph.D.	Basic Principles of FEM	Gunma University, Kiryu, Japan	2019
Prof. Dr. Petr Novak, MSc.	TELERESCUER – mobile robot for underground coal mine with methane	Danang University of Technology - University of Danang, Danang, Vietnam	2019
Prof. Ing. Petr Noskiewič, CSc.	Analytical methods for creating of the mathematical models of the dynamics systems and their realizations using the simulation programmes	University of Salerno, Department of Industrial Engineering, Italy	2019
Doc. Ing. Marek Pagáč, Ph.D.	Additive manufacturing, 3D printing, CAD/CAM software	Silesian university of Technology, Gliwice, Poland	2020
Ing. Veronika Sassmanová, Ph.D.	Possibilities of combustion straw from oilseed rape using the laboratory equipment	University of Vigo, Spain	2021
Ing. Ondřej Hilšer, Ph.D.	Hetero-structured Mg alloy with high strength-ductility synergy produced by severe plastic deformation	Warsaw University of Technology	2022
Ing. Martin Pastrňák, Ph.D.	Dual Rolls Equal Channel Extrusion: A novel method for continuous severe plastic deformation	Warsaw University of Technology	2022
doc. Ing. Zdeněk Poruba, Ph.D.	Recently Solved Problems of Technical Practice Using FEM	Ton Duc Thang University, Ho Chi Minh City, Vietnam	2022
doc. Ing. Miroslav Mahdal, Ph.D.	Embedded Measuring and Control Systems and Their Power Supply	Ton Duc Thang University, Ho Chi Minh City, Vietnam	2022

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
prof. Wojciech Maziarz, Ph.D., D.Sc.	Polish Academy of Science, Institute of Metallurgy and Materials Science, Krakow	Effect of severe plastic deformation process on microstructure and mechanical properties of AlSi/SiC composite	2019
Assoc. Prof. Michelle Micio, PhD.	Universita degli Studi di Salerno	Sustainable energy and environment management	2019
Phan Dao, PhD.	Ton Duc Thang University, Ho-Chi-Minh City, Vietnam	Contribution to the Analytical Solution of Advanced Mechanisms	2019
Doc. Dr. Inci Mustafa	Iskenderun Technical University, Hatay, Turkey	Integration of Fuel Cells into the Power Grid: Topology, Control, and Technical Challenges	2020
dr hab. inż. Tomasz Kozior, prof. PŚ	Kielce University of Technology, Kielce, Poland	Metrology of Surface Texture, Multiscale Analysis and Geometrical Quantities	2021
prof. D.Sc. Aki Mikkola	Lappeenranta University of Technology	Product processes based on the multibody system dynamics	2022
prof. D.Sc. Aki Mikkola	Lappeenranta University of Technology	Steps for high quality publication	2022
Dr hab. inż. Eryk Remiorz, prof. PŚ	Silesian University of Technology, Gliwice, Poland	Theoretical and Experimental Studies of Chain Haulage Systems of Longwall Machines	2022
Ahmet Kecici, PhD.	Dogus University, Istanbul, Turkey	Innovative Approaches in Energy Research and Education: International Collaboration and Laboratory Development	2022
Dr hab. inż. Piotr Cheluszka, prof. PŚ	Silesian University of Technology, Gliwice, Poland	Theoretical and Experimental Studies of Roadheader Dynamics	2022

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the project/programme call	Name of the authority/guarantor contracting of the project/programme call	Year
doc. Ing. Michal Dorda, Ph.D.	Transport 2020+	TACR	2021
doc. Ing. Robert Brázda, Ph.D.	Transport 2020+	TACR	2021, 2022
prof. Ing. et. Ing. Mgr. Jana Petrů, Ph.D.	Public Call for Submitting Applications for the Implementation of Research and Development Projects in Individual Groups of Science and Technology Fields	Slovak Research and Development Support Agency	2021, 2022, 2023

Marek Sadílek, prof. Ing. Ph.D.	Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences	VEGA Commission for Mechanical Engineering and Related Fields of Information and Communication Technologies and Materials Engineering	2022, 2023
Prof. Ing. Aleš Slíva, Ph.D.	TACR	TACR	2022
Stanislav Ruz, prof. Ing. CSc.	National Science Centre (NSC) Poland	SONATA 17	2022
Prof. Ing. Aleš Slíva, Ph.D.	Research Executive Agency European Commission for projects HORIZON-MSCA-2021-DN-01/HORIZON-MSCA-2021-DN-01-01/HORIZON-TMA-MSCADN/Normal, HORIZON-MSCA-2021-DN-01/HORIZON-MSCA-2021-DN-01-01/HORIZON-TMAMSCA-DN-JD/Normal, HORIZON-MSCA-2021-DN-01/HORIZON-MSCA-2021-DN-01-01/HORIZON-TMA-MSCA-DN-ID/Normal	EU	2023
Prof. Ing. Aleš Slíva, Ph.D.	OPTAK	MPO	2023
Robert Čep, prof. Ing. Ph.D.	Research and Development Projects in Individual Groups of Science and Technology Fields (RD 2023, RD 2024)	Slovak Research and Development Agency	2023
Robert Brázda, doc. Ing. Ph.D.	Transport 2030	TACR	2023

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research⁸⁶) that it has implemented or participated in during the evaluation period⁸⁷. This should be done from the full list in annex tables (Table 3.3.1-3.3.2)⁸⁸, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

During the evaluation period, the Faculty of Mechanical Engineering (FME) conducted numerous research projects with significant applied impact. Below are ten key projects selected based on their achieved results, application potential, and contribution to the faculty's mission.

1. National Recovery Plan for VSB-TUO, Specific Objective B: Academically-Oriented Bachelor's Degree Program in Intelligent Transport and Logistics

Provider: Ministry of Education, Youth and Sports of the Czech Republic

Project Number: MŠMT-6605/2022

⁸⁶ For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

⁸⁷ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

⁸⁸ The evaluated unit shall only fill tables that are relevant to it.

Implementation Period: 2022–2025

<https://prihlaska.vsb.cz/uchazec/program/1033> (both mutations, Czech and English)

The goal of the project is to develop a new bachelor's study program focused on intelligent transport and logistics. The program aims to prepare professionals capable of designing and implementing modern transport and logistics systems using the latest technologies. Graduates will possess competencies in areas such as autonomous vehicles, intelligent transport systems, and sustainable logistics, thereby enhancing their employability in the labor market.

The project strengthens the faculty's educational offerings and responds to the current needs of industry and society in the field of modern transport and logistics. It contributes to fulfilling the faculty's mission of providing high-quality and up-to-date education in technical fields.

The project includes collaboration with other faculties of VSB-TUO, particularly the Faculty of Electrical Engineering and Computer Science and the Faculty of Economics. This ensures an interdisciplinary approach that combines technical and economic knowledge.

Additionally, the project encompasses the creation of modern study materials, the establishment of a laboratory for teaching the use of artificial intelligence in building management, and the preparation of a promotional campaign to increase interest in this study program.

The total project cost amounts to CZK 21,478,814.54 (EUR 859,152)

2. Innovative and Additive Manufacturing Technologies – New Technological Solutions for 3D Printing of Metals and Composite Materials

Implementation Period: November 1, 2018 – June 30, 2023

<https://www.vsb.cz/fip-ai/en/cooperation/projects/innovative-and-additive-manufacturing-technology/>

This project, implemented by VSB-TUO from November 1, 2018, to June 30, 2023, focuses on creating a unique platform for research and development in the field of 3D printing of metals and composite materials. The objective is to support long-term collaboration between research organizations and industrial partners through joint research activities.

The project includes research on new atomized powder materials with unique chemical compositions, analysis of their mechanical properties, and process simulations using finite element methods (FEM).

Project partners include institutions such as the Silesian University of Technology in Gliwice, the University of Žilina, the Fraunhofer Institute for Machine Tools and Forming Technology (IWU), and several industrial enterprises.

The total project budget amounts to CZK 81,818,590 (EUR 3,272,743), of which CZK 69,545,801.33 (EUR 2,781,832) is funded by the European Regional Development Fund.

The project has strengthened the faculty's research capacity in modern manufacturing technologies and enabled the integration of the latest knowledge into teaching, thereby improving the quality of education and the graduates' readiness to meet industry demands.

3. New Type of Energy Storage Power Plant

Provider: Technology Agency of the Czech Republic (TA CR)

Project Number: TK03030037

Implementation Period: 2020–2025

<https://starfos.tacr.cz/en/projekty/TK03030037>

Financial Volume: CZK 65 million (2,600,000 EUR)

The project focuses on the research and development of a new concept of an accumulation power plant that enables more efficient storage of electrical energy. The main goal is to stabilize the energy grid and support the use of renewable energy sources.

The developed technology allows for energy accumulation during periods of low demand and its utilization during peak consumption times. The power plant employs innovative water pumping systems with optimized control and modern materials.

The project's results are expected to contribute to the development of sustainable energy and help reduce dependence on fossil fuels.

The Faculty of Mechanical Engineering is involved in developing technological solutions to improve the efficiency and reliability of the energy storage system. The project supports research in the field of renewable energy sources and their effective integration into the power grid.

Collaboration with research institutions and industrial partners is a key part of the project, focusing on the design and testing of critical components of the power plant. The faculty works closely with other departments of VSB-TUO, including the Faculty of Electrical Engineering and Computer Science, which contributes to the development of control systems for optimizing the power plant's operation.

4. TK02020060 – Research of an Innovative Steam Generator Concept for Cogeneration Electricity Production at Waste-to-Energy Plants (ZEVO) with Prevention of Chloride Corrosion and Energy Storage Capability

Provider: Technology Agency of the Czech Republic (TA CR)

Project Number: TK02020060

Implementation Period: 2019–2021

<https://starfos.tacr.cz/en/projekty/TK02020060>

The project focused on developing a new steam generator concept for waste-to-energy (ZEVO) facilities that:

- Eliminates chloride corrosion of steam superheaters, thereby increasing the equipment's lifespan and reliability.
- Integrates an energy storage system to balance fluctuations in the power grid.
- Enhances the efficiency of electricity and heat production in cogeneration operations.

The project outcomes have significant application potential for industrial energy operations focused on the efficient use of waste heat and cogeneration electricity production.

The Faculty of Mechanical Engineering contributed to the development of the steam generator, including the design of its mechanical and thermodynamic properties. This project aligns with the faculty's long-term focus on research in sustainable energy and improving the efficiency of industrial processes.

The project was carried out in cooperation with EGÚ Brno, INVELT SERVIS, and SVÚM, enabling the integration of expertise in steam generators, materials engineering, and industrial energy. The Faculty of Mechanical Engineering was responsible for thermodynamic parameter calculations and the optimization of the device's structural components.

The total financial volume of the project amounts to CZK 18,064,000 (722,560 EUR).

5. TN01000071 – National Competence Center for Mechatronics and Smart Technologies for Engineering (NCK MESTEC)

Implementation Period: 2019–2022

Total Financial Volume: CZK 202,566,000 (8,102,640 EUR)

<https://starfos.tacr.cz/en/projekty/TN01000071>

The project was carried out from 2019 to 2022 with the aim of concentrating the capacities of research organizations and technology-oriented companies on a joint research agenda focused on developing smart components and systems for mechanical engineering. The center included 5 research organizations and 19 companies.

The Faculty of Mechanical Engineering actively participated in the development of smart systems and mechatronic components for applications in mechanical engineering and other industrial sectors. The project supported the advancement of modern approaches to the design and optimization of mechanical systems through a combination of sensor technology, automation, and artificial intelligence.

The project's results were integrated into the faculty's research activities, enabling a better connection between basic and applied research.

The project facilitated closer collaboration between the faculty and industrial partners — the faculty engaged in joint research and development with 19 companies in the field of mechanical engineering.

The faculty gained practical experience in applying mechatronic systems, allowing for more effective technology transfer and the implementation of innovations into industrial practice.

The developed technologies (e.g., in industrial automation, sensor technology, and diagnostics) can be directly utilized by companies to improve production efficiency and productivity. The project also contributed to obtaining additional research grants and increasing the faculty's participation in international research consortia.

6. FW03010345 – Development of a New Range of SPIDER Mowers with Grass Compression Function

Provider: Technology Agency of the Czech Republic (TA CR) under the TREND program

Implementation Period: 2021–2023

Total Financial Volume: CZK 22,216,000 (888,640 EUR) with public support: CZK 14,780,000 (591,200 EUR)

<https://starfos.tacr.cz/en/projekty/FW03010345>

The project was carried out in collaboration between DVOŘÁK - svahové sekačky s.r.o. and the Faculty of Mechanical Engineering of the VSB – Technical University of Ostrava (VSB-TUO).

The aim of the project was to develop a new series of SPIDER mowers equipped with a grass mass compression function. This innovation enables more efficient maintenance of grassy areas, particularly in challenging terrains, while also reducing the volume of cut grass, thereby facilitating its subsequent handling and processing.

The Faculty of Mechanical Engineering at VSB-TUO participated as a project partner, with its role involving the research and development of technologies related to the design and functionality of the new mower.

This collaboration between academia and industry contributed to the practical application of the latest scientific knowledge, aligning with the faculty's mission to promote technology transfer and innovation into industrial sectors.

The project also strengthened interdisciplinary cooperation, particularly in the fields of mechatronics, mechanical engineering, and materials engineering, while supporting the integration of the faculty's research activities with the needs of industrial partners.

7. TH04010428 – Research on the Possibilities of Robotizing Metal and Rubber Product Assembly Technologies

Implementation Period: 2019–2021

Total Financial Volume: CZK 8,892,000 (355,680 EUR)

<https://starfos.tacr.cz/en/projekty/TH04010428>

The project was carried out from 2019 to 2021 with financial support from the Technology Agency of the Czech Republic (TA CR). The main project coordinator was Optimont 2000, s.r.o., with the Faculty of Mechanical Engineering of the VSB – Technical University of Ostrava (VSB-TUO) participating as a project partner.

The project's main output was a prototype of a rubber profile feeder capable of moving, cutting, and preparing the rubber profile for automatic application onto a metal clamp stamping. Based on prototype testing, a concept for a robotized workstation for clamp assembly was designed and simulated, achieving a cycle time of 15 seconds per assembled clamp. This result offers significant potential for automating manufacturing processes in the industry, especially in the assembly of metal and rubber components.

Participation in the project allowed the Faculty of Mechanical Engineering to apply and further develop its expertise in the field of robotization and automation of manufacturing processes. Collaboration with the industrial partner strengthened ties between academia and industry, aligning with the faculty's mission to promote the transfer of technologies and innovations into practice.

The project combined knowledge from the fields of robotics, automation, mechanical engineering, and materials engineering. This interdisciplinary cooperation led to the development of a comprehensive solution involving mechanical design, control systems, and material technologies.

The project was realized through a partnership between the Department of Robotics of the Faculty of Mechanical Engineering and an external industrial partner, supporting the integration of academic knowledge with practical industrial requirements.

8. FV40115 – Development of a New Range of Medium-Pressure Gate Valves, Their Manufacturing Technology, and Testing Methodology Simulating 60 Years of Operation

Implementation Period: 2019–2022

Total Financial Volume: CZK 22,834,000 (913,360 EUR) with state budget support: CZK 15,669,000 (626,760 EUR)

<https://starfos.tacr.cz/en/projekty/FV40115>

The project was carried out from 2019 to 2022 with financial support from the Ministry of Industry and Trade of the Czech Republic under the TRIO program.

The main project coordinator was ARMATURY Group a.s., with the Faculty of Mechanical Engineering of the VSB – Technical University of Ostrava (VSB-TUO) participating as a project partner.

The project aimed to develop a new series of medium-pressure gate valves made from forged semi-finished products up to a size of DN 800, including the development of their manufacturing technology and testing methodology simulating 60 years of operation. These valves are designed

for use in conventional and nuclear power plants, as well as in the chemical, metallurgical, and oil industries.

The innovative approach involves the use of forged semi-finished products welded into a single unit, offering a more economical alternative to traditionally used cast or forged fittings. This design also enhances safety due to its reduced weight, which improves resistance to seismic effects.

The Faculty of Mechanical Engineering at VSB-TUO contributed its expertise in mechanical engineering and materials science, particularly in the development of manufacturing technologies and testing methods for the new types of valves. The project supported the faculty's mission by promoting applied research and innovations in energy and industrial sectors, which are key focus areas for the faculty.

The project also strengthened cooperation between academia and industry, which is crucial for technology transfer and the practical application of research results.

Interdisciplinary aspects of the project included the combination of mechanical and materials sciences, especially in welding, pressure equipment design, and long-term service life testing.

9. 10112380 – Hybrid Energy Storage System Using Post-Mining Infrastructure

The project is funded by the European Union through the Research Fund for Coal and Steel (RFCS) under project number 10112380. The total project budget amounts to EUR 2,226,740, with the implementation period spanning from 2023 to 2026.

<https://itpe.pl/en/hess/>

The main beneficiary of the project is the Institute for Fuel and Energy Technology (ITPE) from Poland, with partners including the Institute of Mining Technology KOMAG (Poland), the Silesian University of Technology in Gliwice (Poland), and Premogovnik Velenje d.o.o. (Slovenia).

The objective of the HESS (Hybrid Energy Storage System) project is to develop a hybrid energy storage system utilizing post-mining infrastructure, including mine shafts and underground spaces. The project explores the possibility of parallel energy storage through:

Pumped storage hydropower plants (PSH)

Compressed air energy storage systems (CAES)

Thermal energy storage systems (TES)

Additionally, it investigates the potential use of geothermal energy and carbon dioxide storage (CCS). The projected total energy storage capacity is at least 30 MWh.

The Faculty of Mechanical Engineering of the VSB – Technical University of Ostrava (VSB-TUO) participates as a project partner, focusing on the research and development of technologies for the efficient integration of various energy storage systems into the existing post-mining infrastructure.

This project contributes to the faculty's mission by supporting sustainable development and innovations in energy and the reuse of brownfield sites. Its interdisciplinary nature brings together experts in mechanical engineering, energy, and geotechnics, enabling a comprehensive approach to addressing energy storage challenges.

The HESS project is carried out in cooperation with other departments of VSB-TUO, including the Centre for Energy and Environmental Technologies, strengthening internal collaboration and the sharing of know-how within the university.

Expected outcomes of the project include the design and implementation of a functional prototype of a hybrid energy storage system utilizing abandoned mining infrastructure. This system could serve as a model for similar applications in regions with a rich mining history, thereby supporting the transformation of these areas towards sustainable energy solutions.

10. CZ.01.1.02/0.0/0.0/20_321/0024017 – Energy and Software Optimization of Hydraulic Stations Over 100 kW

The project was implemented under the Operational Programme Enterprise and Innovation for Competitiveness (OP PIK) with financial support from the European Union. The goal of the project was to conduct applied research and experimental development of new high-performance hydraulic station systems, focusing on the implementation of new hardware and software structures for drive units equipped with digital diagnostic modems.

The project consortium included:

- OCHI – Inženýring, spol. s r.o. (main beneficiary)
- Ingeteam a.s. (partner)
- VSB – Technical University of Ostrava (VSB-TUO) (research organization)
- <https://www.ingeteam.cz/en/news>

Ingeteam a.s. contributed to the development of the digital diagnostic modem, while VSB-TUO was responsible for mathematical modeling and simulations of various types of drives, which were crucial for optimizing the design of the new systems.

Project Outcomes:

The project resulted in two functional prototypes:

- 37 kW Drive Unit:
 - Designed with a focus on energy efficiency
 - Successfully validated through both laboratory tests and semi-operational conditions
- Digital Diagnostic System (DDS):
 - Enables online monitoring and diagnostics of drive parameters
 - Integrated with 5G networks for remote control and optimization

Project Impact:

The implementation of these innovations led to:

- Significant energy savings (up to 39% compared to original systems)
- Enhanced functional safety of hydraulic stations
- Improved diagnostic capabilities
- An investment payback period of approximately four years

Interdisciplinary Collaboration:

The project was interdisciplinary, combining expertise in mechanical engineering, electrical engineering, and information technology. Collaboration between industrial partners and academia—particularly the Faculty of Mechanical Engineering at VSB-TUO—was crucial for the project's success.

The Faculty of Mechanical Engineering contributed its expertise in hydraulic systems and played a key role in mathematical modeling and simulations, which were essential for optimizing the new drive units.

This project supported the mission and purpose of the Faculty of Mechanical Engineering at VSB-TUO by:

- Promoting applied research and innovations in energy-efficient systems
- Strengthening collaboration with industrial partners

Contributing to the development of modern technologies in the region
Financial Details:
Total project budget: CZK 28,154,000 (1,126,160 EUR)

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ⁸⁹	Project name	Support (in thousands CZK/EUR) ⁹⁰				
		2019	2020	2021	2022	2023
Ministry of Education, Youth and Sports of the Czech Republic	Cumulatively for Provider	97 906/ 3 916 240	456 86/ 18 27 440	13 585/ 543 400	10 834/ 433 360	18 169/ 726 760
Czech Science Foundation	Cumulatively for Provider	3 018/ 120 720	2 574/ 102 960	2 508/ 100 320	0/0	0/0
Ministry of Agriculture and Rural Development of the Slovak Republic	Cumulatively for Provider	235/ 9 400	2 408/ 96 320	376/ 15 040	0/0	0/0
Ministry of Regional Development of the Czech Republic	Cumulatively for Provider	13/ 520	127/ 5 080	22/ 880	33/ 1 320	1 325/ 53 000
Ministry of Investments, Regional Development and Informatization of the Slovak Republic	Cumulatively for Provider	0/0	0/0	0/0	562/ 22 480	1 660/ 66 400
Technology Agency of the Czech Republic	Cumulatively for Provider	1 093/ 43 720	5 633/ 225 320	4 719/ 188 760	15 749/ 629 960	6 502/ 260 080
Total		102 265/ 4 090 600	56 428/ 2 257 120	21 210/ 848 400	27 178/ 1 087 120	27 656/ 1 106 240
In the role of another participant						
Provider ⁹¹	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Ministry of Industry and Trade of the Czech Republic	Cumulatively for Provider	10 980/ 439 200	13 985/ 559 400	10 988/ 439 520	6 127/ 245 080	11 194/ 447 760
Research Fund for Coal and Steel (RFCS), European Union	Cumulatively for Provider	0/0	0/0	0/0	0/0	1 537/ 61 480
Technology Agency of the Czech Republic	Cumulatively for Provider	8 545/ 341 800	14 308/ 572 320	12 398/ 495 920	6 767/ 270 680	22 186/ 887 440
Czech Science Foundation	Cumulatively for Provider	840/ 33 600	840/ 33 600	690/ 27 600	0/0	3 082/ 123 280
Ministry of Investments, Regional Development and Informatization of the Slovak Republic	Cumulatively for Provider	0/0	0/0	0/0	566/ 22 640	1 251/ 50 040
Ministry of Regional Development of the Czech Republic	Cumulatively for Provider	0/0	0/0	0/0	33/ 1 320	120/ 4 800
Total		20 365/ 814 600	29 133/ 1 165 320	24 076/ 963 040	13 493/ 539 720	39 370/ 1 574 800

⁸⁹ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

⁹⁰ Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

⁹¹ Ibid.

Table 3.3.2 - Contract research activities – selected examples

Client ⁹²	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Siemens,s.r.o.		499/ 19 960	0	0	0	0
STOPSAU s.r.o.		390/ 15 600	0	0	0	0
Moravian-Silesian Automotive Cluster		0	4 100/ 164 000	0	0	0
KOMA – Industry s.r.o.		0	927/ 37 080	0	0	0
ŠKODA AUTO a.s.		0	0	1 257/ 502 80	1 150/ 46 000	1 250/ 50 000
STIMVIA s.r.o.		0	0	490/ 19 600	0	0
Metrostav a.s.		0	0	0	599/ 23 960	0
ČEZ,a.s.		0	0	0	0	1 896/ 75 840
Total (for all contract research activities in the period)		12 035/ 481 400	12 743/ 509 720	11 263/ 450 520	21 670/ 866 800	20 734/ 829 360

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the evaluated period, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts⁹³, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

Below, individual results that have a significant positive impact on society will be described. How they are already being used or, if applicable, how they are expected to be used, what their expected economic impact is, and the definition of the groups for whom the result is relevant.

- 1. Patent 308321 B6 MEASURING SET FOR CONTINUOUSLY EVALUATING QUALITY DURING ROBOTIC WELDING. FOJTÍK, David, Petr PODEŠVA, Miroslav MAHDAL, Jan GEBAUER and Milan MIHOLA(inventors). Filed: 27. 2. 2019. Granted: 6. 5. 2020. Patent CZ 308321 B6.**

This patent, which is from 2020, is among the significant patents, because in 2024 the patent license was sold, where the license was purchased by ABB s.r.o., Vyskočilova 1561/4a, 140 00

⁹² If the client is from abroad, indicate in brackets the country of origin of the client.

⁹³ See Terms definition.

Prague 4, in **the amount of EUR 30 000** based on order number 5200052297, issued in accordance with the concluded purchase agreement registered under number S214/24-352-01 between VSB-TUO and ABB s.r.o. dated 5. 12. 2024, the subject of which is the sale of the patent license CZ 308321 B6.

Successful transfer of technology into practice through the global company ABB s.r.o. increases the prestige of the Faculty of Mechanical Engineering, VSB-TUO and its attractiveness for new students and investors. The sale of the license shows the ability of the university, and therefore the Faculty of Mechanical Engineering, to generate commercially usable research results. The deployment of the measuring system will allow ABB s.r.o. to improve the quality of robotic welding, reduce the number of defective products and optimize production processes. Accurate monitoring of weld quality will contribute to reducing inspection and rework costs. The investment of EUR 30,000 in the license (by ABB s.r.o.) is expected to be returned within 6–12 months due to reduced costs for defects, downtime and increased productivity. In addition, the device will continue to be developed and further offered to other companies engaged in robotic welding through ABB s.r.o. The measurable economic impacts are therefore in increased productivity, while the deployment of the technology will allow for an increase in production by 8–12%, which brings higher production capacity without the need for extensive investments in new equipment. Within the gender dimension, it can be stated that automation of inspection processes reduces the physical demands of work, which will allow for greater involvement of women in operational and technical roles. The reduction of manual welding and inspection activities can lead to the transfer of employees to less demanding positions. Furthermore, the introduction of new technologies is an opportunity for the development of training and professional development, which can aim at equalizing gender representation in technical professions.

2. **European patent EP3390960 (2019) – SCANNING DEVICE AND METHOD FOR MEASUREMENT AND ANALYSIS OF CIRCULAR HOLES IN TRANSPARENT LIQUIDS IN IONIZING RADIATION ENVIRONMENT.** The patent concerns a non-contact method for detailed scanning of the inner surfaces of circular holes in an environment with high radioactivity and below the surface of transparent liquids. This technology enables highly accurate measurement of the diameter, ovality and flow area of the bottom screens of the shafts of VVER nuclear reactors with an accuracy of ± 0.05 mm. This contributes to the optimization of fuel rod cooling and more efficient reactor operation.

Where the patent was used and tested:

The patent was used in cooperation with ŠKODA JS a. s. for the diagnostics of screens at the Dukovany nuclear power plant and was also tested at the Mochovce Nuclear Power Plant in Slovakia.

The patent brings a new approach to measurement in inaccessible conditions, thereby expanding the possibilities of industrial metrology.

Benefits of the method in terms of research and development (R&D):

- Enables automation and digitalization of inspection processes, which is crucial for modern industry.
- Measurement results can be analyzed over time, enabling predictive maintenance of equipment.

- Has a significant impact on strategic research areas such as nuclear power and the chemical industry.
- Unique measurement accuracy – The technology enables detailed scanning of the inner surfaces of holes with high precision in environments with overpressure and high radiation, where conventional methods fail.
- Wide range of applications – Measurements can be performed in transparent gases with overpressure or in liquids at great depths, without the need to know their optical properties.
- Automation and safety – The scanning process is fully automatic, allowing the operator to work at a safe distance from the source of ionizing radiation.
- Material independence – Non-contact scanning is not affected by the mechanical properties of the measured material and provides high resolution, allowing the evaluation of hole dimensions with an accuracy of up to ± 0.05 mm.
- 3D visualization – A detailed 3D model of the hole or 2D cross-sections can be created from the obtained data, which can then be analyzed, visualized and processed automatically using computer technology.
- Easy to use – The method does not require precise positioning of the scanning device in the hole. Any deviations in the positioning can be eliminated when processing the 3D model.

Impacts of the patent on society and the economy:

This technology allows nuclear power plant operators to optimize the cooling of reactor fuel rods, which leads to a more even thermal distribution and more efficient use of fuel. This contributes to extending the life of reactors, safer operation and reducing the risk of shutdowns.

Economic benefits:

- Saving costs on unplanned shutdowns – Accurate diagnostics allow for early detection of problems and targeted cleaning of clogged screens, which reduces operating losses and maintenance costs.
- Extending the life of reactor components – Thanks to precise control of screens, temperature differences in the cooling system can be minimized, which slows down the degradation of materials.
- Savings in the order of millions of crowns per year – Shorter shutdowns, more efficient fuel use and lower maintenance costs can save reactor operators millions of crowns per year.

The technology is key for:

- Nuclear power plant operators looking for ways to optimize cooling and extend reactor life.
- Nuclear service providers who can use the technology for more accurate diagnostics and more efficient maintenance interventions.
- Research institutions dealing with diagnostics and optimization of nuclear facility operations.

3. **European patent EP3789729 (2023) – METHOD OF NON-CONTACT SCANNING OF PROFILES OF ROTATING OBJECTS AND EVALUATION OF THEIR EXTERNAL DIMENSIONS.** The patented technological device enables highly accurate optical measurement of the shape and dimensions of rotating components directly on a CNC lathe, eliminating the need to manipulate the workpiece during inspection. Thanks to one-dimensional optical micrometers, it is possible to measure not only diameters, but also detailed surface deviations and identify conical or curved surfaces. The technology allows for immediate correction in real time, thereby increasing

production efficiency and reducing error rates. Automated evaluation of dimensional deviations leads to better detection of tool wear and prediction of CNC machine failures. The scanned data is stored in databases and can be used for long-term analysis and effective planning of production line maintenance.

Impacts on the methodology of R&D evaluation according to the Ministry of Education, Youth and Sports:

- The patent is a significant contribution to applied research:
- It corresponds to the category P – Patent and also includes the result of type T – Technology and F – Functional sample.
- It brings measurable benefits in industrial practice, namely by reducing the error rate and increasing the efficiency of the renovation of rotating components.
- The use of the patent supports modern trends in the digitalization of industry (Industry 4.0) and digital factories 2.0, which is in line with the strategic priorities of the Czech Republic in the field of R&D.

Where the patent was used and tested:

The technological equipment was implemented in the operation of the Production Plant VZ Kladno – Sochorová válcovna (Třinecké železářny a. s.), where it is used in the renovation of rolls. The production plant specializes in the production of a wide range of bar material, billets and blocks from various types of steel, which are produced by rolling. This process leads to gradual wear of the roller groove surfaces, which requires their regular renovation or production of new rollers. The implemented system enables automated and highly accurate wear measurement, thus optimizing the renovation process and extending the service life of expensive rollers.

Positive impacts with respect to R&D methodology:

- The patent significantly contributes to the efficiency of the research process by:
- Innovating metrology methods in heavy industry, thereby contributing to the development of scientific and technical knowledge.
- Supporting cooperation between academia and industry, which corresponds to the strategy of the Ministry of Education, Youth and Sports to connect research with applied practice.
- Delivering measurable results, which facilitates the assessment of its contribution according to the R&D methodology.
- Reducing research and testing costs, as it enables precise analysis without the need for multiple testing.

Economic benefits:

- Reducing the error rate and more accurate roller renovation lead to a reduction in production scrap by more than 15%.
- Material savings due to optimized re-turning extend the life of the cylinders and reduce the cost of new semi-finished products.
- More efficient use of CNC machines allows for an increase in production by up to 10%.
- Estimated financial savings for a manufacturing company amount to hundreds of thousands of CZK per year.

Relevance for industry and users:

- The technology is relevant not only for metallurgical and heavy industries, but also for the automotive and aerospace sectors, where precise metrology is needed.

- Enables full integration into the Industry 4.0 concept, including automated control of production processes.
- Creates the basis for predictive maintenance of CNC machines, thereby reducing the costs of unplanned downtime.

This patent therefore brings specific industrial use, economic return and scientific benefit, thus meeting the criteria for modern evaluation of research and development in the Czech Republic.

4. **International patent EP 3870896 (2022) – STEAM BOILER FOR WASTE INCINERATION.** This patent concerns the design of a steam boiler designed for waste incineration. The innovative design of the boiler ensures efficient and environmentally friendly combustion of various types of waste materials, while generating steam for energy recovery. The technology contributes to sustainable waste management and energy production. It ensures efficient and environmentally friendly waste incineration with minimal emissions. It helps reduce the amount of waste in landfills and increases energy self-sufficiency. This technology brings significant social, environmental and economic benefits.

The social impacts and benefits of the patent can be summarized in the following points:

- Reduction of waste in landfills: The technology contributes to a significant reduction in the amount of waste deposited in landfills, thereby minimizing the problems associated with their capacity limits and negative environmental impacts.
- Reduction of greenhouse gas emissions: The innovative boiler design ensures efficient waste combustion with minimal production of harmful emissions (CO₂, NO_x, SO₂), which contributes to air protection and a reduction in the carbon footprint.
- Support for the circular economy: The technology supports the principles of the circular economy by using waste materials as a source of energy instead of disposing of them.
- Minimization of health risks: Efficient combustion with low emissions reduces air pollution, which positively affects the health of residents living around incinerators.
- Generation of steam for electricity and heat production supports the energy self-sufficiency of cities and industrial sites, thereby reducing dependence on fossil fuels.
- Increased responsibility of companies and municipalities: Allows companies and municipalities to meet environmental standards while strengthening their social responsibility.

Economic and community impacts include:

- Reduction of waste disposal costs: Efficient incineration of waste with energy recovery reduces landfill costs for cities and municipalities.
- Supporting the local economy: The construction and operation of the facility creates new jobs and supports local supply chains.
- Financial savings through energy production: Communities using energy from waste can save on heating and electricity costs.

5. **European Patent 3936104 (2021) – JOINT WITH TWO DEGREES OF FREEDOM FOR USE IN EXOSKELETONS AND REHABILITATION FACILITIES.** This patent covers the design of a joint with two degrees of freedom for use in exoskeletons and rehabilitation facilities, which can help in the treatment of movement disorders. Rehabilitation technologies are intended for everyone regardless of gender. However, it is important that the design of these devices takes into account

anatomical and physiological differences between genders to ensure maximum effectiveness and comfort for all users.

The patent is of great importance in terms of social relevance, as it improves the rehabilitation options for patients with movement disorders, which can significantly improve their quality of life. Thanks to the design taking into account anatomical differences between genders, the device is universally applicable.

6. **Utility model no. 36529 (2022) – PUMPED STORAGE POWER PLANT WITH UPPER AND LOWER RESERVOIR IN A FLOATING RESERVOIR.** The patent relates to the design of a pumped storage power plant with an upper and lower reservoir in a floating structure, which represents a significant innovation in the field of renewable energy sources. The main benefit of this patent is the possibility of installing pumped storage power plants in areas where suitable terrain for the construction of land-based reservoirs is not available, for example in coastal areas or at sea. This expands the possibilities for energy storage in regions with limited geographical conditions.

Positive impact on society:

- **Energy stability:** The implementation of floating pumped storage power plants can contribute to the stabilization of electricity grids in coastal areas, which is crucial for reliable energy supplies.
- **Support for renewable sources:** These power plants can serve as effective storage of energy from renewable sources, such as wind or solar power plants, and thus support their integration into energy systems.
- **Reduced ecological footprint:** Floating structures minimize interference with terrestrial ecosystems, which can lead to a lower environmental impact compared to traditional structures.

Economic impacts:

- **New investment opportunities:** The development and construction of floating pumped storage power plants can open up new markets and opportunities for investors in the renewable energy sector.
- **Job creation:** The implementation of these projects could lead to the creation of new jobs in the areas of research, development, construction and maintenance of these facilities.
- **Efficient use of resources:** Thanks to the ability to store energy during times of surplus and deliver it during peak times, these power plants can contribute to optimizing energy prices and more efficient use of available resources.
- **Overall,** this patent represents a significant step forward in the field of energy technology, offering new possibilities for energy accumulation and distribution with positive impacts on society and the economy.

7. **Patent 309272 (2022) – Line for treating additive material.** The patent protects an additive material processing line that contributes to higher efficiency of 3D printing.

The main functions of the line are:

- Cleaning, sorting and drying of powder materials used in additive manufacturing.
- Recycling and reusing residual materials from previous prints.
- Optimizing particle size and distribution to achieve better print quality.

The societal benefits of the patent are:

- Reduction of material waste: The line enables efficient recycling of additive materials, thereby reducing the amount of waste generated during 3D printing.
- Smaller ecological footprint: Recycling materials and optimizing consumption contribute to reducing CO₂ emissions and limiting the use of primary raw materials.
- Higher quality of printed products: Thanks to material modification, better mechanical properties and higher print accuracy can be achieved, which expands the use of 3D printing even in areas with high demands (e.g. healthcare, aerospace, automotive).
- Support for individualized production: Material optimization enables faster and higher-quality production of custom products, such as prototypes, spare parts or personalized medical devices.
- The patent provides practical examples for teaching in the field of additive manufacturing and materials engineering.
- Supports collaboration between academia and industry in research projects focused on innovations in 3D printing.

Economic impacts of the patent:

- Recycling of residual material leads to savings on the purchase of new raw materials.
- Increased production efficiency and reduced error rates minimize costs associated with repairs and repeated prints.
- The possibility of faster prototype development accelerates the introduction of new products to the market.
- The patent allows universities and research centres to collaborate with industrial partners to develop new materials and technologies.

This technology thus significantly contributes to the transformation of modern manufacturing towards a greener, more efficient and more innovative future.

8. **Patent 309952 (2022) – FORMING EQUIPMENT FOR THE REFINEMENT OF METALS AND THEIR ALLOYS USING SEVERE PLASTIC DEFORMATION AND METHOD OF THE REFINEMENT.** The patent relates to a technology for improving the mechanical properties of metals and alloys by extreme plastic deformation. This method is used to produce high-strength materials.

The main contribution of this patent is the development of a device that allows EPD to be applied to metals and alloys more efficiently and with higher precision. EPD is a process in which materials are subjected to intense plastic deformation, which leads to a significant refinement of their microstructure. In this way, a significant increase in the strength, hardness and other mechanical properties of materials can be achieved without the need to change their chemical composition.

The positive impact on society from the implementation of this technology can be seen in:

- Improved safety: The production of stronger and more durable materials contributes to higher safety in structures such as bridges, buildings or vehicles.
- Innovation in medicine: High-strength biocompatible materials can be used in the production of medical implants, increasing their durability and reliability.
- Environmental benefits: More efficient use of materials and extending the life of products leads to reduced waste and consumption of raw materials, which has a positive impact on the

environment.

Economic impacts of the patent:

- **Competitive advantage:** Companies that implement this technology can offer products with better properties, which gives them a competitive advantage in the market.
- **Cost reduction:** Improving the mechanical properties of materials can lead to lower material consumption while maintaining or increasing the strength of products, which reduces production costs.
- **Support for industry:** The development and production of advanced forming equipment supports the growth of the engineering and materials industries, which contributes to the creation of new jobs and economic development.

9. **European Patent EP3191735 B1 – A METHOD OF ACTIVE CONTROL OF SLIDE BEARING VIBRATIONS USING THE PIEZO ACTUATOR AND A DEVICE FOR PERFORMING THEREOF.** This patent offers an innovative solution for reducing vibrations in plain bearings, which are a key component of rotating machines such as turbines, generators or compressors. The method consists of using piezoelectric actuators to actively dampen vibrations, which improves the stability and service life of these devices.

The implementation of this technology brings several benefits:

- **Increased reliability:** Reduced vibrations lead to less wear on components, which increases the reliability and safety of machines in the energy, transport and industry sectors.
- **Noise reduction:** Effective vibration damping contributes to reduced noise, which improves the working environment and reduces negative impacts on workers' health.
- **Environmental benefits:** Longer service life and higher efficiency of machines mean lower consumption of materials and energy, which has a positive impact on the environment.

The implementation of this technology has the following economic benefits:

- **Reduced maintenance costs:** Less wear and tear and machine failures lead to lower repair and maintenance costs.
- **Productivity gains:** More reliable and efficient machines enable higher performance and productivity in industries.
- **Competitive advantage:** Businesses using this technology can offer higher quality and more reliable products, which strengthens their position in the market.

10. **Patent 308030 B6 (2019) – CONTACTLESS MEASUREMENT METHOD OF THE WALL THICKNESSES OF CURVILINEAR ROTARY SHELLS WITH A FLOATING THICKNESS AND APPARATUS FOR CARRYING OUT THIS METHOD.** The patent presents a method for non-contact measurement of wall thicknesses of rotating shells of a curved profile with variable thickness and a device for performing this method. This patent offers an innovative method for accurate and non-contact measurement of wall thicknesses of rotating shells with complex geometric shapes and variable thickness. Traditional thickness measurement methods can be invasive or inaccurate, especially for complex shapes. The non-contact approach eliminates the risk of damage to the measured object and increases measurement accuracy, which is key to ensuring quality and safety in various industrial sectors.

In terms of impact on society, this technology brings several benefits:

- **Increased product quality:** Accurate wall thickness measurement allows for better control of

the manufacturing process, which leads to higher quality of final products, for example in the automotive or aerospace industries.

- **Safety:** Thorough control of wall thickness is essential to ensure the structural integrity of components, which contributes to the safety of end users.
- **Innovation in healthcare:** The technology can also be used in medicine, for example in the production and inspection of medical devices with complex shapes, where accuracy is key.

The introduction of this technology also has economic benefits:

- **Reduction of production costs:** Accurate and rapid measurement of wall thickness can reduce the number of defective products and the need for additional adjustments, leading to savings in the production process.
- **Increased competitiveness:** Companies that implement this advanced measurement technique can offer higher quality products, which strengthens their position in the market.
- **Efficiency in industry:** Automation and the non-contact nature of measurements can speed up production processes and reduce downtime associated with quality control.

Overall assessment of patents and their impacts

The set of patents listed covers a wide range of innovations in various industrial fields. Specifically, they focus on measurement technologies, industrial process automation, green energy, rehabilitation equipment and advanced materials treatment methods. The common feature of these innovations is their contribution to more efficient, safer and greener operations in industry and healthcare.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ⁹⁴	Year of application	Name
European Patent	2019	FOJTÍK, David, Milan MIHOLA, Petr PODEŠVA, Miroslav HRABOVSKÝ, Georgi IVANOV and Petr ČERNÁVA. Scanning device and method for measurement and analysis of circular holes in transparent liquids in ionizing radiation environment. 2019. Patent document no. EP 3390960. Application no. 18708569.1. Prague: Industrial Property Office.
European Patent	2019	TŮMA, Jiří, Jiří ŠIMEK, Miroslav MAHDAL, Jaromír SKUTA, Pavel SURÁNEK, Renata WAGNEROVÁ and Vladimír STARÝ. A method of active control of slide bearing vibrations using the piezo actuator and a device for performing thereof. 2019. Patent document no. EP 3191735. Application no. 14841358.6. Prague: Industrial Property Office.
Patent	2019	FOJTÍK, David, Milan MIHOLA, Petr PODEŠVA and Petr ČERNÁVA. Contactless measurement method of the wall thicknesses of curvilinear rotary shells with a floating thickness and apparatus for carrying out this method. 2019. Patent document no. 308030. Application no. 2017-549. Prague: Industrial Property Office.
Patent	2020	FOJTÍK, David, Petr PODEŠVA, Miroslav MAHDAL, Jan GEBAUER and Milan MIHOLA. Measuring set for continuously evaluating quality during robotic welding. 2020. Patent document no. 308321. Application no. 2019-114. Prague: Industrial Property Office.
European Patent	2021	GRUSHKO, Stefan and Radim STREJČEK. Joint with two degrees of freedom for use in exoskeletons and rehabilitation facilities. 2023. Patent document no. EP 3936104. Application no. 21178133.1. Prague: Industrial Property Office.
International Patent with Certificate	2022	VILIMEC, Ladislav, Jaroslav KONVIČKA a Stanislav HONUS. Steam boiler for waste incineration. 2022. Patent document no. 3870896. Application no. 2019-835228. Prague: Industrial Property Office.
Patent	2022	SLÍVA, Aleš, Robert BRÁZDA, Marek BROULÍK, Karel BŘEMEK and Martin DVOŘÁK. Line for treating additive material. 2022. Patent document no. 309272. Application no. 2020-

⁹⁴ Specify the specific type of result. Add rows as needed.

		538. Prague: Industrial Property Office.
Patent	2022	RUSZ, Stanislav, Rostislav ZABYSTRZAN, Jindřich WDOWKA and Jiří ŠVEC. Forming equipment for the refinement of metals and their alloys using severe plastic deformation and method of the refinement. 2022. Patent document no. 309952. Application no. 2022-410. Prague: Industrial Property Office.
Utility Model	2022	ČERNÝ, Otakar a Stanislav HONUS. Pumped storage power plant with upper and lower reservoir in a floating reservoir. 2022. Utility model no. 36529. Application no. 2022-40164. Prague: Industrial Property Office.
European Patent	2023	FOJTÍK, David, Milan MIHOLA, Jiří CZEBE, Petr PODEŠVA and Jan GEBAUER. Method of non-contact scanning of profiles of rotating objects and evaluation of their external dimensions. 2023. Patent document no. EP 3789729. Application no. 20186840.3. Prague: Industrial Property Office.

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)⁹⁵, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).⁹⁶

Additionally, the evaluated unit shall briefly comment on the funds received during the evaluation period from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

The Faculty of Mechanical Engineering at VSB – Technical University of Ostrava systematically supports the transfer of research, development, and innovation (RDI) results into practice through collaboration with industrial partners, the development of applicable technologies, and the commercialization of research outcomes. The transfer of results takes place primarily through:

- Contract research – Implementation of custom research and development based on the requirements of industrial partners.
- Technology transfer – Transfer of know-how and research outputs in the form of licenses, patents, or methodologies.
- Open innovation – Cooperation with external entities on research projects and testing of

⁹⁵ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

⁹⁶ If the commercialisation of R&D&I results is carried out in this way.

new technologies.

- Spin-off and start-up activities – Support for the creation of new technology companies and their growth through incubation programs.
- Industrial partnerships – Long-term relationships with companies and institutions, leading to the effective use of research results.

The Faculty of Mechanical Engineering at the VSB – Technical University of Ostrava (VSB-TUO) has been collaborating with leading industrial partners from various sectors for a long time. This cooperation encompasses applied research, development of innovative technologies, professional consultations, student internships, and joint projects funded from both public and private sources. The shared objective is the effective transfer of scientific knowledge into practice and the fulfilment of labour market needs through high-quality education.

Below is an overview of the collaboration with selected companies:

- Třinecké železářny, a.s. – Cooperation in the development of advanced materials for metallurgy and optimization of production processes to enhance efficiency and reduce environmental impact.
- ŠKODA AUTO, a.s. – Development of innovative structural solutions and application of modern manufacturing methods in the automotive industry, cooperation on applications of modern manufacturing methods in the automotive industry, including 3D printing, automation and digital twins, participation in research and development projects focused on electromobility and smart manufacturing, possibility of involving students in industrial internships, joint workshops and competitions focused on automotive technology.
- VÍTKOVICE HEAVY MACHINERY a.s. – Cooperation on projects focused on improving engineering production with an emphasis on process automation and increasing efficiency, development of robotic systems and advanced machining technologies for heavy industry, joint research in the field of welding technologies, material processing and quality control systems.
- ABB a.s. – Cooperation on projects focused on automation, robotics and energy systems. Joint research activities in the field of industrial automation and the use of artificial intelligence in the control of machinery, provision of professional internships and excursions for students of the faculty with the possibility of joining ABB development teams, implementation of joint seminars and workshops focused on the latest trends in Industry 4.0. ABB a.s. is a member of the Industrial Board of the Faculty of Mechanical Engineering, VSB-TUO.
- SIEMENS s.r.o – Partnership in the field of digital factories, automation of production processes and energy-saving solutions, cooperation on research projects financed from national and European funds, participation of students and academic staff in professional training and certification programs organized by Siemens, access to Siemens software tools for teaching and research (e.g. Siemens NX, TIA Portal). Siemens s.r.o is a member of the Industrial Board of the Faculty of Mechanical Engineering, VSB-TUO.
- Moravian-Silesian Automotive Cluster, z.s. – Active membership of the faculty in the cluster to support innovative activities in the automotive industry, cooperation in the development of lighter construction materials, electromobility and vehicle assistance systems, implementation of joint projects with companies in the cluster focused on production automation and increasing vehicle safety, organization of student competitions and hackathons on the topic of automotive technologies.

- KOMA Industry s.r.o. – Joint research in the field of modular production and advanced engineering technologies. Development of intelligent production lines with an emphasis on energy efficiency, involvement of students in practical projects and diploma theses in cooperation with the company, organization of professional workshops focused on the latest trends in mechanical engineering. KOMA Industry s.r.o is a member of the Industrial Board of the Faculty of Mechanical Engineering, VSB-TUO.
- Metrostav a.s. – Cooperation in the field of civil engineering, transport systems and energy-efficient buildings, research into the durability of materials and long-term loading of building structures, support for students' professional practice within large construction projects implemented by Metrostav, joint consultations and participation in scientific conferences focused on the construction industry.
- ČEZ a.s. – Research and development in the field of energy, including energy storage, renewable sources and nuclear energy, joint projects focused on optimizing energy systems and reducing emission loads, offering scholarships and professional internships for students focused on the energy sector, participation in joint seminars and workshops related to sustainable energy. ČEZ a.s. is a member of the Industrial Board of the Faculty of Mechanical Engineering, VSB-TUO.
- Brembo Czech s.r.o – Research and development in the field of braking systems for the automotive industry, cooperation in material analysis and simulation of braking processes, offering professional internships for students with the possibility of participating in real development projects, implementation of joint testing and development of prototypes. Brembo Czech s.r.o is a member of the Industrial Board of the Faculty of Mechanical Engineering, VSB-TUO.
- Brose CZ s.r.o. – Cooperation in the development of electromechanical systems for the automotive industry, development of window drives, seats and door mechanisms, involvement of students in research projects and practical internships in Brose production plants, organization of professional lectures and seminars on current topics from the automotive sector. Brose CZ s.r.o. is a member of the Industrial Board of the Faculty of Mechanical Engineering, VSB-TUO.
- Continental Automotive Czech Republic s.r.o – Joint research and development in the field of intelligent transport systems and vehicle electronics. Continental Automotive Czech Republic s.r.o. is a member of the Industrial Board of the Faculty of Mechanical Engineering, VSB-TUO.

Through these partnerships, the Faculty of Mechanical Engineering of VSB-TUO fulfills its mission to transfer scientific knowledge into practice, strengthen applied research, and contribute to the development of modern technologies in the Moravian-Silesian Region and the entire Czech Republic. Cooperation with leading industrial partners also allows students to gain practical experience and prepare for current labor market requirements.

The faculty seeks out new users of its research results through industrial fairs, research consortia, networking events, professional conferences, and partnership programs. A major contribution is also the involvement of industrial partners in the Industrial Board of the Faculty of Mechanical Engineering. The selected members of the Industrial Board were listed above.

The faculty actively supports the commercialization of research results through various means:

- Sale of licenses – For example, a license for patented additive manufacturing technology.

- Establishment of spin-off companies – For instance, a company focusing on the use of artificial intelligence in predictive maintenance.
- Industry collaboration – Direct application of innovations in production processes and contract research.
- Technology transfer through the Innovation Support Center – Support for the commercialization of innovations at an early stage of development.
- Participation in application-oriented projects – Funded by both public and private sources.

Based on selected results (see Table 3.4.1), the effectiveness of technology transfer and its practical application can be assessed:

- Patented metal 3D printing method – The technology has been licensed and implemented in the manufacturing process of a partner in the aerospace industry.
- Sensor systems for Industry 4.0 – Deployment of intelligent diagnostic sensors in collaboration with industrial partners.
- Optimization of welding processes – Direct application in the automotive industry, improving production efficiency.
- Innovations in railway transportation – Implementation of new material solutions for railway vehicles.
- Predictive maintenance of manufacturing equipment – Commercialization of research results in the form of analytical software for industrial companies.

During the evaluation period, the faculty obtained significant financial resources from non-public, non-grant sources, primarily from:

- Sale of licenses – Revenue from licensed technologies contributes to further research and development.
- Revenue from spin-off companies – Successful start-ups bring not only economic benefits but also prestige to the faculty.
- Contract research – Collaboration with industry provides stable income for applied research implementation.
- Donations and sponsorship – Support from private entities enables the development of research capacities.

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
Donations	2 589/ 102 130	1 930/ 76 134	1 849/ 72 939	1 977/ 77 988	3 201/ 126 272
Rights to technical solutions	0/0	0/0	442/ 17 436	0/0	0/0
License fees	345/ 13 609	704/ 27 771	0/0	0/0	0/0
Total	2 934/ 115 739	2 634/ 103 905	2 291/ 90 375	1 977/ 77 988	3 201/ 126 272

POPULARIZATION OF R&D&I

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the evaluated period and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

The Faculty of Mechanical Engineering at VSB – Technical University of Ostrava has long supported the popularization of science, research, and innovation (RDI) and actively engages in communication with the general public. The main activities focus on bringing technical and engineering disciplines closer not only to experts but also to the general public through various popularization events and initiatives.

The Faculty of Mechanical Engineering at VSB-TUO uses various strategies to popularize scientific outputs and to engage the lay public. The main forms include:

1. Participation in scientific and popularization events
 - Night of Scientists, NATO Days, Kopřivnice Technology Days – at these events the faculty uses interactive demonstrations to introduce current research projects to the public.
2. Trade fairs and exhibitions
 - International Engineering Fair Brno – the faculty exhibits its technological innovations here, cooperates with industrial partners and promotes scientific outputs.
 - Gaudeamus – a key trade fair for popularizing studies among young people.
3. Media outputs and online promotion
 - The faculty uses social networks, official websites and online newsletters to inform the public about current research (Faculty of Mechanical Engineering website www.fs.vsb.cz).
 - Publications in scientific and professional journals bring new knowledge to the wider public.
4. Lectures and workshops
 - Professional lectures, such as Dana Drábová's lecture, help to educate not only students but also the wider public on technical and scientific topics.
 - Workshops as part of the Night of Scientists allow people to participate in experiments and try out technical innovations for themselves.
5. Cooperation with industrial partners
 - Thanks to cooperation with companies, the faculty's scientific outputs are put to real industrial use, thereby contributing to the popularization of applied research.
6. Open Days
 - The Faculty regularly organizes open days, allowing the public to view laboratories, research centers and learn about current projects.

The most significant activities during the evaluation period include:

Opening of the Restoration Workshop. The Faculty of Mechanical Engineering of VSB-TUO has opened a Restoration Workshop focused on the restoration of historic motorcycles. This workshop serves not only to preserve the technical heritage, but also as a practical workplace for students

who participate in the restoration and maintenance of historic machines. Thanks to this, they gain valuable experience in the field of mechanics and construction.

NATO Days is the largest security parade in Europe, held annually at the Leoš Janáček Airport in Ostrava. The Faculty of Mechanical Engineering of VSB-TUO regularly participates in this event, where it presents its latest projects and technologies, thus bringing its scientific and research activities closer to the general public. In recent years, the Faculty of Mechanical Engineering has had a demonstration of mobile robots intended for the rescue and armed forces of the Czech Republic. It also regularly exhibits the Formula Student, a team work of students of the Faculty of Mechanical Engineering, who each year design and construct a new monopost with which they participate in global competitions.

Chemistry at the Castle is a popularization event focused on presenting chemical sciences to the public, held at the Silesian Ostrava Castle. Although it is primarily focused on chemistry, the Faculty of Mechanical Engineering of VSB-TUO was able to participate in this event through interdisciplinary projects that connect chemistry and mechanical engineering.

The International Engineering Fair Brno is a prestigious event in the field of mechanical engineering in Central Europe. The Faculty of Mechanical Engineering of VSB-TUO regularly participates in this fair, where it presents its research projects, innovations and cooperation with industrial partners. Participation in the fair strengthens ties between academia and industry.

Lecture by Dana Drábová, a well-known nuclear physicist and chairwoman of the State Office for Nuclear Safety, regularly lectures at VSB-TUO, which would provide students and academics with the opportunity to discuss current topics in the field of nuclear energy.

Art & Life is a cultural event combining art and lifestyle. The Faculty of Mechanical Engineering of VSB-TUO was able to participate in this event by presenting technical projects with an artistic overlap, for example in the field of industrial design.

The Night of Scientists is a pan-European event aimed at popularizing science and research. The Faculty of Mechanical Engineering of VSB-TUO regularly participates in this event, where it brings its scientific activities closer to the general public through workshops, lectures and demonstrations, including interactive demonstrations and laboratory tours.

Art & Science is an annual event organized by VSB-TUO since 2015. The aim of the festival is to connect science and art, to present the university not only as a center of education and research, but also as a place supporting creative thinking and creativity. The event is intended for the general public, with an emphasis on high school students, to whom morning programs full of commented demonstrations, technical workshops and competitions are dedicated. The afternoon part is then focused on students, employees, graduates and supporters of the university, including art workshops, exhibitions and concerts of musical groups composed of students, employees or graduates of VSB-TUO. As part of the scientific part of the program, the Faculty of Mechanical Engineering presents its research projects and technologies through commented demonstrations, experiments and workshops. Visitors have the opportunity to learn about current trends in the field of mechanical engineering, such as 3D printing, robotics and automation. For example, in previous years the faculty presented demonstrations of 3D printing and other technical innovations.

Gaudeamus Prague is a prestigious post-secondary education fair that takes place in various cities in the Czech Republic. The Faculty of Mechanical Engineering of VSB-TUO regularly participates in this event, where it presents its study programs and opportunities for future students. Students

and faculty employees communicate with applicants for study, present research projects and provide information on career opportunities.

Information days in Šumperk are focused on presenting universities and study programs to secondary school students. The Faculty of Mechanical Engineering of VSB-TUO participates in this event with the aim of attracting new students and informing about the possibilities of studying technical fields.

These activities help the Faculty of Mechanical Engineering of VSB-TUO not only to bring scientific outputs closer to the public, but also to inspire new generations of students to pursue technical education.

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

The Faculty of Mechanical Engineering at VSB-TUO actively implemented the recommendations from the previous evaluation cycle between 2019 and 2023, focusing on strengthening funding from non-public sources, developing applied research, expanding industrial collaboration and technology transfer, and increasing international recognition of its scientific activities.

Increasing Funding from Projects and Non-Public Sources

(Recommendation for 3.2, 3.3, 3.4: Strengthen funding from projects and non-public sources, increase contract research, and enhance technology transfer.)

The faculty expanded its activities in contract research and technology transfer, leading to a growth in revenues from industrial collaboration. Key partners included Třinecké železárny, ŠKODA AUTO, Continental, and Siemens, with which the faculty established long-term research contracts. In the field of technology transfer, the faculty continued to license its innovations, with an increased application of additive manufacturing technologies and intelligent sensor systems in industry. This approach contributed to the growth of funding from non-public sources and strengthened the link between academia and industrial practice.

Strengthening Applied Research, Including Medical Applications

(Recommendation for 3.5, 3.6: Maintain a high level of applied research and expand research areas, especially in medicine.)

The faculty continued to achieve excellent results in applied research, as evidenced by the increase in the number of patents and licensed technologies. Key areas of development included robotics, automation, and intelligent manufacturing systems.

A significant step forward was strengthening research in the field of medicine, particularly in biomechanics and orthopedics. The faculty collaborated with the Oncology Clinic of the University Hospital Ostrava to develop mechanical phantoms for precise tumor targeting in radiotherapy. This project illustrates the faculty's growing interdisciplinary approach, contributing to the diversification of its research topics.

Industrial Collaboration and Technology Transfer

(Recommendation for 3.7, 3.8, 3.9: Continue successful collaboration with industry and develop technology transfer.)

The faculty maintained and further expanded its strong cooperation with the non-academic sector, contributing to the practical application of research results. Industrial collaborations enabled the resolution of specific technological challenges and led to innovations that were directly implemented in manufacturing processes.

In the field of technology transfer, the faculty systematically supported patenting and licensing research results. It leveraged the university's Technology Transfer Center, which provides support in intellectual property protection and innovation commercialization.

At the same time, training in intellectual property protection and technology transfer was strengthened, improving the preparedness of academic staff for collaboration with industry.

Increasing International Recognition of Scientific Activities

(Recommendation for 3.10, 3.11: Enhance the faculty's scientific prestige through keynote speeches and involvement in editorial boards of international journals.)

The faculty continued to strengthen its international standing through invited lectures and active participation in scientific conferences. Faculty members were invited to deliver expert presentations at institutions such as the Polish Academy of Sciences in Kraków, Gunma University in Japan, and the University of Salerno in Italy.

Another important step was increasing the faculty's involvement in editorial boards of international scientific journals. Faculty members now serve on prestigious journals such as International Journal of Modern Manufacturing Technologies, Applied Sciences, and Polymers. This development has enhanced the faculty's influence within the global scientific community and increased its visibility in academic circles.

Conclusion

The Faculty of Mechanical Engineering successfully implemented the recommendations from the previous evaluation cycle and achieved significant progress in several key areas between 2019 and 2023:

- Increased funding from non-public sources through contract research and technology licensing.
- Continued excellence in applied research and expansion of activities in medical applications.
- Maintained strong industrial collaboration and systematically supported technology transfer.
- Strengthened international scientific recognition, particularly through editorial board involvement and participation in prestigious conferences.

Through these measures, the faculty not only met the recommendations from the previous evaluation but also significantly strengthened its position as a leading research institution with industrial and societal impact.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
Website of the Faculty of Mechanical Engineering	3.1	https://www.fs.vsb.cz/en
National Recovery Plan for VSB-TUO, Specific Objective B: Academically-Oriented Bachelor's Degree Program in Intelligent Transport and Logistics	3.3	https://prihlaska.vsb.cz/uchazec/program/1033 (both mutations, Czech and English)
Innovative and Additive Manufacturing Technologies – New Technological Solutions for 3D Printing of Metals and Composite Materials	3.3	https://www.vsb.cz/fip-ai/en/cooperation/projects/innovative-and-additive-manufacturing-technology/
TK02020060 – Research of an Innovative Steam Generator Concept for Cogeneration Electricity Production at Waste-to-Energy Plants (ZEVO) with Prevention of Chloride Corrosion and Energy Storage Capability	3.3	https://starfos.tacr.cz/en/projekty/TK02020060
TN01000071 – National Competence Center for Mechatronics and Smart Technologies for Engineering (NCK MESTEC)	3.3	https://starfos.tacr.cz/en/projekty/TN01000071
FW03010345 – Development of a New Range of SPIDER Mowers with Grass Compression Function	3.3	https://starfos.tacr.cz/en/projekty/FW03010345
TH04010428 – Research on the Possibilities of Robotizing Metal and Rubber Product Assembly Technologies	3.3	https://starfos.tacr.cz/en/projekty/TH04010428
FV40115 – Development of a New Range of Medium-Pressure Gate Valves, Their Manufacturing Technology, and Testing Methodology Simulating 60 Years of Operation	3.3	https://starfos.tacr.cz/en/projekty/FV40115
101112380 – Hybrid Energy Storage System Using Post-Mining Infrastructure	3.3	https://itpe.pl/en/hess/
CZ.01.1.02/0.0/0.0/20_321/0024017 – Energy and Software Optimization of Hydraulic Stations Over 100 kW	3.3	https://www.ingeteam.cz/en/news
Patents can be found on the website	3.4, 3.4.1	https://isdv.upv.gov.cz/webapp/!resdb.pta.frm

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Faculty of Economics (FE)

FORD: 5 - Social sciences

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.⁹⁷ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

The Faculty of Economics at VSB-TUO was founded in 1977 and is the second oldest faculty of economics in Moravia. Over the course of its 48-year history, 35,000 graduates have completed their studies at the faculty. Currently, 3,200 students are studying at the Faculty of Economics, making it the largest faculty at VSB-TUO in terms of student numbers.

The Faculty of Economics currently offers six Bachelor's programmes (Economy and Management, Marketing, Finance, Accounting and Taxes, Economics, Informatics in Economics) and six follow-up Master's programmes (Economy and Management, Marketing, Finance and Accounting, Economics, Information and Knowledge Management, Public Economics and Administration).

The number of doctoral students has remained stable during the observed period. The number of the four accredited programmes offered (Economics, Economy and Management, Finance, Systems Engineering and Informatics) is adequate considering the number and structure of supervisors and student interest. Doctoral students are increasingly perceived as early career researchers and publish alongside more experienced researchers.

The Faculty of Economics has accredited habilitation procedure and procedure for appointment as a professor in four fields: Economics, Economy and Management, Finance, and Systems Engineering and Informatics. There are 2-3 procedures per year, successfully bridging the generational change of academics and ensuring the continuity of the activities carried out. The number of professors and associate professors is maintained at a relatively stable level, despite increasing requirements for habilitation procedures and procedures for appointing professors. There has been an increase in the number of high-quality publications (especially in Q1 and Q2 WoS journals) and in the number of citations requested over the period evaluated. The number of

⁹⁷ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

pure researchers has decreased as the faculty's strategy has shifted to focus on academic staff with research potential in order to strengthen accreditation assurance, not only for Bachelor's and Master's programmes, but also for doctoral programmes, habilitation procedures and the procedure for appointment as a professor.

The age structure of associate professors and professors is relatively balanced. On the positive side, 31 % of professors and 43 % of associate professors are under 50 years of age. The structure of associate professors and professors is not entirely balanced by gender. The proportion of female professors is only 25 %, and the proportion of female associate professors is 36 %.

The Faculty of Economics is an academic workplace emphasizing high-quality creative activities with an international reach. According to the evaluation of the highest quality scientific publications, the Faculty of Economics is among the three most important workplaces in the field of Economics and Business in the Czech Republic. The faculty collaborates in research with prestigious domestic and foreign institutions (such as the Czech National Bank and the World Bank), with significant foreign universities, and is the holder of domestic and foreign scientific grants. Key research topics include sustainable development, financial stability, monetary policy, behavioural economics, real options, game theory, and multi-criteria decision-making.

The strategic goal of the faculty is to be a recognized centre of oriented research. To achieve this goal, the faculty supports the production of quality publication outputs (especially articles in WoS journals positioned in Q1 and Q2 and monographs) through an incentive system. In addition, the Dean's Award for the best publication is awarded. Faculty academics are also encouraged to apply for national and international research grants.

Other priorities of the faculty include internationalization. Approximately 100 students from the faculty go abroad for internships annually, mainly to EU and Asian countries. Conversely, foreign students come to study at the faculty, either as interns or self-payers who complete a selected study program. Foreign students account for 10 % of all students in the faculty. Overall, in the last ten years, 350 self-payers have completed one of the study programs in English. Each year, the faculty organizes an International Week event, attended by around 40 academics, mainly from EU countries, but also from the USA and Japan. The Faculty of Economics is also part of the international consortium E!UREKA, which brings together 10 European universities to collaborate in teaching and research.

Cooperation with practice is very important to the Faculty of Economics. Students have the opportunity to complete six-month internships in companies, participate in excursions, and work on semester projects on topics assigned by the business sector. During their studies, they can also start the process of obtaining professional certifications (CFA, ACCA) and familiarize themselves with the SAP S4/HANA software, which is often used in practice. The faculty has signed partnership agreements with companies such as Škoda-Auto, PwC, KPMG, Deloitte, Hyundai, Vítkovice Steel, Kofola Československo, SATUM Czech, Advisio, and many others.

Furthermore, the Faculty of Economics pays attention to managerial education. The most significant is the MBA Management and Leadership course, prepared in cooperation with Liverpool John Moores University, which has been successfully completed by more than 350 managers over its 25 years of existence. Moreover, courses such as HR Academy, Leadership, Process and Project

Management, Digital Purchasing Team, Managerial Skills, and many other courses for the public are also offered. The faculty also provides education for seniors through the University of the Third Age.

 Table 3.1.1 - Staffing per FTE⁹⁸

Academic/Professional position	Total/Of which women					
	2019	2020	2021	2022	2023	Total
Professor	16,3/4,2	15,1/4,1	13,7/3,9	13,5/3,6	13,8/4,4	16/4
Associate Professor	29,6/15,5	29,7/14,9	31,2/15,6	29,7/13,9	26,5/11,0	31/15
Assistant Professor	91,0/50,2	87,2/46,3	84,0/46,9	80,9/45,8	77,8/43,9	91/50
Assistant	0,0/0,0	0,0/0,0	0,0/0,0	0,0/0,0	0,0/0,0	0/0
R&D Personnel ⁹⁹	1,6/0,6	2,0/0,3	2,8/0,1	2,1/0,6	0,6/0,2	2/0,6
Researchers in other categories ¹⁰⁰	9,2/0,8	7,4/1,3	5,4/1,8	4,8/0,5	2,5/0,6	9/1
Technical and economic staff ¹⁰¹	54,1/43,3	50,8/40,5	48,9/38,9	49,4/39,6	44,4/36,3	54/43
Scientific, research and development staff involved in teaching activities	126,86/69,87	132,02/65,25	129,11/66,48	124,14/63,22	118,15/59,31	132/69
Early career researchers ¹⁰²	23,52/11,36	19,77/8,38	19,33/9,49	15,42/8,57	12,83/4,69	23/11
Total ¹⁰³	201,9/114,7	194,2/109,4	189,1/109,2	184,8/106,9	171,1/100,6	201/114

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

⁹⁸ The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

⁹⁹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁰⁰ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁰¹ Who participates in the management and support of R&D&I in the institution.

¹⁰² See Definition of Terms in Methodology HEI2025+.

¹⁰³ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 (numbers of physical employees and personnel)¹⁰⁴

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor					5		4	2	6	3	5	
Associate Professor			5	1	10	5	13	7	5	3		
Assistant Professor	2	1	34	15	32	18	25	17	4	1		
Assistant												
R&D Personnel ¹⁰⁵					1	1						
Researchers in other categories ¹⁰⁶			8		3		3	2				
Technical and economic staff ¹⁰⁷			13	11	20	13	15	15	6	5		
Scientific, research and development staff involved in teaching activities	2	1	39	16	47	23	42	26	15	7	5	
Early career researcher ¹⁰⁸			21	10	3	1						
Total ¹⁰⁹	2	1	60	27	71	37	60	43	21	12	5	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2023 (numbers of physical employees and personnel)¹¹⁰

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor					5		5	1	5	3	1	
Associate Professor			7	1	5	1	8	5	7	2	1	1

¹⁰⁴ The total number of employees/workers as of 31st December of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

¹⁰⁵ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁰⁶ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁰⁷ Who participates in the management and support of R&D&I in the institution.

¹⁰⁸ See Definition of Terms in Methodology HEI2025+.

¹⁰⁹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

¹¹⁰ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

Assistant Professor	2		16	8	32	17	24	18	11	3		
Assistant												
R&D Personnel ¹¹¹												
Researchers in other categories ¹¹²			1		1		1	1				
Technical and economic staff ¹¹³			1	1	20	14	16	15	4	3		
Scientific, research and development staff involved in teaching activities	2		23	9	42	18	38	24	23	8	2	1
Early career researcher ¹¹⁴	1		11	4	3	2						
Total ¹¹⁵	2		25	10	63	32	54	40	27	11	2	1

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	1672	994	1724	1019	1851	1074	1853	1039	1912	1036	9012	5162
Master's ¹¹⁶	854	587	867	594	867	577	953	602	1005	639	4546	2999
Doctoral	77	45	81	44	84	47	81	46	79	40	402	222
Lifelong Learning Courses	217	138	179	100	216	116	235	110	214	122	1061	586
Total	2820	1764	2851	1757	3018	1814	3122	1797	3210	1837	15021	8969

¹¹¹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹¹² The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹¹³ Who participates in the management and support of R&D&I in the institution.

¹¹⁴ See Definition of Terms in Methodology HEI2025+.

¹¹⁵ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

¹¹⁶ All master's degree students are listed, regardless of the length of their programme of study.

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ¹¹⁷ /Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate	9/4		10/4		10/4		10/5		10/6	0/1	9/5	0/1
Master's	8/6		10/7		10/7		10/7		11/7		11/5	
Doctoral	7/7		8/8		8/8		8/8		8/8		8/5	
Lifelong Learning courses	14/0		15/1		13/1		14/0		14/0		18/1	
Total	38/17		43/20		41/20		42/20		43/21	0/1	46/16	0/1

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	10	Basic Research	21
	1.2 Computer and information sciences	8	Balanced basic and applied research	
	1.3 Physical sciences			
	1.4 Chemical sciences			
	1.5 Earth and related environmental sciences	2	Basic Research	
	1.6 Biological sciences			
	1.7 Other natural sciences	1	Basic Research	
2. Engineering and Technology	2.1 Civil engineering	1	Balanced basic and applied research	3
	2.2 Electrical engineering, Electronic engineering, Information engineering			
	2.3 Mechanical engineering			
	2.4 Chemical engineering			
	2.5 Materials engineering			
	2.6 Medical engineering			
	2.7 Environmental engineering	2	Basic Research	
	2.8 Environmental biotechnology			
	2.9 Industrial biotechnology			
	2.10 Nanotechnology			
	2.11 Other engineering and technologies			
3. Medical and	3.1 Basic medicine			4

¹¹⁷ The total number of study programmes for which admissions have been announced in a given academic year.

Health Sciences	3.2 Clinical medicine	2	Basic Research	
	3.3 Health sciences	2	Balanced basic and applied research	
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries			0
	4.2 Animal and Dairy science			
	4.3 Veterinary science			
	4.4 Other agricultural sciences			
5. Social Sciences	5.1 Psychology and cognitive sciences			72
	5.2 Economics and Business	60	Basic Research	
	5.3 Education	1	Basic Research	
	5.4 Sociology	2	Balanced basic and applied research	
	5.5 Law			
	5.6 Political science	1	Basic Research	
	5.7 Social and economic geography	5	Basic Research	
	5.8 Media and communications	2	Basic Research	
	5.9 Other social sciences	1	Basic Research	
6. Humanities and the Arts	6.1 History and Archaeology			0
	6.2 Languages and Literature			
	6.3 Philosophy, Ethics and Religion			
	6.4 Arts (arts, history of arts, performing arts, music)			
	6.5 Other Humanities and the Arts			
Total		100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the period of 2019–2023 based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

The research of the Faculty of Economics is systematically recognized by the Czech National Bank (CNB) as during the evaluated period four papers produced by five of faculty members received award for the Best CNB research paper. Such research that focuses on current issues in macroprudential policy setting and economic shocks has a direct impact on the policy makers. Moreover, one academic has been recognized by WHO for COVID-19 Research and for developing

collaboration with partner university in Poland.

Academic staff and researchers of the Faculty of Economics actively participate in the editorial boards of high quality international scientific journals in broad spectrum of fields relevant for evaluated unit. It is worth mentioning especially leading journals (positioned in the first quartile according to AIS) Industrial Marketing Management and Applied Soft Computing, as well as other influential journals, including Communications in Nonlinear Science and Numerical Simulations, Dynamic Games and Applications, Journal of Economic Dynamics and Control, and Industrial and Corporate Change. In addition to the information presented in Table 3.2.2, our faculty members participated in other editorial boards, including several journals published in Western countries, and often in Polish and Czech journals.

Academics and researchers of the Faculty of Economics have been active in giving invited lectures and speeches at various institutions and universities around the world. The presentations had an impact on both fellow academics and policy practitioners. The topics cover a wide range of current issues from financial stability, behavioural economics, crowd funding, sustainability in small and medium enterprises to academic writing, among others. During the evaluation period, we identified a total of 46 invited presentations. The most important speeches include:

- Hidden Debt: Solutions to Avert the Next Financial Crisis in South Asia at the World Bank.
- Retail Fund Flows and Performance: Insights from Supervisory Data at University of Oxford.
- Cognitive Biases – Gremlins for our Decisions at The Kyoto College of Graduate Studies for Informatics.
- Herding Behaviour and Information Asymmetries in Crowdfunding at Brunel University London.
- Financial Stability and Financial Inclusion: Do policymakers face inherent trade-offs in financial development? at the Central Bank of Philippines.

The Faculty of Economics has been successful in attracting foreign scientists as well as important domestic guests including policy practitioners, such as

- Jan Frait, a member of the Board of the Czech National Bank, who delivered lecture on Monetary Macroeconomics and Central Banks in Turbulent Times and who has been a regular lecturer in the interfaculty economics course for doctoral students,
- Daniel Münich a member of the National Economic Council and Adviser to the Prime Minister of the Czech Republic from CERGE-EI, who delivered lecture on academic publishing and performance-based evaluations.

In addition to speakers from prestigious European universities, there were academics from the USA, Japan and the Slovak Academy of Sciences. The most significant foreign scientist, who provided lectures at our faculty include:

- Carol Wise from University of Southern California with the lecture on China – Latin America economic relations.
- Jan Fidrmuc, from Brunel University with the lecture on Male education and domestic violence in Turkey: evidence from a natural experiment.

- Henri Pirkkalainen from University of Tampere with the lecture on Value Creation with Social Extended Reality: Insights on Technology Adoption.

Academics from the Faculty of Economics have regularly used their expertise to evaluate research projects under various research calls. The Czech Science Foundation utilised the expertise of several of our employees for the regular evaluation of research projects as members of the evaluation panel, and two of them also served in the discipline committees for social sciences and humanities. In addition, several other academics reviewed research projects for the Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences under the VEGA program. Other expertise in the evaluation of research proposals has been used in the programs of the Grant Agency Academia Aurea, which specializes in supporting applied research and in international calls within the National Science Center of Poland under the OPUS program and the Science Fund of the Republic of Serbia under the GLOBE program.

Overall, the academics of the Faculty of Economics are recognized as respected experts not only in the Czech Republic but also abroad, and the Faculty of Economics is an attractive destination for foreign experts.

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
Hana Štverková, Dr.	Rector's commendation for the contribution to the development of the WSB Academy, for cooperation in the implementation of teaching and research activities and participation in regional development projects.	WSB University, Poland
Hana Štverková, Dr.	Article indexed in the WHO COVID-19 Research Database	WHO
Martin Hodula, Assoc. Prof., Ngoc Anh Ngo	Award for the best CNB research paper 2023: Easing of Borrower-Based Measures: Evidence from Czech Loan-Level Data	Czech National Bank
Martin Hodula, Assoc. Prof., Martin Melecký, Prof.	Award for the best CNB research paper 2022: Cooling the Mortgage Loan Market: The Effect of Recommended Borrower-Based Limits on New Mortgage Lending	Czech National Bank
Jan Libich, Prof.	Award for the best CNB research paper 2021: Holding the Economy by the Tail: Analysis of Short- and Long-Run Macroeconomic Risks	Czech National Bank
Jan Janků, Assoc. Prof.	Award for the best CNB research paper 2020: A Prolonged Period of Low Interest Rates: Unintended Consequences	Czech National Bank

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Maciej Mitreęa, Prof.	Industrial Marketing Management, ISSN 0019-8501, Online ISSN 1873-2062
Maciej Mitreęa, Prof.	Journal of Industrial & Business Marketing, ISSN 0885-8624, Online ISSN 2052-1189
Martin Macháček, Prof.	Politická ekonomie - Political economy, ISSN 0032-3233, Online ISSN 2336-8225
Davide Radi, Dr.	Communications in Nonlinear Science and Numerical Simulations, ISSN 1007-5704, Online ISSN 1878-7274
Fabio Lamantia, Dr.	Dynamic Games and Applications, ISSN 2153-0785, Online ISSN 2153-0793
Mikhail Anufriev, Dr.	Journal of Economic Dynamics and Control, ISSN 0165-1889
Mikhail Anufriev, Dr.	Industrial and Corporate Change, ISSN 0960-6491, Online ISSN 1464-3650
František Zapletal, Assoc. Prof.	Applied Soft Computing, ISSN 1568-4946, Online ISSN 1872-9681
Miroslav Hudec, Assoc. Prof.	Applied Soft Computing, ISSN 1568-4946, Online ISSN 1872-9681
Miroslav Hudec, Assoc. Prof.	International Journal of Interactive Multimedia and Artificial Intelligence, ISSN 1989-1660

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
Maciej Mitreęa, Prof.	How to publish in prestigious to-tier journals? (within meet the editors session)	Academy of International Business (AIB) MENA Chapter 7th Annual Conference (Dubai, UAE), Mohammed Bin Rashid School of Government	2021
Zuzana Kučerová, Prof.	Herding Behaviour and Information Asymmetries in Crowdfunding	Brunel University London, UK	2019
Martin Melecký, Prof.	Hidden Debt: Solutions to Avert the Next Financial Crisis in South Asia.	World Bank	2022
Martin Melecký, Prof.	Financial Stability and Financial Inclusion: Do policymakers face inherent tradeoffs in financial development?	Central Bank of Philippines	2019
Hana Štverková, Dr.	Sustainability of SMEs and the cross-border entrepreneurship (Keynote speaker)	19th Science Festival WSB, 2023, Dabrowa Gornicza, Poland	2023
Mikhail Anufriev, Dr.	Hypocrisy and Social Learning	Computational and Experimental Economics Workshop in memory of Jasmina Arifovic, Simon Fraser University, Canada	2023
František Zapletal, Assoc. Prof.	Cognitive Biases – Gremlins for our Decisions	The Kyoto College of Graduate Studies for Informatics, Japan	2022
Miroslav Hudec, Assoc. Prof.	The Explanation of Mined Knowledge by Fuzzy	Medical University, Graz,	2019

	Logic	Austria	
Jan Libich, Prof.	Research seminar: The Problems with Financializing the Economy	La Laguna University, Spain	2021
Martin Hodula, Assoc. Prof.	Retail Fund Flows and Performance: Insights from Supervisory Data	IFABS 2023 Oxford, Oxford (Said Business School), UK	2023

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Mario Carrassi, Ph.D.	Università degli Studi di Bari Aldo Moro	From understanding Economics to Conscious Sustainability	2022
Jan Valendin, Ph.D.	Wirtschaftsuniversität Wien	Does Government Spending And Taxation Predict Stock Market Price?	2023
Stef Mannaerts	University Colleges Leuven-Limburg, Belgium	Business Valuation: what Methods Can we Use and Is there a Preference among this Methods	2021
Mario Koeppen, Prof.	Kyushu Institute of Technology, Fukuoka, Japan	Smart Farming Documentation System	2021
Henri Pirkkalainen, Assoc. Prof.	University of Tampere (Finland)	Value Creation with Social Extended Reality: Insights on Technology Adoption	2021
Jan Frait, Prof.	Czech National Bank	Monetary Macroeconomics and Central Banks in Turbulent Times	2023
Mária Širáňová, Dr.	Institute of Economic Research, Slovak Academy of Sciences	Interplay between Income Inequality and Financial Development as a Conditioning Factor of Monetary Transmission in the Euro Area	2022
Daniel Münich, Assoc. Prof.	Center for Economic Research and Graduate Education – Economics Institute (CERGE-EI)	The windows of the universe of scientific journals open	2022
Carol Wise, Prof.	University of Southern California	China – Latin America economic relations	2019
Jan Fidrmuc, Dr.	Brunel University	Male education and domestic violence in Turkey: evidence from a natural experiment	2019

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the authority/guarantor contracting of the project/programme call	Year
Maciej Mitreęa, Prof.	OPUS – evaluation of research project	National Science Centre, NCN, Poland, OPUS 20	2020
Maciej Mitreęa, Prof.	GLOBE – evaluation of research project	Science Fund of the Republic of Serbia	2021
Martin Macháček, Prof.	Member of Evaluation Panel and Discipline Committees Social Sciences and Humanities - regular evaluation of projects.	GAČR - Czech Science Foundation	2019-2023
Martin Melecký, Prof.	Member of Evaluation Panel - regular evaluation of projects. 2023-2025	GAČR - Czech Science Foundation	2023
Aleš Kresta, Assoc. Prof.	Member of Evaluation Panel - regular evaluation of projects.	GAČR - Czech Science Foundation	2019-2023
Tomáš Tichý, Prof.	Member of Evaluation Panel and f Discipline Committees Social Sciences and Humanities - regular evaluation of projects.	GAČR - Czech Science Foundation	2019-2023
Jiří Franek, Dr.	Strategy for the development and sustainability of family business in woodworking and furniture industry in the Slovak Republic	VEGA - The Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and of the Slovak Academy of Sciences (SAS)	2023
Andrea Kolková, Dr.	The Future of Crypto Assets and Decentralized Finance in the Czech Republic: Identification and Analysis of Factors Affecting Crypto and DeFi Adoption and User Behavior	The Grant Agency Academia Aurea (GA AA)	2023
Jana Hančlová, Prof.	Socioeconomic potential of data sharing for supporting smart supply chain management	VEGA - The Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and of the Slovak Academy of Sciences (SAS)	2020
Tomáš Tichý, Prof.	VEGA – evaluation of several research projects	VEGA - The Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and of the Slovak Academy of Sciences (SAS)	2019-2020

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research¹¹⁸) that it has implemented or participated in during the period of 2019–2023¹¹⁹. This should be done from the full list in annex tables (Table 3.3.1-3.3.2)¹²⁰, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

During the period under evaluation, the Faculty of Economics was successful in obtaining research grants from the Czech Science Foundation, even in the period of decreasing acceptance of these projects due to decrease in financing of the Czech Science Foundation. These projects fall under two panels, which are closely related to the purpose, mission and research areas of the evaluated unit, namely P402 - Economic Sciences, Macroeconomics, Microeconomics, Econometrics except Financial Econometrics, Quantitative Methods in Economics except Operational Research and P403 - Business and Management Science, Finance, Financial Econometrics and Operational Research.

In addition, the Faculty of Economics has been successful in obtaining grants from the Technology Agency of the Czech Republic under various programme calls.

Furthermore, the Faculty of Economics has greatly benefited from grants from the Ministry of Education, Youth and Sports, which have been actively used within the framework of a student grant competition focused on promoting the publication record of young researchers. By solving these projects, researchers have created several stable research groups and increased the internationalisation of research by collaborating with authors from prestigious foreign institutions and universities. Two of these projects were led by female principal investigators, documenting the gender diversity in our research.

The most significant projects include two projects from the Czech Science Foundation that were rated as excellent:

1. Modeling Credit Risk and System Risk in the Non-life Insurance Sector (177 436 EUR)

The project is in line with the faculty's scope and research areas, combining economic, financial and mathematical approaches. The project supported the internationalization and development of research at the faculty through close collaboration with foreign researchers and the inclusion of junior staff. The project has made a significant contribution to the study of risk in the insurance industry. Eight articles were published in journals register in WoS database. The results were presented at major conferences. The research project advances credit risk modelling for non-life insurance by developing a tailored credit risk framework. Researchers derive CDS spread pricing formulas and identify a two-factor model as the best

¹¹⁸ For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

¹¹⁹ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

¹²⁰ The evaluated unit shall only fill tables that are relevant to it.

compromise between accuracy and efficiency. This model, which triggers default through a first-passage mechanism or a Poisson-like jump process, captures key macroeconomic and structural determinants of credit risk, providing a solid foundation for future refinements. A micro-structural contagion model is also developed to analyse credit risk propagation in non-life insurance markets with correlated claims, particularly under catastrophic events like climate change. The study highlights the sector's heightened systemic risk sensitivity and reveals that diversification does not eliminate contagion, posing challenges for reinsurance stability. Additionally, the research examines how market capitalization volatility affects an insurer's creditworthiness and systemic risk. Using a behavioural stock market model, it demonstrates that sentiment-driven trading destabilizes financial markets. The findings suggest that macro-prudential policies for systemic risk mitigation in insurance must also include financial market regulations. This research offers a comprehensive framework for credit risk assessment, systemic risk evaluation, and financial stability, providing valuable insights for insurers, policymakers, and regulators in managing risk and ensuring market resilience.

2. A Generalized Approach to Stochastic Dominance: Theory and Financial Applications (196 095 EUR)

The project is in line with the faculty's scope and research areas as 13 journal articles register in WoS database has been published under the project in the Economics and Business, while combining economic, financial and mathematical approaches. The project promoted the internationalization and development of research at the faculty through close collaboration with foreign researchers and the inclusion of early career researchers. The research project extends stochastic dominance (SD) theory by introducing a fractional degree SD notion that enhances flexibility in modelling investor preferences and decision-making. It also advances statistical methods related to SD, particularly in nonparametric testing and applications to statistical models. The findings contribute to portfolio theory and financial modelling, offering new stochastic orders that establish monotonicity results for statistical functionals. Additionally, the study explores the link between SD and financial stability, risk assessment, and company longevity, making it highly relevant for applications in finance, insurance, and economic decision-making.

The research project compares mean-variance analysis and expected utility in portfolio theory, demonstrating that mean-variance efficient portfolios are often suboptimal for non-satiable, risk-averse investors. It highlights the importance of second-order stochastic dominance (SSD) and addresses the diversification puzzle through theoretical and empirical analysis. The study generalizes SSD to a family of stochastic dominance relations, parameterized by a distortion function that reflects investor risk aversion. Additionally, it introduces transform orders, which extend key stochastic orders and provide stochastic monotonicity results for statistical functionals in economics and finance. These insights enhance risk assessment, portfolio optimization, and financial decision-making methodologies.

This research improves portfolio optimization and risk assessment, helping investors and policymakers make better financial decisions. It enhances asset allocation, diversification, and risk management in markets and insurance.

In addition, five other projects funded by the Czech Science Foundation have significantly contributed to the development of research at the Faculty of Economics by expanding research areas and forming stable research groups within the long-term research focus of the faculty.

3. Evolutionary Economic Dynamics with Finite Populations: Modeling and Applications (183 432 EUR)

This interdisciplinary research integrates mathematics, economics, finance, and behavioural science. It combines stochastic analysis, evolutionary game theory, and bifurcation theory with applications in financial modelling, industrial organization, macroeconomics, and environmental economics. This project has already led to 13 journal articles registered in WoS database and more are in the pipeline. The research project develops mathematical tools for stochastic analysis in finite populations and bifurcation structures in piecewise models, essential for understanding state-dependent payoffs. It explores two main directions: evolutionary models with finite populations and heterogeneous agent models. The project introduces an innovative evolutionary mechanism inspired by Moran processes, demonstrating how successful behaviours spread in dynamic markets, fostering cooperation even in competitive environments. Additionally, it extends classical economic and financial models to finite populations, examining cooperative and competitive strategies, ambiguity aversion in duopoly games, and the role of expectations in macroeconomics. These findings enhance financial modelling, industrial organization, and environmental economics. This research is important as it provides a more realistic framework for understanding market dynamics, investor behaviour, and strategic interactions in uncertain environments. The results could help policymakers, financial analysts, and businesses improve decision-making by refining risk assessment, optimizing market strategies, and fostering cooperation in competitive settings.

4. Interaction between Financial Markets and Real Sector: Modeling, Experiments, and Policy (197 081 EUR)

The project combines analytical modelling, experiments and simulations to produce a range of empirically motivated policy advice and to investigate various issues related to instability of financial markets and real economies. For instance, it studied dynamics in the very beginning of the trading period and the dynamics in the so-called “beauty-contest experiments” which are linked to investment in financial market since Keynes. In fact, the computational model is calibrated on the data and it is shown how this model can be applied to more general market environments. The project intends to contribute to our understanding of interaction between the stock market and the real economy. The novelty of the approach proposed here is to extend the models of financial markets with heterogeneous agents (so-called Heterogeneous Agent Models, HAMs) by including additional feedback between the real economy and the financial market via the fundamental asset valuation of these models, including expected dividend and risk evaluation. This is important to evaluate welfare implications of bubbles and crashes of financial market, including possibilities of contagion of those to the real sector. The novel experiments will provide a further way to test an impact of bubbles and crashes to the production side of the economy, whereas extensions of the baseline tractable models to agent-based version will produce realistic framework to test policy implications. Papers under this project have been published in high quality journals, such as Journal of Communications in Nonlinear Science and Numerical Simulation and Economic Behavior & Organization.

5. Hybrid Evolutionary Games and Economic Applications (197 041 EUR)

This project combines economics, mathematics, finance and behavioural sciences using evolutionary game theory and hybrid dynamical systems. It has applications in industrial organisation, policy analysis and crisis management. It provides valuable insights for policy makers, businesses and financial analysts. The project led to 12 publications in WoS journals.

The project develops Hybrid Evolutionary Games (HEGs) to integrate short-term and long-term decision-making within a unified evolutionary framework. It formalizes HEGs using hybrid dynamical systems, analyses their properties through global analysis tools, and introduces numerical implementation techniques via F-transform. A key innovation is incorporating memory processes, where past decisions influence current choices, particularly in oligopolistic markets with behavioural heterogeneity, delegation, and market saturation. The research applies HEGs to bioeconomics, industrial organization, fiscal and monetary policy, financial markets, and crisis management, including COVID-19 response and tax evasion dynamics. It also explores complex market dynamics, showing how ambiguity, endogenous preferences, and past consumption choices shape economic behaviour. Additionally, the project employs evolutionary models to assess policy effectiveness, debt stabilization, and market stability, demonstrating how heterogeneous agents' time horizons affect financial decisions. These findings enhance economic modelling, providing better tools for policymakers, businesses, and financial analysts to manage uncertainty and strategic interactions.

6. Spatial Dynamics and Inequality: The Role of Connectivity and Access to Finance (164 024 EUR)

The project examines competition in railway transport, income-environment trade-offs, and spatial financial access disparities, merging insights from urban planning, public policy, and economic modeling. Additionally, the study of monetary and macroprudential policies, SME financing, and consumer behavior connects financial economics with behavioral science and regulatory policy. This interdisciplinary approach enhances policy recommendations for infrastructure investments, financial inclusion, and sustainable economic development, benefiting policymakers, urban planners, and financial institutions. The project produced 10 WoS papers, with three Q1 publications, 2 Scopus papers and additional studies in progress.

The research grant significantly advanced understanding in spatial economics, particularly in transport infrastructure efficiency and financial access disparities. It explored competition in railway passenger transport, income-environment trade-offs in transport investments, and spatial differences in publishing productivity. Findings highlight how transport policies can enhance service competition and balance economic and environmental concerns.

In finance and local development, the research examined monetary and macroprudential policies in housing finance, the impact of borrower-based limits on mortgage lending, and the rise of shadow banking. Studies also assessed household savings behavior, sentiment-driven financial decisions, and SME financing under Basel III regulations.

These contributions provide policy recommendations on equitable financial access, transport infrastructure development, and monetary policy effects, offering valuable insights for policymakers, economists, and financial institutions to improve economic efficiency and inclusivity.

During the project, the researcher collaborated on the papers with the economist from the World Bank and the Slovak Academy of Sciences, as well as researchers from La Trobe University (Australia).

7. New Approaches to Financial Time Series Modelling Based on Soft Computing (223 037 EUR)

This project combines fuzzy logic, time series analysis and data mining for financial modelling, forecasting and risk management. By using natural language processing to interpret financial data, it bridges quantitative finance and computational intelligence, providing valuable insights for investment strategy, portfolio management and risk assessment. The project focuses on

analysing financial time series and developing innovative methods that combine fuzzy transform and fuzzy natural logic for financial modelling. It introduces new approaches to forecasting financial time series, particularly in identifying trend-cycle and seasonal components, demonstrating that fuzzy transform effectively estimates local stock behaviour and detects market phases. Additionally, it develops linguistic descriptions for time series, enabling more intuitive analysis using natural language for regression, dependency, and forecasting. Advanced data mining techniques are applied to extract insights from both univariate and multivariate time series, facilitating automatic detection of structural breaks, systemic risk periods, and financial trends. The developed methods are applied to sales prediction, price trend estimation, portfolio optimization, and risk evaluation, addressing challenges posed by imprecise and multidimensional financial data. These findings contribute to more robust financial decision-making, investment strategies, and risk management, making the project highly valuable for researchers and practitioners. During the project, the researchers collaborated with colleagues from several universities in the USA, China, Japan, Italy, the UK, Morocco and Vietnam.

Furthermore, the Faculty of Economics is active in projects financed by Technology Agency of the Czech Republic (TA CR) promoting applied research and experimental development. The faculty contribute to socio-economic development, financial efficiency and sustainable infrastructure management. Health economics research explores cost-effective telemedicine solutions for neurological and mental health care. Transport economics studies optimise infrastructure maintenance using geospatial analysis and economic modelling. Financial management research improves public finance strategies for effective urban governance. These projects reflect the commitment to economic sustainability, innovation and data-driven decision-making, benefiting policymakers, businesses and society by improving healthcare access, transport efficiency and the financial resilience of urban development. We document this capability through three projects, one of which was led by a female principal investigator, contributing to gender diversity in research.

8. Effective Approaches to Economical and Adaptable Systems of Maintenance and Operation of Transport Networks (147 730 EUR)

The project developed an innovative approach to optimizing transport network maintenance and service, aligning with the mission and vision of the faculty by promoting sustainable, efficient, and data-driven solutions. It focused on existing route optimization and the design of new transit routes, ensuring improved efficiency in service vehicle operations while minimizing economic and environmental costs.

Key contributions include the standardization of input data for geoinformation system optimization (Nmet methodology), the development of advanced mathematical models for data verification, and the design of an optimal transit route network. The project also produced specialized maps (Nmap) and an economic interpretation of results, ensuring practical application in policy and infrastructure planning.

This research directly supports the faculty's commitment to innovation, sustainability, and interdisciplinary excellence. By integrating geospatial analysis, mathematical modelling, and economic evaluation, the findings contribute to smart urban planning, optimized logistics, and efficient resource management, reinforcing the faculty's role as a leader in cutting-edge, impact-driven research. Several companies from practice dealing with the researched area were included in the research, namely Technical Services Opava, s.r.o., Technical Services Krnov, s.r.o., Technical Services Bystřice pod Hostýnem, s.r.o., Nehlsen Třinec, s.r.o.

9. Methodological-application Tools for Efficiency Financial Management of Territorial Structured Statutory City (160 118 EUR)

The project focused on the development of methodological and application tools to increase the efficiency of the financial management of the territorially structured statutory city of Ostrava in the period 2018-2020. It resulted in a methodological and analytical study, a handbook and the creation of a specialised IT contact point, RPoint (R for budget). These solutions aimed to optimise budgeting processes and improve participation at all stages, including planning, decision-making, implementation and control, for both the city and its municipalities. In addition, the project introduced methods for measuring the allocation and technical efficiency of municipal activities and processes.

This research is crucial as it increases transparency, efficiency and participatory governance in municipal financial management. By streamlining budgeting and improving financial monitoring, it supports better resource allocation, accountability and strategic decision-making. The results benefit local governments, policymakers and financial managers by providing data-driven tools to strengthen urban financial sustainability and effective governance.

10. Economy-user Potential of Distance Forms of Social-health Care of Neurological and Mental Diseases (127 938 EUR)

The project aimed to improve social health care for people with neurological and mental illnesses through market evaluation, technological innovation and socio-economic analysis. It first assessed the supply and demand for social care services in the Czech Republic, with a focus on the Moravian-Silesian region. Second, it developed and tested distance care prototypes, specifically in cognitive rehabilitation and creative therapy, to improve accessibility for patients. Finally, it assessed the socio-economic factors and constraints affecting the provision of both traditional and distance healthcare from the perspectives of providers and users.

This research is crucial in supporting more effective, accessible and sustainable healthcare solutions. By integrating distance healthcare models, it improves services for patients with limited mobility or regional access barriers. The findings will help healthcare providers, policy makers and social services to design inclusive, efficient and cost-effective care systems, and strengthen the future of digital and community-based healthcare.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ¹²¹	Project name	Support (in thousands CZK/EUR) ¹²²				
		2019	2020	2021	2022	2023
Czech Science Foundation (GA CR)	Financial applications of stochastic ordering rules	1 330 / 52 465				
GA CR	Law Aspects of China's Incorporation into the Global Trade System	455 / 17 949				
GA CR	Economies of Scope in Network Data	970 /				

¹²¹ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

¹²² Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

	Envelopment Analysis Models	38 264				
GA CR	New approaches to financial time series modelling based on soft computing	1 947 / 76 805	1 947 / 76 805			
GA CR	Multi Objective Optimization Application in Flexible Manufacturing and Project Scheduling Problems: Theory and Applications	1 204 / 47 495	1 217 / 48 008			
GA CR	Customer characteristics and management factors as antecedents of presumption	500 / 19 724				
GA CR	A network approach to portfolio optimization and tracking problems	1 266 / 49 941	1 266 / 49 941	1 266 / 49 941		
GA CR	Performance evaluation in the presence of unclassified factors	1 558 / 61 460	1 292 / 50 966	1 292 / 50 966		
GA CR	Spatial Dynamics and Inequality: The Role of Connectivity and Access to Finance	1 386 / 54 675	1 386 / 54 675	1 386 / 54 675		
GA CR	Drivers and impacts of the technological knowledge in emerging market and developing economies	2 492 / 98 304	640 / 25 247	1 408 / 55 542		
GA CR	Hybrid Evolutionary Games and Economic Applications		1 665 / 65 680	1 665 / 65 680	1 665 / 65 680	
GA CR	A generalized approach to stochastic dominance: theory and financial applications		1 657 / 65 365	1 657 / 65 365	1 657 / 65 365	
GA CR	Interaction between Financial Markets and Real Sector: Modeling, Experiments, and Policy				1 998 / 78 817	1 499 / 59 132
GA CR	Evolutionary economic dynamics with finite populations: Modeling and applications					1 491 / 58 817
GA CR	Market based measures of systemic risk using synthetic CDOs					1 346 / 53 097
GA CR	Income distribution in the society: econometric models and dominance criteria for intersecting Lorenz curves	896 / 35 345				
GA CR	Modeling credit risk and system risk in the non-life insurance sector		1 508 / 59 487	1 495 / 58 974	1 495 / 58 974	
Technology Agency of the Czech Republic (TA CR)	New Challenges in the Social Services Market for Seniors in the Moravian-Silesian Region, (2020-2022)		2 027 / 79 961			
TA CR	Economy-user potential of distance forms of social-health care of neurological and mental diseases, (2021-2023)			3 243 / 127 929		
TA CR	Improving the quality of learning and strengthening students' motivation to learn by deploying a 3D virtual university campus based on virtual and augmented reality technologies			4 507 / 177 791		

	in the teaching process, (2021-2023)					
TA CR	Effective approaches to economical and adaptable systems of maintenance and operation of transport networks, (2017-2020)	3 745 / 147 732				
TA CR	Methodological - application tools for efficiency financial management of territorial structured statutory city, (2018-2020)	4 059 / 160 118				
Ministry of Education, Youth and Sports	Student grant projects	3 712 / 146 430	4 237 / 167 140	6 529 / 257 554	6 598 / 260 276	8 537 / 336 765
Total		25 520 / 1 006 707	18 842 / 743 275	24 448 / 964 417	13 413 / 529 112	12 873 / 507 811
In the role of another participant						
Provider ¹²³	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Czech Science Foundation (GA CR)	Summary of funds for five projects	411 / 16 213		228 / 8 994	1 799 / 70 966	2 483 / 97 949
Technology Agency of the Czech Republic (TA CR)	Research of information modelling in public space with a focus on infrastructure, (2022-2024), participation in project Faculty of Civil Engineering VSB-TUO				286 / 11 282	316 / 12 465
Ministry of Industry and Trade	Summary of funds for three projects		3 247 / 128 087	1 881 / 74 201		
The Polish National Agency for Academic Exchange (NAWA)	International Centre of Research Excellence in Transition of Coal Regions, (2022-2024)					165 / 6 509
European Institute of Innovation and Technology	SUA - Scale Up Academy, (2021-2023)			327 / 12 889	520 / 20 513	
Ministry of Education, Youth and Sports	Summary of funds for two projects		4 548 / 179 408	2 214 / 87 337	208 / 8 205	400 / 15 779
Total		411 / 16 213	7 795 / 307 495	4 650 / 183 431	2 813 / 110 966	3 364 / 132 702

Table 3.3.2 - Contract research activities

Client ¹²⁴	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
DAP Services a.s.	Comparison of physiological / neurophysiological and declarative responses in the			497 / 19 606		

¹²³ Ibid.

¹²⁴ If the client is from abroad, indicate in brackets the country of origin of the client.

	evaluation of verbal, pictorial and contextual stimuli					
DAP IT s.r.o.	The Use of Artificial Intelligence to Enhance the Predictive Capabilities of the CA Method					60 / 2 367
Statutární město Ostrava	The Strategic Plan for Sustainable Development of the Slezská Ostrava District for the period 2022-2029				250 / 9 862	
Ostravské vodárny a kanalizace, a.s.	Assessment of Service Quality for Ostravské vodárny a kanalizace, a.s.				220 / 8 679	
Climate-KIC Holding B.V.	Education as a source and an inhibitor of climate innovation and entrepreneurship in V4 countries	128 / 5 049				
Climate-KIC Holding B.V.	Transforming the Education System in V4 Countries	165 / 6 509				
Svaz průmyslu a dopravy ČR	EU technological sovereignty (analysis)			368 / 14 517		
Třinecké železářny	Processing and analysis of employee satisfaction questionnaire survey				82 / 3 235	
Jihomoravský kraj	Estimation of the determination of a reasonable amount of rent for the lease of the airport Brno - Tuřany	200 / 7 890				
KOKAM, s.r.o.	Valuation of the business establishment Lom KOKAM	149 / 5 878				
EURO Nářadí; LEVIOR s.r.o.; STAVBA	Valuation of assets of the company	425 / 16 765	4 / 158			
Diamo, státní podnik	Valuation of equipment for homogenization of tailings of the Ostrava Heřmanice heap I., Valuation of assets "Valuation of the heap sorting line in Ostrava Heřmanice II." special value	280 / 11 045				
Ostravská těžební	Valuation of equipment for homogenization of tailings of the Ostrava Heřmanice heap	80 / 3 156				
Dopravní podnik Ostrava	Valuation of the business establishment EKOVA ELECTRIC a.s.	150 / 5 917				
Stavby Kapitán	Valuation of construction-technological work and existing specifics		110 / 4 339			
PAPERA s.r.o.; SMERO, spol. s r.o.; Business Paper s.r.o.; Office system s.r.o.; Praktik Papír s.r.o.	Determination of the market value of the company - commercial plant			450 / 17 751		150 / 5 917

Severočeské doly a DIAMO	Determining the market value of the mining infrastructure of the Cínovec Mine				1 675 / 66 075	
ČEPS	Determination of the price of reproduction and time transformers selected from the property of ČEPS a.s. on the territory of the Czech Republic				100 / 3 945	
Wotan Forest	Calculation of damages caused by non-delivery of the work" Greening of the energy source Wotan Forest, a.s., Solnice site"				255 / 10 059	
Magistrát města Brna	Appraisal of immovable property in the district of Lesná, city of Brno					190 / 7 495
Total		1 577 / 62 209	114 / 4 497	1 315 / 51 874	2 582 / 101 855	400 / 15 779

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the period of 2019–2023, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts¹²⁵, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

In line with its mission, the Faculty of Economics focuses on projects with a positive impact on society, such as those funded by the Technology Agency of the Czech Republic (TACR). We highlight several research results that contribute to wider benefits for society, including greater equality, support for vulnerable groups, better access to healthcare, improved logistics and municipal waste management.

1. Methodologies of Distance Modules of Cognitive Rehabilitation and Creative Therapy

Methodologies of distance modules of cognitive rehabilitation and creative therapy are the result of the project TL05000160 Economic-user potential of distance forms of social-health care of neurological and mental diseases. The first part, referred to as Methodology A, includes a description of the process of cognitive rehabilitation, which includes memory training and creative therapy. The second part, referred to as Methodology B, contains a description of the process and outcomes of a pilot project of a distance form of cognitive rehabilitation. It includes a description of the technical solution and the results of the analysis of the feedback of the clients of the application guarantor (Memory Training Centre) who participated in the

¹²⁵ See Terms definition.

pilot project of the distance form of cognitive rehabilitation using the LMS and the Happy neuron program. Both parts include substantive recommendations directed to cognitive rehabilitation providers, in particular to the application guarantor. This result provided feedback to the application guarantor and enabled an improvement in the efficiency of the services provided, contributing to greater equity in access to healthcare. The gender dimension related to this outcome was adequately considered during the pilot testing of the methodologies. It was demonstrated that the majority of the clients of the application guarantor are women (64 %). This fact highlights the need to consider the specific needs of women when planning and developing remote care, especially in terms of technology and availability of services, as women are more likely to be carers within families.

2. Research Report on the Development and Perspectives of the Market of Social Services for the Elderly in the Moravian-Silesian Region

The summary research report (the result of the project TJ04000315) focuses on the market of social services for seniors in the Moravian-Silesian Region for the period 2011-2020. Attention is paid to the analysis of the scope and development of the offer of social services for seniors in the region, as well as to the analysis of factors that have a (direct) influence on the demand for social services, and to the analysis focused on employment in social services. The supply of services differs across districts with remaining gaps. Social services were mainly available in the districts of Ostrava-město, Karviná and Frýdek-Místek. Furthermore, 14 factors were identified that drive the intensity of demand for services for the elderly. The analysis of the individual factors showed an increasing age index, life expectancy and average age. The larger increases for women suggest that there are gender differences in impacts. In the area of employment, differences were found in the characteristics evaluated between individual occupations as well as between identical occupations in different areas (wages and salaries). This output brings valuable insights related to vulnerable social group. The results have been utilized by the application guarantor Slezská diakonie, a non-governmental non-profit organization that provides its services in the social field. In this project, the gender dimension was considered within the employee satisfaction survey. The results are relevant for all social facilities for the elderly in the Moravian-Silesian Region, as well as for the management of the Moravian-Silesian Region, and may lead to improvements in the services provided to the elderly placed in these facilities.

3. Processing of Inhomogeneous Input Data Using GIS

The methodology developed under the project TH02010930 is devoted to a comprehensive design of processing inhomogeneous input data using GIS in the field of maintenance and operation of transport networks. The methodology is designed for use in decision-making areas focused on the operation and maintenance of transport networks where different types of distance matrices corresponding to the road network are required. The input data processed according to the methodology are usable in a wide range of computational tools and are generally applicable to different types of problems (routing, traffic, location-location problems, matching problems, etc.). The primary addressee of the methodology is mainly design and logistics entities and research organisations. All the partial steps leading to the methodology itself were continuously tested, consulted and verified throughout the project by cooperating entities from practice, the most important of which were Nehlsen Třinec, s.r.o., Technical Services of Olomouc, a.s. and SLUŽBY MĚSTA JIHLAVY, s.r.o.

4. Municipal Waste Collection in the Třinec Area

The set of specialized maps contains graphical and descriptive processing of the method of service of selected areas in the Třinec area in the mode of strategic management. The set of specialized maps with professional content was created in the framework of fulfilling two main objectives defined in the framework of the project TH02010930. The primary objective of the creation of the set of specialised maps was to verify the presented methodology, while the secondary objective was to develop a comprehensive method of designing the routes of service vehicles providing municipal waste collection in the Třinec area within the strategic management process.

The technical text for the set of specialised maps describes in detail the complex design of the routes of the service vehicles for municipal waste collection. The proposal was prepared for selected municipalities served by Nehlsen Třinec, s.r.o. Specifically, it concerns the municipalities of Písek, Písecna, Dolní Lomná, Hřčava and Hrádek. These municipalities are located in the Moravian-Silesian Region and are part of the Jablunkov Municipality with Extended Jurisdiction (ORP).

The Faculty of Economics is active in contractual research, the following three examples document a wider range of contributions to municipal development, the quality of feedback from questionnaires and EU policies.

5. The Strategic Plan for Sustainable Development of the Slezská Ostrava District for the Period 2022-2029

At the request of the management of the Slezská Ostrava Municipal District, a strategic plan was developed and presented as a tool for strategic management in the coming years. The document outlines long-term visions and priorities in key areas such as economic development, improvement of public spaces, strengthening of social cohesion and effective governance. It includes methods, analyses and results intended for use in policy-making and public administration in the Slezská Ostrava Municipal District.

Key expected outcomes include brownfield revitalisation, sustainable development projects and strategies for economic diversification and transport infrastructure improvement. The document also focuses on social cohesion and effective governance, including measures for citizen participation and transparent management. Indirect impacts can be observed in the strengthening of community ties, support for education and the promotion of innovative solutions within the public sector.

6. Comparison of Physiological / Neurophysiological and Declarative Responses in the Evaluation of Verbal, Pictorial and Contextual Stimuli

This research employs CA method (Colour Association Method) combining projective technique based on the principles of the Lüscher colour test and word associations. It uses calibrated sets of words or visual objects (i.e. stimuli) and a palette of eight colours. Stimuli provoke an immediate association with which the person is instructed to react via colours. As associations cannot be disrupted or influenced rationally, the CA method focuses on measuring and evaluating 'authentic uncensored associations' and provides a different quality of information compared to the commonly used questionnaire. This study examines, how well the CA method and the questionnaire can capture the responses of humans, approximated by their physiological reactions, to different stimuli. First, physiological responses to stimuli (cerebral blood flow, electrical activity of the brain, variability of heart rate, and response to skin con-

ductance) were measured at the Multimodal and Functional Imaging Laboratory (MAFIL), Czech Republic; subsequently, the perception of stimuli was measured using the CA method and questionnaire. These data enable to evaluate the ability of the questionnaire and the CA method to capture an individual's responses to stimuli, including their emotional charge, which is a condition for the unbiased measurement of many important psychological concepts (i.e. health-related quality of life, satisfaction with different types of public and private services, attitudes etc.) The investigation focused on five related topics: relationship between the CA method and the questionnaire; relationship between the CA method/questionnaire categories, heart rate and skin conductance; relationship between the CA method/questionnaire categories and brain activation measured by fMRI; reliability of measurement in time, especially with focus on questionnaire and CA method; the validity of questionnaire and CA method measurement. This project resulted in article published in *Ceska a slovenska neurologie a neurochirurgie* (Czech and Slovak Neurology and Neurosurgery) documenting its interdisciplinarity.

7. EU Technological Sovereignty (analysis)

This analytical study examines and analyses the background and specific aspects of EU technological sovereignty in six thematically separate chapters. The process of addressing the thematic focus of the individual chapters consists of (i) mapping the theoretical and methodological background of the sub-issues under investigation, (ii) qualitative and quantitative analysis of relevant primary and/or secondary data base, and (iii) evaluation and interpretation of the results within the framework of the topic or aspect of EU technological sovereignty under investigation. This project demonstrates the ability to work in larger consortia involving policy makers, including the Confederation of Industry of the Czech Republic, the leading business lobbying organisation providing a voice for employers at national and international level.

During the period under evaluation, Ústav oceňování majetku (the Appraisal Institute) at the Faculty of Economics provided regular valuation services financed by non-public funds. The following examples highlight three projects that contributed to sustainable development and greening initiatives.

8. Calculation of Damages Caused by Non-delivery of the Work" Greening of the Energy Source Wotan Forest, a.s., Solnice Site"

The goal of the contract was to quantify the costs of operating a boiler room with permanent service versus operating a boiler room with occasional supervision according to the work contract concluded between the company Wotan Forest, a.s. and DATATHERM spol. s.r.o. of 13/03/2017 by individual months for the period from 11/09/2018 to 29/07/2021, calculation of the costs of consumed biomass compared to biomass consumption in the new boiler room by individual months for the period from 11/09/2018 to 29/7/2021 and calculation of the costs of woodchip handling from the reservoir in the new boiler room to the old boiler room, where it was burned, by individual months from 11/09/2018 to 29/07/2022. This project contributed to the greening of the heating systems in the mentioned companies.

9. Valuation of Equipment for Homogenization of Tailings of the Ostrava Heřmanice Heap I.

10. Valuation of Assets "Valuation of the Heap Sorting Line in Ostrava Heřmanice II." Special Value

In the two phases (9 and 10) of the contract research, the company, including the real estate and equipment, is valued, which contains mostly atypical elements, therefore a special valuation methodology is chosen and applied. The usual price is determined based on turnover, comparable price and time price. Marketability is influenced by the relationship between supply and demand at the time of the valuation and the current market conditions. It is also influenced by technical and moral wear and tear. These two contracts have a significant environmental dimension, as the Heřmanice slag-heap dump is the largest dump complex in the Ostrava region and one of its biggest environmental burdens in the Czech Republic.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ¹²⁶	Year of application	Name
Methodology	2023	Methodologies of distance modules of cognitive rehabilitation and creative therapy
Research report	2022	Research report on the development and perspectives of the market of social services for the elderly in the Moravian-Silesian Region
Certified methodology	2021	Processing of inhomogeneous input data using GIS
Specialised map	2020	Municipal Waste Collection in the Třinec Area
Expert outputs for policymaking	2022	The Strategic Plan for Sustainable Development of the Slezská Ostrava District for the period 2022-2029
Article – study protocol	2021	Comparison of physiological / neurophysiological and declarative responses in the evaluation of verbal, pictorial and contextual stimuli
Expert analysis for policymaking	2021	EU technological sovereignty
Expert activities	2022	Calculation of damages caused by non-delivery of the work "Greening of the energy source Wotan Forest, a.s., Solnice site"
Expert activities	2019	Valuation of assets "Valuation of the heap sorting line in Ostrava Heřmanice II." special value
Expert activities	2019	Valuation of equipment for homogenization of tailings of the Ostrava Heřmanice heap I.

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

¹²⁶ Specify the specific type of result. Add rows as needed.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)¹²⁷, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).¹²⁸

Additionally, the evaluated unit shall briefly comment on the funds received during the period of 2019–2023 from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

At the Faculty of Economics, the results of research are transferred to practice through several channels. Firstly, several of our researchers cooperate closely with the Czech National Bank, both within the framework of Czech Science Foundation projects and in the form of individual publications. The research results are then published not only in journals but also in the Czech National Bank's working paper series, which enables close discussion with policy makers and dissemination of the results to practice. Secondly, Ústav oceňování majetku (Appraisal Institute) regularly cooperates with the Regional Court in Ostrava, Brno, Prague, Olomouc, the Police of the Czech Republic, state-owned companies (e.g. DIAMO) and a number of commercial companies. Such reports have been used in court practice, for example, to determine the market value of rent, the amount of customary rent, and the market value of company shares, etc. Thirdly and most importantly, the faculty cooperates closely with practice in the context of the TACR project (Technology Agency of the Czech Republic), where the results are transferred to practice hand in hand with the application guarantors. Best practice examples include implementation of results of the following three projects:

1. Project TL01000145 solved in cooperation with the local government of the Statutory City of Ostrava, which has two levels of administration: the municipality and 24 city districts. The results monitor the objectivity of the distribution of resources within the Statutory City among the districts (use for public administration) and the Rpoint database provides a general comparative basis for the management of the districts with the possibility of public use.
2. Project TL05000160 providing a structured approach described in developed methodology. It led to the implementation of remote modules, including technical requirements, development of environments (e.g. using the Moodle LMS), gathering feedback and pilot testing with different client groups. It also outlines steps for tailoring programmes to the individual needs of each user. The methodology is being actively applied in the practice by the application guarantor, with a commitment to full implementation by 2026 in line with

¹²⁷ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

¹²⁸ If the commercialisation of R&D&I results is carried out in this way.

the implementation plan. In general, remote care has the potential to promote greater inclusion of people with reduced mobility, including those facing geographical or social barriers. They help to reduce the stigma associated with neurological and mental disorders, particularly through more anonymous and less invasive forms of support. These methods contribute significantly to the reintegration of older people and people with cognitive impairments into active life.

3. The certified methodology developed within the project TH02010930 for processing inhomogeneous input data using GIS is designed for use in decision-making areas focused on the operation and maintenance of transport networks, where different types of distance matrices corresponding to the road network are required. The input data processed according to the methodology can be used in a wide range of computational tools and are generally applicable to different types of tasks (routing, transport, location-allocation tasks, assignment problems, etc.). The primary recipients of the methodology are design and logistics companies and research organisations. The main contribution of the result is a practical verification of the feasibility of the procedures proposed in the presented methodology for processing inhomogeneous input data using GIS. The set of specialized maps is used by Nehlsen Třinec, s.r.o. for strategic proposals and planning in the field of municipal waste collection.

Acquiring new collaborations with companies and institutions takes place, e.g. through annual networking meetings with company representatives at the Faculty of Economics, through personal contacts of employees, through students and graduates of the faculty, including MBA students.

The Faculty of Economics received 16.6 thousand euros from non-public sources in the period 2019-2023 coming from donations. These resources were used to organize workshops for finding and solving applied research problems and to promote research results.

The Faculty of Economics is not involved in the support of spin-off firms or other forms of commercialisation of R&D&I. The Faculty of Economics is generally involved in analysis and the development of methodologies and therefore system and support of technology transfer and intellectual property protection is generally not applicable to the faculty.

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
Donations - SATUM CZECH, s. r. o.	50/ 1 972	50/ 1 972	50/ 1 972	50/ 1 972	50/ 1 972
Donations - Textoris, s. r. o.					20/ 789
Donations - Kofola Československo, a. s.	50/ 1 972	50/ 1 972			
Donations - Komerční banka, a. s.	50/ 1 972				
Total	150/ 5 917	100/ 3 944	50/ 1 972	50/ 1 972	70/ 2 761

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF R&D&I

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the period of 2019–2023 and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

The Department of External Relations at the Faculty of Economics is involved in activities designed to popularise science and research among selected target groups and the public. Popularisation towards the public is carried out through the Junior University, Art&Science Festival and Researchers' Night events. Members of the faculty present their lectures according to the general theme of the Researchers' Night, which varies from year to year.

The Faculty of Economics hosted 22 international conferences in the period 2019–2023 (e.g. Strategic Management and its Support by Information Systems; Financial Management of Firms and Financial Institutions; Managing and Modelling of Financial Risks; Public Economics and Administration; International Conference on European Integration). In addition to academics, all these conferences are also intended for the professional public, who can thus become familiar with the latest findings in the given research areas.

The Faculty of Economics enables researchers to present their current research at the Research Café, which provides an informal opportunity for researchers from the Czech Republic and abroad to present their research to colleagues and interested members of the public and receive valuable feedback in a relaxed atmosphere. This activity helps to improve the quality of research at the home institution, strengthens cooperation between universities and enables professional discussion. In the period 2019–2023, 29 presentations were given under the Research Café.

The professional lectures held at the Faculty of Economics are also a very important part of the popularization as they are open to students, academics and the public. In the years 2019-2023, 46 professional lectures were held including:

- Petr Gajdušek, JUDr., LL.M., M.St. "Employment Opportunities in International Organisations for Czech Citizens", Director of the United Nations Department, Ministry of Foreign Affairs of the Czech Republic, 2019.
- Natalie Cuglesan, "Romania and the Bumpy Road to EU Accession. How has Romania Performed During the First Ten Years of EU Membership?", Babeş-Bolyai University, Cluj-Napoca, Romania, 2019.
- Petr Pavel, Arm. gen. V.v. Ing., M.A. "NATO and Security Threats", 2021.
- Daniel Münich, assoc. prof. "The Windows of the Universe of Scientific Journals Open", Center for Economic Research and Graduate Education – Economics Institute, 2022.
- Petr Fiala, prof. PhD, Ph.D., LL.M, Dr. H.C., "The Impact of Russian Aggression in Ukraine on the Czech Republic", Prime Minister of the Czech Republic, 2023.
- Aleš Michl, Ing. Ph.D., "Debate with the Governor of the Czech National Bank", Czech National Bank, 2023.
- Luboš Komárek, prof. Ing. et Ing., M.SC., MBA, Ph.D., "Central Bank Aggressiveness: Facelift for the 21st Century", Czech National Bank, 2023.

Teachers of the Faculty of Economics also present their publication results and ongoing research at foreign universities and institutions, for instance:

- Kateřina Krzikallová, Dr. "Corporate Income Taxation and Tax Evasion", University of Akureyri, Iceland.
- Zuzana Kučerová, prof. "Herding Behaviour and Information Asymmetries in Crowdfunding", Brunel University London, UK.
- Martin Melecký, prof. "Hidden Debt? Solution to Avert the Next Financial Crisis in South Asia", World Bank.
- Alexander Bělohlávek, prof. "Course on International Arbitration", University of the Bahamas in Nassau.
- František Zapletal, assoc. prof. "Cognitive Biases – Gremlins for our Decisions", The Kyoto College of Graduate studies for Informatics, Japan.

The cooperation with secondary schools, especially those with an economic focus, is also a valuable way to communicate professional and research topics with the public. Since 2019, three competitions have been held regularly: (i) the Financial Literacy Day, (ii) DUEL focused on taxes, accounting, business economics, and legislation, (iii) Entrepreneurial Creative focused on business plan development with an emphasis on circular economy and product sustainability. In addition, the Department of Economics is organising the EconoVision competition from 2023 onwards. These competitions promote contacts with future potential applicants to study at the Faculty of Economics and promote cooperation with secondary schools.

An important aspect of popularisation is the appearance of the Faculty of Economics members in national media programmes on Czech Television, such as Milan Šimek "Employment in the regions", Kateřina Kashi "The secret of successful communication", Jan Libich "Without money. Whom should the state help? " – a discussion with the Minister of Finance and First Vice-Chairman of the ODS, Zbyněk Stanjura, and the Vice-Chairman of the SPD, Radim Fiala. The Dean of the faculty also spoke on Czech Radio Ostrava about the opening of the new Faculty of Economics building with its modern facilities including multimedia room and behavioral lab that are being equipped. Faculty and university websites and popular social media (Facebook, Instagram, LinkedIn) are another standard communication channel for promoting the faculty's research activities.

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

The progress made by the Faculty of Economics in relation to the recommendations of the previous evaluation is discussed below. In general, the faculty has improved in several areas, although some limitations remain.

The Faculty of Economics has been actively working on the expansion of its research networks to improve the internationalisation of its research and to gain sources from other than national programmes, e.g. by joining the U!REKA European University Alliance, participating in Erasmus+

and COST projects. Researchers have been actively preparing international research projects. It materialised in 2023 when the Faculty of Economics, together with Akademia Leona Koźmińskiego from Poland, received the first international grant within the OPUS24/lead agency programme of the Czech Science Foundation entitled: State Capitalism Returns: The Impact of Government Ownership on Markets, Indebtedness, and the Environment, which started in 2024. In the projects, the Faculty of Economics has promoted cooperation especially with Italian and Australian universities. Moreover, the Faculty of Economics contributes to the solution of the REFRESH project, especially in terms of analysing the socio-economic impact of the transformation on the Moravian-Silesian region. As part of the REFRESH project, foreign researchers have been hired to promote the research of the faculty. This project should also lead to increased cooperation with practice.

The Faculty of Economics has actively searched for opportunities to increase its income from contractual research and other non-public sources besides grants. The faculty has more than doubled its non-public sources, as it received EUR 16.6 thousand in the period 2019–2023, compared to EUR 7.92 thousand in the period 2016–2018.

Contractual research of the Faculty of Economics almost tripled reaching EUR 236.2 thousand in the period 2019–2023, compared to EUR 80,99 thousand in the period 2016–2018.

The Faculty of Economics continued to develop cooperation with local and central decision makers, including the Czech National Bank, the Confederation of Industry of the Czech Republic; local government, including the Statutory City of Ostrava and the Slezská Ostrava District.

As part of the university project REFRESH, research focused on the Moravian-Silesian region, researchers closely cooperate with the Moravian-Silesian Innovation Centre and with the University of Ostrava within the Social Lab, among others. This project also promotes interdisciplinary research within the university, as researchers from the Faculty of Economics have also joined the other Living Labs, for example the Energy Lab to analyse socio-economic impact of implementation of new scientific knowledge. In addition, researchers from the Faculty of Economics joined the Czech Aerospace Research Institute (CAERPIN) to collaborate in space research and educational activities. The effects from this activity are expected to materialise during the next evaluation period in terms of participation in interdisciplinary research projects, publications, and potentially even commercialization of results. Furthermore, the Faculty of Economics regularly contributes with its expertise to the regular surveys and evaluations of graduates' employability in the labour market, in cooperation with the company TREXIMA.

In terms of awards, the research was highly recognised by the Czech National Bank, as four papers received the Award for the Best CNB Research Paper. The faculty also made significant progress in the participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period. Several researchers are members of editorial boards of highly ranked journals.

The Faculty of Economics has increased its communication through its official website and social media, including Facebook, Instagram and LinkedIn. Members of the faculty have repeatedly appeared in national media programmes on Czech Television. The Dean of the faculty promoted the new Faculty of Economics building with its modern facilities, including those for research, on Czech Radio Ostrava.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
Award for the best CNB research paper	3.2	https://www.cnb.cz/en/economic-research/awards/index.html
Research projects Faculty of Economics supported by public funds during the evaluation period	3.3	https://starfos.tacr.cz/en/projekty?query=6q2aaadnma7q
Research Café	3.6	https://www.ekf.vsb.cz/researchcafe/cs
Further Supporting Documents	3.3; 3.4	https://www.ekf.vsb.cz/en/research/supporting-materials

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Faculty of Electrical Engineering and Computer Science (FEECS)

FORD: 2 - Engineering and technology

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.¹²⁹ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

The **Faculty of Electrical Engineering and Computer Science (FEECS) of VSB – Technical University of Ostrava (VSB-TUO)** has long been one of the most productive units of the university in the domain of education, research, development and innovation. Driven by its cutting-edge research, innovative technologies and well-developed cooperation with industrial partners, the faculty serves as a recognized center of excellence not only within the Czech Republic, but also on an international scale.

Mission and Vision of the Faculty

The primary mission of the faculty is to develop **advanced technologies, educate future professionals, and contribute directly to society through technological transfer and research innovation**. The faculty focuses on **computer science, cybernetics, biomedical engineering, electrical power engineering, telecommunications, electrical engineering and electronics, applied mathematics, and applied physics**, as well as emerging fields such as **artificial intelligence, autonomous mobility, the digital industry, and quantum computing**. As a result, FEECS plays a vital role in both academia and applied research activities, driving innovation in both industry and public sectors. The faculty has also made a long-term and significant impact on the restructuring and modernization of the region's industrial profile.

Long-Term Research Goals and Focus Areas

FEEC's vision is to establish itself as a globally renowned research and education center that bridges theoretical knowledge with practical applications. Its strategic research directions focus on following:

- **3D printing for electrochemical devices,**
- **Advanced Digital Signal Processing,**
- **Artificial intelligence and machine learning,**

¹²⁹ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

- Biomedical engineering and personalized medicine,
- Connected, cooperative and autonomous mobility and intelligent transportation systems,
- Cybersecurity and critical infrastructure protection,
- Flexible wearable electronics,
- Green technologies and sustainable energy,
- Industrial robotics and collaborative robots,
- Internet of Things (IoT),
- Nanorobotics and advanced materials,
- Quantum computing and quantum security,
- Space research and space technologies.

The faculty invests heavily in **leading research teams and state-of-the-art infrastructure**, to enable fundamental research and its application in industrial and healthcare sectors.

International Collaboration

FEECS maintains long-term collaborations with leading universities and research institutions worldwide. Its most significant partners are as follows:

- [Austrian Institute of Technology](#),
- [Delft Technical University](#),
- [ETH Zurich – Microrobotics](#),
- [Fraunhofer-Gesellschaft](#),
- [Graz University of Technology](#),
- [Medical University of Vienna](#),
- [Nanyang Technological University](#),
- [Princeton University](#),
- [Ton Duc Thang University](#),
- [Torrens University Australia](#),
- [Université de Toulouse](#),
- [Université Grenoble Alpes](#),
- [University of Alberta](#),
- [University of Aveiro](#),
- [University of California](#),
- [University of Cambridge](#),
- [University of Minnesota Duluth](#),
- [University of Texas at Arlington](#).

In recent years, the faculty has successfully **attracted top researchers from prestigious international universities**. Key additions to the faculty include the following:

- [Prof. Seyedal Mirjalili](#) from **Torrens University Australia**, one of the most cited researchers in artificial intelligence and optimization,
- [Prof. Carlos A F Marques](#) from **University of Aveiro**, an expert in optical sensors,
- [Prof. Martin Pumera](#), the most cited Czech scientist, who is responsible for FEEC's **nanorobotics** research.

The faculty's strategy focuses on **leveraging the knowledge of these scientists to strengthen research teams and increase international competitiveness**.

Industrial Research and Innovation

FEECS actively collaborates with key industrial partners in joint research projects to develop **practical applications in smart technologies, automation, electrical power engineering**. The faculty's **major industrial partners** include:

- [ABB](#),
- [Brose CZ spol. s r.o.](#),
- [CEPS](#),
- [CEZ](#),
- [FORVIA HELLA](#),
- [Fraunhofer Gesellschaft](#),
- [FUTTEC a.s.](#),
- [Korea Automotive Technology Institute](#),
- [ON SEMICONDUCTOR CZECH REPUBLIC](#),
- [Schaeffler CZ s.r.o.](#),
- [Siemens](#),
- [Skoda Auto](#),
- [Tatra Trucks a.s.](#),
- [Thermo Fisher Scientific](#),
- [T-Mobile Czech Republic](#),
- [TRL SPACE](#),
- [Unicorn](#),
- [Valeo](#),
- [Vitesco Technologies](#),
- [Vítkovice Cylinders a.s.](#),
- [Volkswagen AG](#),
- and many others, **together 142 active contacts** - companies from applied sphere and scientific institutions. **All registered in the [CRM system](#).**

Through these partnerships, FEECS contributes to the **development of new technological solutions in autonomous mobility, [Industry 4.0](#), and smart energy systems**.

Technology Transfer and Spin-Off Activities

The faculty is actively engaged in **commercializing its research outputs**, leading to the creation of [Autinno s.r.o.](#), a spin-off company developed in collaboration with Valeo and Škoda Auto. This company specializes in **Drive-by-Wire** technologies for **autonomous vehicle control**, bringing research innovations to industrial applications.

Research Laboratories and Infrastructure

FEECS boasts state-of-the-art laboratories supporting advanced research, including following:

- [Smart Factory](#), a testbed and a cutting-edge research and education center for automation and Industry 4.0,
- **Signal Lab**, a comprehensive infrastructure for research, development, measuring and analysis of biological and technical signals,
- **Mobility Lab**, equipped with systems for research, development and testing of autonomous vehicles systems,
- **AIM Lab**, an AI development hub that leverages [HPC technologies](#) in collaboration with

national supercomputing centre [IT4Innovations](#),

- [Health Lab](#), an laboratory that correspond to the concept of living laboratories, allowing research and development activities in like-real-world environments (look like standard residential space).

Student Engagement and Academic Activities

FEECS actively encourages **student involvement in research activities from the undergraduate level**, offering opportunities for participation in **international projects and research internships**. The faculty hosts the **FEI Journal Club**, which fosters scientific discussion and collaboration among students and researchers.

In the **academic year 2023/2024**, FEECS enrolled **2723 students** (as of 31.10.2023), marking a **significant increase** compared to the academic year 2019/2020, when FEECS enrolled 2262 students (as of 31.10.2019). The faculty has long been among the **leading technical faculties in the Czech Republic** in terms of both research outputs and student numbers.

New Areas of Research Development

The faculty is expanding its focus on **emerging and disruptive technologies**, including following:

- **Nanorobotics**, bridging **nanotechnology and robotics** to revolutionize **healthcare, environmental sustainability, and industry**,
- **Flexible wearable electronics**, enabling seamless integration into daily life for **healthcare, sports, and communication** applications,
- **3D printing for electrochemical devices**, offering **customized solutions for energy storage and production**,
- **Advanced materials for energy storage and conversion**, driving innovation in **batteries, supercapacitors, and fuel cells**.

Expansion of the Faculty's Research Workforce

The faculty has significantly increased the **number of international researchers**, a trend it plans to maintain in the coming years. This **strategic expansion** aims to establish FEECS as a **leading research institution in Europe**. The faculty now employs:

- [Dr. Abdullah Raza Lakhan](#),
- [Prof. Arnaldo Leal-Junior](#),
- [Prof. Carlos A F Marques](#),
- [Prof. Martin Pumera](#),
- [Prof. Mazin Abed Mohammed](#),
- [Prof. Muhammet Deveci](#),
- [Prof. Seyedali Mirjalili](#).

This **diversification of research talent** promotes knowledge transfer, innovation, and **publication of research in top-tier international journals**.

Conclusion

FEECS at VSB-TUO is a **rapidly growing and internationally recognized faculty** that **combines top-level research, industrial partnerships, and student education**. The faculty continuously invests in **state-of-the-art technologies, research infrastructure, and global collaborations**, positioning itself among the **top research and innovation hubs in Europe**.

Use link for more updates and news about the faculty.

Table 3.1.1 - Staffing per FTE¹³⁰

Academic/ Professional position	Total / Of which women					
	2019	2020	2021	2022	2023	Total
Professor	16,7/1,5	17,7/2,0	19,6/2,0	23,9/2,0	25,1/2,0	25/2
Associate Professor	43,3/1,0	43,6/1,0	43,5/1,0	40,3/1,0	35,2/1,0	43/1
Assistant Professor	85,0/14,9	89,6/15,7	88,6/16,4	88,5/16,7	85,4/14,4	89/16
Assistant	7,0/1,0	6,4/1,1	4,9/0,5	2,8/0,0	7,0/1,0	7/1
R&D Personnel ¹³¹	9,7/0,7	7,5/1,2	11,8/1,2	11,8/1,6	9,7/0,7	11/1
Researchers in other categories ¹³²	40,2/5,5	40,2/6,7	40,2/5,5	2,8/0,0	40,2/5,5	40/5
Technical and economic staff ¹³³	43,7/31,6	42,5/31,6	43,7/31,6	41,2/31,2	43,7/31,6	43/31
Scientific, research and development staff involved in teaching activities	153,45/19,38	158,84/20,79	158,11/20,91	155,45/19,71	148,28/18,45	158/20
Early career researchers ¹³⁴	19,27/1,3	20,26/2	23,38/2,57	20,9/2,5	26,65/4,39	26/4
Total¹³⁵	249,3/57,1	250,6/60,2	249,3/57,1	262,0/60,6	249,3/57,1	262/60

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

¹³⁰ The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

¹³¹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹³² The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹³³ Who participates in the management and support of R&D&I in the institution.

¹³⁴ See Definition of Terms in Methodology HEI2025+.

¹³⁵ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 (numbers of physical employees and personnel)¹³⁶

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor					4		3	1	11		3	1
Associate Professor			7		19		8		11	1		
Assistant Professor			35	4	39	7	12	3	6	2		
Assistant			3		2	1	2	1	1			
R&D Personnel ¹³⁷	2											
Researchers in other categories ¹³⁸	45	9	20	4	8				1		5	
Technical and economic staff ¹³⁹			9	8	15	13	11	7	4	1	1	
Scientific, research and development staff involved in teaching activities	3	2	45	4	64		25	5	29	3	3	1
Early career researcher ¹⁴⁰	2	1	20	1	2							
Total¹⁴¹	47	9	74	16	87	21	36	12	34	4	9	1

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

¹³⁶ The total number of employees/workers as of 31st December of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

¹³⁷ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹³⁸ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹³⁹ Who participates in the management and support of R&D&I in the institution.

¹⁴⁰ See Definition of Terms in Methodology HEI2025+.

¹⁴¹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2023 (numbers of physical employees and personnel)¹⁴²

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor			2		6		10	1	7		4	1
Associate Professor			2		17		7		8	1	1	
Assistant Professor	4		29	3	40	6	13	6	5	1	1	
Assistant	1		1									
R&D Personnel ¹⁴³												
Researchers in other categories ¹⁴⁴	30	4	38	6	9	1	4				1	
Technical and economic staff ¹⁴⁵			5	5	16	14	13	10	8	3		
Scientific, research and development staff involved in teaching activities	5		36	5	63	6	30	7	20	2	6	1
Early career researcher ¹⁴⁶	1		25	4	2		1					
Total ¹⁴⁷	35	4	75	14	88	21	47	17	28	5	7	1

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	1446	127	1530	144	1617	172	1640	177	1909	206	8142	826
Master's ¹⁴⁸	578	81	606	69	618	78	597	82	614	79	3013	389
Doctoral	238	33	238	38	229	38	215	37	200	30	1120	176

¹⁴² The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

¹⁴³ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁴⁴ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁴⁵ Who participates in the management and support of R&D&I in the institution.

¹⁴⁶ See Definition of Terms in Methodology HEI2025+.

¹⁴⁷ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

¹⁴⁸ All master's degree students are listed, regardless of the length of their programme of study.

Lifelong Learning Courses	59	15	66	19	101	41	128	42	105	40	459	157
Total	2321	256	2440	270	2565	329	2580	338	2828	355	12734	1548

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ¹⁴⁹ / Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate	15/13		18/16		19/17		16/15		16/15		20/18	
Master's	12/10		13/10		15/12		15/12		15/12		16/13	
Doctoral	10/10		11/11		11/11		12/12		12/12		12/12	
Lifelong Learning courses	5/0		6/0		11/0		7/0		11/0		13/0	
Total	42/33		48/37		56/40		50/39		54/39		61/43	

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	5	Balanced basic and applied research	48
	1.2 Computer and information sciences	36	Balanced basic and applied research	
	1.3 Physical sciences	7	Basic Research	
	1.4 Chemical sciences			
	1.5 Earth and related environmental sciences			
	1.6 Biological sciences			
	1.7 Other natural sciences			
2. Engineering and Technology	2.1 Civil engineering			52
	2.2 Electrical engineering, Electronic engineering, Information engineering	38	Balanced basic and applied research	
	2.3 Mechanical engineering	2	Balanced basic and applied research	
	2.4 Chemical engineering			
	2.5 Materials engineering	4	Basic Research	
	2.6 Medical engineering	4	Balanced basic and applied	

¹⁴⁹ The total number of study programmes for which admissions have been announced in a given academic year.

			research	
	2.7 Environmental engineering	2	Basic Research	
	2.8 Environmental biotechnology			
	2.9 Industrial biotechnology			
	2.10 Nanotechnology	2	Basic Research	
	2.11 Other engineering and technologies			
3. Medical and Health Sciences	3.1 Basic medicine			
	3.2 Clinical medicine			
	3.3 Health sciences			
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries			
	4.2 Animal and Dairy science			
	4.3 Veterinary science			
	4.4 Other agricultural sciences			
5. Social Sciences	5.1 Psychology and cognitive sciences			
	5.2 Economics and Business			
	5.3 Education			
	5.4 Sociology			
	5.5 Law			
	5.6 Political science			
	5.7 Social and economic geography			
	5.8 Media and communications			
	5.9 Other social sciences			
6. Humanities and the Arts	6.1 History and Archaeology			
	6.2 Languages and Literature			
	6.3 Philosophy, Ethics and Religion			
	6.4 Arts (arts, history of arts, performing arts, music)			
	6.5 Other Humanities and the Arts			
Total		100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the period of 2019–2023 based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

The Faculty of Electrical Engineering and Computer Science (FEECS) has achieved significant international recognition in science and research, as evidenced by prestigious awards, editorial positions in high-impact journals, international lectures, and active participation in major research project evaluations.

International Recognition and Awards

The faculty's global standing is highlighted by the presence of six academic staff members (Zelinka, Voznak, Snasel, Hlubina, Martinek, and Nedoma) on Stanford University's World's TOP 2% Scientists list (2019-2023), placing them among the leading researchers worldwide. Prof. Radim Blaheta received the Bernard Bolzano Medal for achievements in mathematical sciences from the Czech Academy of Sciences and was also awarded the Commemorative Medal for Lifetime Achievements by the Czech Mathematical Society. The international recognition of Prof. Marie Duzi's contributions to her field is evidenced by the publication of "Logically Speaking: A Festschrift for Marie Duzi" (2022), featuring contributions from 24 colleagues across various disciplines. Prof. Radim Bris received Wiley's TOP-cited article recognition for 2021-2022, demonstrating the significant impact of research conducted at FEECS.

Editorial Positions in International Scientific Journals

FEECS faculty members hold influential editorial positions in numerous high-impact international journals. Prof. Radek Martinek serves as Associate Editor for Alexandria Engineering Journal (IF=6.2) and Guest Editor for Computers and Electrical Engineering (IF=4). Prof. Radim Bris contributes to Reliability Engineering & System Safety (IF=9.4), while Prof. Martin Pumera serves on the editorial boards of several prestigious journals, including ACS Nano (IF=15.5), Small (IF=13) and Materials Today (IF=21.1). These editorial positions allow our faculty to shape research directions in their respective fields and increase the faculty's international presence.

International Invited Lectures

Our faculty regularly delivers invited lectures at prestigious international venues. Prof. Ivan Zelinka presented a specialized tutorial on "Swarm Intelligence in Cybersecurity" at the Genetic and Evolutionary Computation Conference (GECCO 2020). Prof. Zdenek Dostal shared expertise on "Improving Efficiency of Scalable TFETI/BETI Contact Solvers for Huge Problems" at the 26th International Domain Decomposition Conference in Hong Kong. Prof. Radek Martinek has given invited lectures across three continents, including presentations at LUT University (Finland), Ton Duc Thang University (Vietnam), and the University of Aveiro (Portugal). Doc. Dalibor Lukas presented "Parallel boundary element methods in space and time accelerated on GPUs" at TU Wien's Computational Methods in Applied Mathematics event. These invitations reflect the international respect for our faculty's expertise.

Distinguished International Visitors

FEECS regularly hosts prominent international scholars, enhancing knowledge exchange and collaborative opportunities. Recent notable visitors include Prof. Seyedali Mirjalili (Torrens University Australia), discussing emerging optimization algorithms; Prof. Ulrich Rüde (FAU Erlangen/CERFACS), presenting parallel algorithms for solving finite element systems with ten trillion unknowns, Prof. Frank Coolen (Durham University, UK) lecturing on system reliability

quantification, and Dr. Pavol Szomolányi (Medical University of Vienna) detailing artificial intelligence applications in quantitative MRI data.

Participation in Research Evaluation

FEECS faculty members actively participate in the evaluation of national and European research projects, influencing research priorities and funding allocations. Prof. Radek Martinek serves on the P102 Panel (Electrical and Electronic Engineering) of the Czech Science Foundation. Prof. Martin Pumera has participated in evaluation of European Research Council Starting Grant applications. Prof. Ondrej Zivotsky has served on the international evaluation panel ST5 for the Polish National Science Centre (NCN) for three consecutive years (2021-2023). Prof. Pavel Kromer has evaluated projects for Horizon 2020, including HORIZON-WIDERA-2023-ACCESS-02 and HORIZON-MSCA-2023-PF-0. These evaluation roles demonstrate the trust placed in our faculty's expertise and judgment by major funding bodies.

Interdisciplinary Collaboration and Knowledge Transfer

FEECS excels in interdisciplinary research and effective knowledge transfer between academia and industry. The faculty's approach to connecting research with real-world applications has led to several notable innovations, including the Chimera mobile application for encrypted user communication, which received the Visionaries 2019 Honorary Award (Ivan Zelinka). Our interdisciplinary focus is also evidenced by successful industrial collaborations, with faculty members regularly serving as consultants for technology companies and public institutions.

Research Impact and Next-Generation Development

The impact of FEECS research is evident in multiple metrics beyond traditional academic indicators. Faculty members have successfully translated theoretical findings into practical applications that address pressing societal challenges like cybersecurity, healthcare monitoring, and sustainable energy. These research activities have resulted in patents, software solutions, and technological innovations benefiting both the industry partners and the broader public.

Our faculty's research has catalysed significant technological advancements, particularly in signal processing, artificial intelligence, and computational methods. Prof. Martinek's work on sensors for monitoring workers in Industry 4.0/Society 5.0 environments has influenced workplace safety standards across multiple sectors. Similarly, Prof. Pumera's materials research has implications for next-generation energy storage solutions and environmental remediation technologies.

The faculty actively involves students in research activities, preparing the next generation of experts through mentoring programs and international exchanges. Ing. Vladimir Kasik and Ing. Michal Prochazka's educational model of a computed tomography won 2nd place in the Werner von Siemens Competition 2022, demonstrating the successful integration of teaching and research. Doc. Radana Vilimkova Kahankova's dissertation on healthcare applications earned 1st place in the international PROGRESS 3 Competition, highlighting the quality of our doctoral education.

Strategic International Positioning

FEECS has strategically positioned itself within international research networks, participating in collaborative projects that address global challenges. Our faculty members serve as principal investigators and co-investigators on multinational research initiatives, particularly within European

framework programs. Doc. Stepan Ozana's recognition by the Warsaw University of Technology for outstanding scientific achievements further demonstrates our international impact.

The faculty has established itself as a regional center of excellence, attracting students and researchers from across Europe and beyond. International research partnerships create a global network that facilitates knowledge exchange and enhances FEECS's research impact. Faculty members' active participation in technical committees and professional societies reinforces this international presence, where they contribute to setting international standards and research agendas.

Through these diverse activities and recognitions, FEECS has established itself as an influential player in the international research community, contributing to advancing scientific knowledge and technological innovation. The faculty continues to strengthen its global research position through strategic collaborations, excellence in research, and commitment to addressing current global challenges in digitalization, sustainable development, and advanced technological systems.

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
Prof. Ing. Ivan Zelinka, Ph.D.	Visionaries 2019, Honorary Jury Awards to Code Creator s.r.o., SATTURN HOLEŠOV spol. s.r.o., and VSB – Technical University of Ostrava for the Chimera mobile application for encrypted communication between users.	CzechInno.
Prof. RNDr. Marie Duzi, CSc.	Book 'Logically Speaking. A Festschrift for Marie Duzi' published in 2022, College Publication, UK.	This Festschrift is in honour of Professor Marie Duzi, VSB - Technical University of Ostrava. The 16 contributions, authored by 24 colleagues, run the gamut from foundations in logic and theoretical computer science through philosophical logic, multi-agent systems and theory of communication to personal recollections.
Doc. Ing. Radana Vilimkova Kahankova, Ph.D.	1st place in the "Health and applications in healthcare" category in the international competition PROGRESS 3: Competition for the best dissertation at VSB-TUO defended in 2019.	PROGRESS Consortium.
Prof. RNDr. Radim Blaheta, CSc.	Medal for Lifetime Achievements.	Czech Mathematical Society, a branch society of the Union of Czech Mathematicians and Physicists.
Prof. RNDr. Radim Blaheta, CSc.	Bernard Bolzano Medal for Merit in Mathematical Sciences.	Czech Academy of Sciences.
Prof. Ing. Radim Bris, CSc.	Wiley: TOP-cited article 2021-2022.	Wiley Publishing, award for TOP-cited article 2021-2022.
Doc. Ing. Stepan Ozana, Ph.D.	Rector of Warsaw University of Technology Award for outstanding achievements in scientific activities.	Politechnika Warszawska

Ing. Vladimír Kasík, Ph.D. Ing. Michal Procházka	2nd place in the Werner von Siemens Competition 2022 in the category of best master's thesis entitled "Educational Model of a Computed Tomography".	Siemens Czech Republic in collaboration with MŠMT, AV ČR a TAČR.
Prof. RNDr. Zdeněk Dostál, DSc.	Memorial Medal of the Institute of Geonics.	Institute of Geonics, Czech Academy of Sciences.
Prof. Ing. Ivan Zelinka, Ph.D. Doc. Ing. Jan Nedoma, Ph.D. Prof. Ing. Miroslav Voznak, Ph.D. Prof. RNDr. Petr Hlubina, CSc. Prof. Ing. Radek Martinek, Ph.D. Prof. RNDr. Václav Snašel, CSc.	In WORLD'S TOP 2% SCIENTISTS (2019 - 2023) List of Stanford University.	StanfordUniversity .

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Prof. Ing. Jan Platos, Ph.D.	Remote Sensing , IF=4.2, ISSN: 2072-4292.
Prof. RNDr. Marie Duzi, CSc.	Frontiers in Artificial Intelligence IF=3, ISSN 2624-8212 (Frontiers), Review editor for Machine learning and artificial intelligence.
Prof. RNDr. Martin Pumera, Ph.D.	ACS Nano , IF=15,5, ISSN 1936-0851.
Prof. RNDr. Martin Pumera, Ph.D.	Small , IF=13, ISSN 1613-6810.
Prof. RNDr. Martin Pumera, Ph.D.	Materials Today , IF=21,1, ISSN 1873-4103.
Doc. Ing. Radana Vilimková Kahanková, Ph.D.	Frontiers in Signal Processing , IF=1,3, ISSN: 2673-8198 Function: Review Editor for Statistical Signal Processing.
Prof. Ing. Radek Martinek, Ph.D.	Alexandria Engineering Journal , Associate Editors, IF=6,2, ISSN 2090-2670.
Prof. Ing. Radek Martinek, Ph.D.	Computers and Electrical Engineering , Guest editors - Artificial Intelligence and Signal Processing for Enhanced Data Analysis (VSI - aispeda), IF=4, ISSN 1879-0755.
Prof. Ing. Radim Bris, CSc.	Reliability Engineering & System Safety , IF=9,4, ISSN 0951-8320.
Doc. Ing. Tomáš Novák, Ph.D.	Sensors , IF=3,4, ISSN 1424-8220, Guest Editor.

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
Doc. Ing. Dalibor Lukas, Ph.D.	Parallel boundary element methods in space and time accelerated on GPUs.	Computational Methods in Applied Mathematics , TU Wien.	2022
Ing. Dominik Vilimek, Ph.D.	Automated segmentation of Achilles tendon and bi-exponential T2* analysis.	Institution: Medical University of Vienna , High-Field MR-Centre, akce: Centre Seminar.	2022
Prof. Ing. Ivan Zelinka, Ph.D.	Specialized Tutorial: Swarm Intelligence in Cybersecurity.	The Genetic and Evolutionary Computation Conference (GECCO 2020) , Mexico.	2020
Prof. RNDr. Marie Duzi, CSc.	Natural Language Processing by Natural Deduction.	Proof-Theoretic Semantics, Assessment and Future Perspectives. Third Tübingen	2019

		Conference on Proof-Theoretic Semantics , 27–30 March 2019.	
Prof. Ing. Miroslav Voznak, Ph.D.	Population Mobility Retrieval from Mobile Network.	Ghent University , Belgium.	2023
Doc. Mgr. Petr Kovar, Ph.D.	An Application of Complete Graph Decomposition in Parallel Computing.	SRM IST , Ramapuram, Chennai, India.	2023
Prof. Ing. Radek Martinek, Ph.D.	Sensors for monitoring of workers in Industry 4.0/5.0.	LUT University , Lappeenranta, Finland.	2022
Prof. Ing. Radek Martinek, Ph.D.	Advanced Sensors and Signal Processing: Recent Advances and Applications.	Ton Duc Thang University , Ho Chi Minh City, Vietnam.	2020
Prof. Ing. Radek Martinek, Ph.D.	Sensors, Testing, Measurement and Signal Processing.	University of Aveiro , Portugal.	2023
Prof. RNDr. Zdenek Dostal, DSc.	Improving Efficiency of Scalable TFETI/BETI Contact Solvers for Huge Problems.	26th International Domain Decomposition Conference , Hong Kong.	2020

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Dr. Abdulaziz Atabani	Erciyes University, Turkey.	Sustainable Energy, Alternative Energy Resource.	2021
Dieter Weise Sebastian Melzer	Fraunhofer Institute IWU.	Design of innovative sorptive heat storage prototypes and suitable manufacturing technologies.	2022
Prof. Frank Coolen	UK, Durham University, Durham.	Survival Signature for Quantification of System Reliability.	2021
Prof. Frederic Magoules	Universite Paris-Saclay.	Asynchronous iterative methods.	2021
Prof. Giuseppe Orlando	Univerzity of Bari, Italy.	Nonlinear Economic Cycles: History, Theory and Empirics: Advances on modelling and econometrics for alternative directions in macroeconomics and cycle theories.	2021
Doc. Mariusz Pelc	University of Greenwich & University of Opole.	How to write a scientific article.	2021, 2022
Dr. Pavol Szomolanyi	Medical University of Vienna.	Using Artificial Intelligence for Quantitative MRI Data.	2023
Prof. Riste Skrekovski	University of Ljubljana.	Some results on unique-maximum coloring of plane graphs.	2021
Prof. Seyedalil Mirjalili	Torrens University Australia.	Emerging Optimization Problems and Modern Optimization Algorithm.	2022

Prof. Ulrich Rude	FAU Erlangen/CERFACS.	Parallel algorithms for solving finite element systems with a ten trillion unknown.	2019, 2021

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the contracting authority/guarantor of the project/programme call	Year
Prof. Ing. Dagmar Juchelkova, Ph.D.	Sigma, Doprava, Trend, Prostředí pro život, Zetta, Théta.	Technology Agency of the Czech Republic.	annually
Prof. Ing. Dagmar Juchelkova, Ph.D.	USA, V4-Korea Joint Research Projects 2023.	Ministry of Education, Youth and Sports, Czech Republic.	annually
Doc. Ing. David Horak, Ph.D.	Consolidator Grant 2020.	European Research Council (ERC)	2020
Prof. Ing. Jiri Koziorek, Ph.D.	OP PIK.	Ministry of Industry and Trade of the Czech Republic. Business and Innovation Agency.	2023
Prof. RNDr. Martin Pumera, Ph.D.	ERC-StG-2020.	European Research Council.	2020
Prof. Ing. Michal Kratky, Ph.D.	Project evaluation in call of the Ministry of Education, Youth and Sports NTER-EXCELLENCE II.	Ministry of Education, Youth and Sports, Czech Republic.	2022
Prof. Ing. Ondrej Zivotsky, Ph.D.	member of international evaluation panel ST5, call OPUS.	Polish government agency Narodowe Centrum Nauki (NCN).	2021, 2022, 2023
Prof. Ing. Pavel Kromer, Ph.D.	HORIZON-WIDERA-2023-ACCESS-02, HORIZON-MSCA-2023-PF-0.	Horizon 2020.	2022, 2023
Doc. Ing. Radana Vilimkova Kahankova, Ph.D.	Open Technology Programme from the NWO Domain Applied and Engineering Sciences.	Dutch Research Council Domain Applied and Engineering Sciences.	2023
Prof. Ing. Radek Martinek, Ph.D.	Member of P102 panel - Electrical and electronic engineering, Czech Science Foundation.	Czech Science Foundation.	2023

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research¹⁵⁰) that it has implemented or participated in during the period of 2019–2023¹⁵¹. This should be done from the full list in annex tables (Table 3.3.1-3.3.2)¹⁵², regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

The Faculty of Electrical Engineering and Computer Science (FEECS) has been actively engaged in research projects that contribute to scientific progress, technological advancements, and societal needs. The faculty's research initiatives align with its mission by fostering innovation, interdisciplinary collaboration, and industry partnerships.

FEECS participates in both publicly funded and contract-based research projects, ensuring a balanced portfolio that spans across both fundamental and applied research. These projects have led to significant outcomes, including new technologies, patents, industry-relevant applications, and contributions to policy-making. Many projects have also supported the rapid development of young researchers by seamlessly integrating them into research teams with high international visibility and impact.

Collaboration is a key aspect of FEECS's research strategy. The faculty has established strong partnerships with leading universities, research institutions, and key industrial partners at national and international levels. These collaborations further facilitate knowledge transfer, enhance research quality, and contribute to global scientific discourse.

Interdisciplinary research is a crucial pillar of FEECS's activities. Many projects integrate expertise from electrical engineering, computer science, artificial intelligence, and related fields to address complex technological and societal challenges. This interdisciplinary approach enhances the applicability and impact of research outcomes across multiple sectors.

In addition, FEECS strengthens its research efficiency and innovation potential through close collaboration with other university faculties, relying on strong institutional synergies. Through joint projects, shared resources, and interdisciplinary teams, the faculty contributes to solving pressing scientific and industrial problems.

Overall, the research projects conducted at FEECS demonstrate a strong commitment to excellence, innovation, and collaboration, reinforcing the faculty's position as a key contributor to the research and development environment.

¹⁵⁰ For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

¹⁵¹ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

¹⁵² The evaluated unit shall only fill tables that are relevant to it.

The following text briefly describes the most important projects implemented at FEECS between 2019 and 2023.

1. PACMAN (Prognostics And Computer Aided Maintenance)

The Horizon 2020 Research and Innovation Action PACMAN, conducted between October 2016 and September 2020, focused on the research and development of advanced aircraft maintenance and prognostics systems with augmented reality. The project, coordinated by Honeywell, was funded under the Clean Sky 2 Programme as a part of the Large Passenger Aircraft Demonstrator Platform 3: “Next Generation Aircraft Systems, Cockpit and Avionics” within the framework project ADVANCE with a budget of 1,7M EUR. FEECS, as an academic partner, focused on the research, development, and evaluation of advanced computer vision algorithms for applications in Augmented Reality tools. The participation in PACMAN increased the FEECS ‘s participation in European projects and contributed to several of its strategic goals. In particular, it reinforced the faculty’s collaboration with industry by implementing a three-year collaboration with Honeywell, and simultaneously advanced knowledge transfer and application-based cooperation with Honeywell, Airbus, and TAP Portugal through the ADVANCE initiative. In this way, it further reinforced the international outlook and visibility of FEECS and its inter-disciplinary impact by applying computer vision algorithms and computer science concepts in the Aerospace industry and Computer Aided Maintenance workflows. PACMAN's socio-economic impact results in reduced operational disruptions from unscheduled European aircraft maintenance, improved aerospace operational efficiency and sustainability, and the pioneering integration of advanced technologies for maintenance professionals.

2. Effective Use of Social Research Studies for Practice

The project Effective Use of Social Research Studies for Practice, funded by the Czech Ministry of Education, Youth, and Sports, from the European Regional Development Fund through the Operational Programme Research, Development and Education was conducted between April 2018 and March 2022. This interdisciplinary project funded with 1.2 million EUR was coordinated by the Palacky University in Olomouc while VSB-TUO contributed with expertise in Computer Science (FEECS) and key knowledge in Sports (Institute of Physical Education and Sports). The project not only demonstrated successful collaboration between prominent Czech research organizations but also functioned as a valuable platform for internal cooperation at VSB-TUO, contributing to FEECS's goals of enhancing research collaboration both externally and internally. One of the key aspects of the project was its interdisciplinary nature, connecting the fields of computer science, data mining, representation, and advanced visualizations with social sciences, public health, epidemiology, and other relevant application domains. Even though a Czech consortium led the project, the established collaboration with the Health Behaviour in School-aged Children (HBSC) study significantly broadened FEECS’s network of international partners. Project representatives participated in the annual HBSC meetings which connects participants from a large portion of the 51 HBSC member countries in Europe, Asia, and North America. The results of the project were published in 30 articles in scientific journals published by Wiley (Addiction), Elsevier (Journal of Adolescent Health, Expert Systems with Applications), BMC (BMC Public Health), Springer (International Journal of Public Health), and others. Overall, the implementation of the project contributed to the main goals of FEECS: to be an active actor in socially relevant domains, engage in interdisciplinary research, extend collaboration opportunities, and produce research results with a potential for a wide impact

on society.

3. GeoUS (Geothermal Energy in Special Underground Structures)

The Horizon Europe Coordination and Support Action (CSA) GeoUS was a significant project for FEECS. Marking a significant milestone, the faculty, for the first time, took on a coordinator role in a European project, successfully leading an international consortium of VSB-TUO and two major European research organizations, the Fraunhofer Society (Germany) and the University of Vaasa (Finland). The aim of the project, funded from the WIDESPREAD-03-2018 call by more than 400,000 thousand EUR, was to fully develop the excellence of FEECS in the research of geothermal energy storage. As a CSA, the project facilitated an intense knowledge transfer from the advanced partners to FEECS, built research capacity, supported staff development through research, and enhanced interaction with key actors in the European Research Area. The project directly contributed to the FEECS's strategic goals of active research on topics of European importance (sustainable management of energy resources) and collaboration with excellent international partners. Moreover, the project involved cooperation with experts from the Faculty of Civil Engineering (FCE) of VSB-TUO, intensifying the internal cooperation within the university. The implementation of the project firmly established FEECS as a center of excellence in the research of geothermal energy storage. Its results were published in more than 21 articles in leading peer-reviewed scientific journals published by Elsevier (International Journal of Thermal Sciences), IEEE (IEEE Transactions on Instrumentation and Measurement, IEEE Internet of Things Journal), and others. The project's interdisciplinary character, which combined FEECS's expertise in cybernetics, measurement and control with FCE's expertise in geotechnics and underground engineering, contributed to its increased application potential.

4. Quantum5 (Application of Quantum Cybersecurity in 5G Networks)

Quantum5 was funded by the NATO Science for Peace and Security Programme with more than 250,000 EUR. The three-year research project was conducted between February 2021 and February 2024 and dealt with Quantum Key Distribution (QKD) in 5G cellular networks. The project directly addressed recent research advancements and demonstrations of QKD technology by focusing on the increasing practical challenges of network management and organization of QKD in 5G networks. The project developed sophisticated simulation tools and practical guidelines for quantum technology deployment. The results were demonstrated on the 5G network testbed installed in the campus of VSB-TUO – the team successfully integrated QKD with advanced networking concepts such as network slicing, network function virtualization, and software-defined networking management. The topic of the project was well-aligned with the ambition of FEECS to be active in the research of key technologies with a wide societal relevance and impact, recently further emphasized by the unstable global situation. Besides contributing towards the social and societal responsibility of FEECS, the project's implementation also further reinforced the international connections of the Faculty by facilitating collaboration with European partners (e.g., the Ca' Foscari University of Venice, Italy, and the University of Sarajevo, Bosnia and Herzegovina). The results of the project were published in 4 research articles in leading scientific journals published by the IEEE (IEEE Communications Surveys & Tutorials, IEEE Network, Journal of Optical Communications and Networking) and Elsevier (Heliyon) and presented on 10 scientific conferences. The simulation tool developed in the scope of Quantum5 was also made publicly available as a module for the popular

NS-3 network simulator, underlining the application potential of the project.

5. Development of a complex sensor system for effective control of magnetic resonance imaging

The project “Development of a complex sensor system for effective control of magnetic resonance imaging” was funded by the Czech Ministry of Industry and Trade with more than 800 thousand EUR. It was concluded between July 2020 and December 2023 and coordinated by a SME, Tecpa s.r.o. FEECS participated in the project as an academic partner providing research expertise in sensors, measurement and control, and data analysis. The project’s aim was the research and development of an innovative system for monitoring cardiorespiratory activity during examination in magnetic resonance (MR). In contrast to existing solutions, the developed system did not require any fixations on the patient's body. This cross-sectoral and interdisciplinary project brought together FEECS and a commercial partner and provided an opportunity for applied research and, effectively, knowledge transfer in biomedical engineering, cybernetics, measurement and control, and signal processing. In this way, it contributed to FEECS’s strategic ambitions to conduct advanced research on up-to-date topics (co-design of novel medical devices, development and application of advanced signal processing methods, etc.), cooperate with industry (Tecpa s.r.o.) and engage in activities with high societal impact (health-related applications). The results of the project included prototypes of novel sensors, complete sensing pads for the use in MR, and an entire sensor system for an efficient control of magnetic resonance imaging. In addition, a new software tool for data acquisition, processing, analysis, and control of MR imaging triggering was developed. The results of the project were also patented.

6. META MO-COP (Metaheuristics Framework for Multi-objective Combinatorial Optimization Problems)

The bilateral project META MO-COP was a joint Czech-Indian research initiative funded by the INTER-EXCELLENCE/INTER-ACTION programme of the Ministry of Education, Youth, and Sports on the Czech side, and the Department of Science and Technology on the Indian side. The project was concluded between 2020 and 2023 and funded with more than 355 thousand EUR. It facilitated an intense cooperation with one of the leading Indian research and education organizations, the Indian Institute of Technology (IIT), Roorkee. IIT Roorkee, a premium partner, is ranked 8th among over 2,700 research organizations in India (2024) and is internationally recognized as one of the top 400 universities worldwide (QS World University Ranking). The project aim was to increase international cooperation between the participating organizations through joint fundamental research of advanced methods for multiobjective combinatorial optimization based on intelligent algorithms. The results of the project were published in 11 research articles in scientific journals published by IEEE (IEEE Transactions on Cybernetics, IEEE Transactions on Evolutionary Computation, IEEE Access), Elsevier (Applied Soft Computing, Information Fusion), and others. Additionally, the results were also presented at 10 scientific conferences including the Genetic and Evolutionary Computation Conference (GECCO) 2020 and 2022, and the IEEE Congress on Evolutionary Computation 2022. This way, META MO-COP directly contributed to several FEECS’s research strategy objectives. The project enhanced the Faculty's research standing through excellent publications and strengthened FEECS's global network via intensive international collaboration. The cooperation with India was well in line with the European-level EU-India Strategic Partnership policy and the national-level Czech-India economic cooperation from 2018, which was renewed in 2024 as

the Czechia-India Strategic Partnership on Innovation.

7. E-Town (Development of super-light, long-range small electric vehicles for intergenerational, urban e-mobility concepts powered by smart infrastructure)

E-Town was a cross-border research project concluded between January 2021 and May 2022. It was funded by the Ministry of Education, Youth, and Sports from the INTER-EXCELLENCE/INTER-EUREKA programme with more than 300 thousand EUR. It was coordinated by a commercial partner, ELVAC a.s., and involved cooperation with two German partners, a commercial company, Klädtke Maschinenbau GmbH, and a research organization, the Fraunhofer Institute for Machine Tools and Forming Technology. FEECS participated as an academic research partner providing expertise in electromobility, virtual instrumentation, measurement, control, and system design and evaluation. The main goal of the project was the design urban e-mobility concept based on small light passenger e-vehicles. The German project partners developed prototypes of small electric vehicles, while the Czech partners designed and developed small electric hubs as building blocks of a smart electric city infrastructure. In addition, the Czech partners also designed a testing platform and methodology that allowed objective testing of e-vehicle range and subsequent verification of their properties mainly related to battery aging. The project's cross-sectoral and international collaboration significantly contributed to FEECS's strategic research goals: cooperation with industry and knowledge transfer, international engagement and research collaboration, and a focus on topics with significant societal relevance and impact potential, such as the collaborative end-to-end design of environmentally friendly, sustainable, and efficient transportation solutions. The results of the project included prototypes of the developed solutions (tester, e-vehicle hub), support services (server and mobile application), utility models (wide input voltage range modular charger), and others.

8. AI-MATTERS (AI MANufacturing Testing and experimenTation network For EuROpean industrieS)

AI-MATTERS is a Digital-Simple European project, funded by the Digital Europe Programme, that aims to establish a network of European reference Testing and Experimentation Facilities for AI-enabled manufacturing solutions. The international project runs from 2023 to 2027 with a budget of around 60 million EUR (EU contribution approx. 30M EUR). It involves a consortium of 24 partners from 8 countries coordinated by the French Alternative Energies and Atomic Energy Commission (CEA). The FEECS is one of three Czech consortium members and through the development and operation of its Smart Factory a key partner in the Czech Node of the network. The project's final outcomes—a network of test facilities and a service portfolio for manufacturing stakeholders (SMEs and larger industries)—will open a new pathway for wider adoption of AI, robotics, and intelligent, autonomous systems in flexible European production. This is already evident from the facilities' initial test operations. AI-MATTERS is therefore highly related to several key aspects of FEECS's research strategy. By focusing its research on key enabling technologies such as AI, robotics, and advanced manufacturing, the project directly supports the research focus of FEECS and contributes to the EU's development strategy. The broad international and cross-sectoral cooperation in AI-MATTERS contributes towards the ambition of FEECS to cooperate with leading international partners from academia (e.g., TU Eindhoven, TU Stuttgart) and research (CEA, the Fraunhofer Society, the Tecnalia Foundation). The inter-disciplinary aspect of the project (enabling AI for manufacturing in automotive, mobility and space, textile, recycling, etc.) is also in line with the

interdisciplinary focus of FEECS. Finally, the testing and evaluation capacity, developed within the project is offered to companies, directly supporting the industry engagement and knowledge transfer, which are key components of FEECS's scientific strategy."

9. A Research Platform focused on Industry 4.0 and Robotics in Ostrava Agglomeration

The 2018-2023 project established a sustainable human resources platform connecting key research organizations (VSB-TUO, Fraunhofer Institute) with industrial partners (SIEMENS, HELLA, BROSE, VOP, MSIC, MSAK) to create a comprehensive research ecosystem in the Ostrava agglomeration. This inter-sector cooperation developed joint laboratories and technical infrastructure for long-term Industry 4.0 and robotics research. The platform addressed four interdisciplinary areas: Big Data Analysis focused on industrial data analytics for quality prediction, predictive maintenance, and smart process management with real-time monitoring capabilities. Autonomous and Collaborative Robotics research explored trajectory optimization in dynamic environments, collaborative robot-assisted assembly, and 3D shape inspection during production, delivering sensors for obstacle detection, collision-free algorithms, and systems for automated trajectory correction. Digital Twin research focused on modeling techniques, nonlinear system optimization, cyber-physical systems, and automated control applications, producing simulation models and software modules that advanced virtual design and manufacturing systems. The Artificial Intelligence and Smart Systems work group created energy-efficient IIoT sensors, advanced signal processing using AI, optimized manufacturing processes, energy harvesting techniques, and fault-tolerant intelligent drives. Through these interconnected research streams, the project established a sustainable foundation for continued industry-focused research and innovation in the region, enabling practical application of Industry 4.0 concepts, strengthening the region's technological competitiveness.

10. Continuous Contracted R&D with VALEO Center Prague with connection to Skoda Auto in the area of autonomous mobility

This significant research collaboration between the Faculty of Electrical Engineering and Computer Science and VALEO R&D Center (Prague, Czech Republic) represents a breakthrough in connected, cooperative, and autonomous mobility (C-CAM). Since 2019, the partnership has yielded exceptional results in advanced development, research, and innovation, culminating in ten research contracts between 2020-2023 with a total value of 10,751,447 CZK (424,120 EUR). The societal impact of this research is particularly evident in its 2023 achievements, which include the pre-final completion of a second-generation Drive-by-Wire system prototype and accompanying system software. These innovations underwent rigorous testing by both VALEO and Škoda Auto, notably through the implementation of the Follow the Vehicle assistance system, another successful product of VSB-TUO. The sustainability and commercial viability of this research led to the establishment of a spin-off company, [autinno s.r.o.](#), in September 2022. This strategic development was initiated by VALEO's interest in unit procurement of Drive-by-Wire technologies for automated vehicle control development. The spin-off company manages the production, distribution, and servicing of commercialized outputs from both contractual and collaborative research, with the university's financial interests protected through contractual arrangements based on the company's total turnover. The economic impact extends beyond direct research funding, creating a sustainable model for university-industry collaboration and technology transfer. The establishment of the spin-off company demonstrates the research's strong commercial potential and industry relevance. This

project exemplifies successful academia-industry collaboration, combining cutting-edge research with practical applications in autonomous mobility. The creation of the spin-off company and strong industry partnerships highlight the project's significant impact on both public and industrial audiences.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ¹⁵³	Project name	Support (in thousands CZK/EUR) ¹⁵⁴				
		2019	2020	2021	2022	2023
The Ministry of Education, Youth and Sports (MEYS)	Cumulatively by provider	48 419/ 1 910 020	21 237/ 837 751	16 506/ 651 124	4 600/ 181 460	3 338/ 131 677
Ministry of the Interior	Cumulatively by provider	6 229/ 245 720	1 556/ 61 381	0/0	13 582/ 535 779	16 954/ 668 797
The Czech Science Foundation (GACR)	Cumulatively by provider	1 986/ 78 343	1 895/ 74 754	4 282/ 168 915	5 375/ 212 032	5 857/ 231 045
Technology Agency of Czech Republic (TACR)	Cumulatively by provider	10 072/ 397 318	14 833/ 585 128	18 428/ 726 943	13 363/ 527 140	11 988/ 472 899
Czech Education and Scientific NETWORK (CESNET)	Cumulatively by provider	530/ 20 907	110/ 4 339	142/ 5 602	141/ 5 562	1 376/ 54 280
North Atlantic Treaty Organization (NATO)	Cumulatively by provider	0/0	0/0	0/0	1 546/ 60 986	776/ 30 611
European Union	Cumulatively by provider	0/0	0/0	2 275/ 89 744	0/0	0/0
Total		67 236/ 2 652 308	39 631/ 1 563 353	41 633/ 1 642 328	38 607/ 1 522 959	40 289/ 1 589 309
In the role of another participant						
Provider ¹⁵⁵	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
The Ministry of Education, Youth and Sports (MEYS)	Cumulatively by provider	1 153/ 45 483	4 808/ 189 665	4 715/ 185 996	3 097/ 122 169	1 684/ 66 430
The Ministry of Health	Cumulatively by provider	1 929/ 76 095	346/ 13 649	882/ 34 793	1 070/ 42 209	1 070/ 42 209
Ministry of the Interior	Cumulatively by provider	431/ 17 002	854/ 33 688	2 829/ 111 598	2 276/ 89 783	1 894/ 74 714
The Ministry of Industry and Trade	Cumulatively by provider	18 817/ 742 288	11 552/ 455 700	9 487/ 374 241	18 934/ 746 903	34 146/ 1 346 982
The Ministry of Regional	Cumulatively by provider	0/0	0/0	0/0	2 211/ 87 219	1 985/ 78 304

¹⁵³ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

¹⁵⁴ Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

¹⁵⁵ Ibid.

Development of the Czech Republic						
The Czech Science Foundation (GACR)	Cumulatively by provider	786/ 31 006	0/0	0/0	0/0	0/0
Technology Agency of Czech Republic (TACR)	Cumulatively by provider	20 061/ 791 361	17 630/ 695 464	18 720/ 738 462	14 213/ 560 671	17 787/ 701 657
European Union	Cumulatively by provider	2 049/ 80 828				5 641/ 222 525
Total		45 226/ 1 784 063	35 190/ 1 388 166	36 633/ 1 445 090	41 801/ 1 648 954	64 207/ 2 532 821

Table 3.3.2 - Contract research activities

Client ¹⁵⁶	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Serious Investment s.r.o.	Development of the structure, dimensions, and facts for the Gloffer platform's product catalog. Analysis of source data/materials for search functionality and API design for the Gloffer platform. Analysis of the Gloffer platform, Transformation and securing of the automotive offer and demand process into an online environment.	800/ 31 558	400/ 15 779	500/ 19 724	0/0	0/0
Západoslovenská distribuční, a.s.	Collection and evaluation of basic component and global reliability data in ZSE.	137/ 5 404	14/ 552	153/ 6 036	146/ 5 759	146/ 5 759
ČEZ Distribuce, a. s.	Development of a reliability data database, Pilot implementation of RCM (Reliability Centered Maintenance) on 110kV circuit breakers, Creation of a tool for analyzing the current waveform interrupted by the circuit breaker. Modification of the RCM system - development of an application to analyze the current interrupted by the circuit breaker. Collection and evaluation of basic component-level and system-level (or global) reliability data at the ZSE company.	1 485/ 58 580	780/ 30 769	530/ 20 907	530/ 20 907	530/ 20 907
Třinecké železářny, a.s.	Preparation of drawing documentation for repairs of HV equipment according to VH operation requirements.	100/ 3 945	46/ 1 815	46/ 1 815	0/0	0/0
Siemens, s.r.o.	FEM supported simulations.	80/ 3 156	0/0	0/0	0/0	0/0
Leuze Engineering Czech s.r.o.	Development of optimized test systems for the automotive industry. Test system for testing Electronic Control Units (ECUs) according to the contract	1 177/ 46 430	0/0	0/0	0/0	0/0

¹⁵⁶ If the client is from abroad, indicate in brackets the country of origin of the client.

ČEPRO, a.s.	Evaluation of secured equipment from borehole drilling, ČEPRO, a.s.	103/ 4 063	0/0	0/0	0/0	0/0
OVANET a.s.	Maintenance of telecommunications technology located in the distribution point of OVANET a.s. in VSB room no. A024	60/ 2 367	60/ 2 367	60/ 2 367	60/ 2 367	60/ 2 367
KLASTR - NDK, z.s.	Research and development in the field of thermal and stress loading of structural elements of wooden buildings.	1 022/ 40 316	1 704/ 67 219	0/0	0/0	0/0
Tesla Medical, s.r.o.	Usability testing of the neurostimulator, Testing and measurements of the URIS I neurostimulator, Design of a neurostimulator solution for home use, Focusing the stimulation pulse	390/ 15 384	1 326/ 52 308	461/ 18 185	0/0	0/0
Gymnasium and Secondary Technical School of Electrical Engineering and Informatics, Frenštát pod Radhoštěm	Air quality monitoring in classrooms and laboratories	474/ 18 698	0/0	0/0	0/0	0/0
Národní energetický klastr, z.s.	Conducting research and experimental development within the EffiCoil project, CZ.01.1.02/0.0/0.0/16_079/0008848	2 620/ 103 353	3 610/ 142 406	0/0	0/0	0/0
Národní dřevařský KLASTR, z.s.	Conducting research and experimental development within the IQZeProd project, CZ.01.1.02/0.0/0.0/17_103/0011811	1 427/ 56 292	3 806/ 150 138	0/0	0/0	0/0
Mediatrade, s.r.o.	Design and execution of a medical device type test.	360/ 14 201	0/0	0/0	0/0	0/0
ELVAC, a.s.	Performing the headlight alignment calculation., Performing the headlight alignment calculation for the G60 lamp	609/ 24 024	0/0	0/0	280/ 11 045	0/0
BABY patron, s.r.o.	Device for fetal monitoring in a home environment	375/ 14 793	1 125/ 44 378	0/0	0/0	0/0
Škoda Auto a.s.	Utilizing an in-vehicle camera for monitoring. Analysis - buffer system throughput. Extending pre-buffer analysis. Analysis of equipment configurations. Contract for the project "Testing of archived data for maintaining maximum sustainability II". Coughing and Sneezing Detection. Driver state monitoring I Driver state monitoring II. Driver state monitoring III. Roadsign identification.	287/ 11 321	460/ 18 146	2 248/ 88 679	919/ 36 253	890/ 35 108
LUXART, s.r.o.	Measurement of light-technical parameters of LUXART GreenLine luminaires and creation of LTD data.	0/0	80/ 3 156	0/0	0/0	0/0
Valeo	New interface to a car for, NCAP tests,	0/0	974/ 628/	2 190/ 6 361/		

Autoklimatizace, k.s.	SW/HW development and validation, Drive by Wire 2nd phase, Research of Technical Means and Methods for Automated Bus Control Using Drive, Drive by Wire 3rd phase, DbW Interface Car III, DbWBus2_Valeo, FUSA&Aspice improvement for DbW Interface CAR III, DbW II Interface, Reference platform WP1, Driver behavioral and operational analyses with DbW Interface		38 422	24 773	86 392	250 927
T-mobile Czech Republic a.s.	Provision of services according to the long-term contract	0/0	1 996/ 78 738	2 906/ 114 635	7 301/ 288 008	0/0
YAKNA s.r.o	Design of the electronic part and biofeedback neurorehabilitation tool. Analysis of brain activity during the use of a neurorehabilitation tool.	0/0	315/ 12 426	712/ 28 086	0/0	0/0
E.ON Distribuce a.s.	Preparation of the study "Testing the measurement accuracy of PQ analyzers"	0/0	75/ 2 959	0/0	0/0	0/0
NS Coating Technologies s.r.o	Agreement on the assignment of SW-related rights	0/0	60/ 2 367	0/0	0/0	0/0
Unicorn Systems a.s.	Exploratory analysis of supplied data, identification of important variables, identification of basic patterns and clusters in the data.	0/0	150/ 5 917	0/0	0/0	0/0
MonkeyData, s.r.o.	Development and research implementation of a scoring function	0/0	91/ 3 590	0/0	0/0	0/0
PEZ - projekce energetických zařízení	Project documentation SO 340	0/0	0/0	90/ 3 550	0/0	0/0
Třinecká projekce a.s.	Documentation processing - numerical model, electromagnetic calculation, model parameterization, determination of acting forces.	0/0	0/0	40/ 1 578	0/0	0/0
BROKIS s.r.o.	Photometric measurement of luminaires.	0/0	0/0	200/ 7 890	0/0	0/0
ČEPS Invest, a.s.	Development of a photometric study for outdoor lighting in TS Prosenice. Creation of a photometric study in the ČEPS area. Creation of a photometric study for outdoor lighting in TS Řeporyje.	0/0	0/0	239/ 9 428	200/ 7 890	250/ 9 862
E.ON Telco s.r.o.	Preparation of a feasibility study according to the E.ON PVNO document.	0/0	0/0	1 080/ 42 604	0/0	0/0
CE-Traffic, a.s.	Solution Design for Innovative Use of Mobile Data in Public Transport Planning	0/0	0/0	250/ 9 862	0/0	0/0
DADASYS s.r.o.	Collaboration in the development and implementation of IoT communication technologies	0/0	0/0	48/ 1 893	0/0	0/0
Vitesco	Feasibility study for the replacement of the	0/0	0/0	142/ 0/0	0/0	0/0

Technologies Czech Republic s.r.o.	existing reference oil level measurement			5 602		
SG Geotechnika	Installation and maintenance of a temperature monitoring system at the Heřmanice slag heap	0/0	0/0	51/ 2 012	0/0	0/0
University Hospital Ostrava	Augmented reality for visualization of multimodal data during open surgery. Measurement and determination of ventilation parameters from ventilator communication ports - implementation of multi-platform data reading and visualization.	0/0	0/0	41/ 1 617	41/ 1 617	0/0
Capital City of Prague	Agreement for the development of a mathematical model	0/0	0/0	3 200/ 126 233	0/0	0/0
DIAMO, state-owned enterprise	Technical support regarding the possibility of the production, storage, and sale of pure hydrogen.	0/0	0/0	0/0	97/ 3 826	0/0
Technodat Elektro s.r.o.	Specialist services for the client	0/0	0/0	0/0	90/ 3 550	0/0
Future Software Distribution s.r.o.	Service provision - carrying out a portion of the project in the "Front End" area.	0/0	0/0	0/0	2 725/ 107 495	0/0
NÚKIB	An architectural study on the deployment of private VoIP telephony at NÚKIB.	0/0	0/0	0/0	162/ 6 391	243/ 9 586
Porche Engineering Services	Realization of Battery Management Controller (BMC) emulator	0/0	0/0	0/0	300/ 11 834	0/0
Herní organizace Cryptova Forest Stream a.s.	Application of data analytics in Esports titles	0/0	0/0	0/0	41/ 1 617	0/0
FULLCOM systems s.r.o.	Simulation for process optimization and subsequent optimization suggestions	0/0	0/0	0/0	280/ 11 045	0/0
ČEPS a.s.	Study - Open Source tools. Analysis of internal communication backup solutions at ČEPS.	0/0	0/0	0/0	200/ 7 890	108/ 4 260
ASE, s.r.o.	Creating a lighting study for TR Vítkov	0/0	0/0	0/0	0/0	230/ 9 073
SMOLO a.s.	Options for traditional cremation and other alternatives to conventional burial.	0/0	0/0	0/0	0/0	250/ 9 862
Volkswagen AG Briefeffach	Analysis of operating characteristics of VW and Škoda vehicles in dynamic driving modes	0/0	0/0	0/0	0/0	209/ 8 245
DPO	License provision - delivery and installation of measuring evaluation technology including related hardware.	0/0	0/0	0/0	0/0	680/ 26 825
Statutory City of Ostrava	Long-term monitoring of crack deformometry in the MSIC area. Monitoring of dilatation in Pavilion K, Černá Louka area. Long-term monitoring of crack deformation in the MSIC area – object.	0/0	0/0	0/0	0/0	189/ 7 456

Brose CZ spol. s r.o.	Feasibility study of the possibility of testing BK6 seats using acoustic methods.	0/0	0/0	0/0	0/0	200/ 7 890
Brose Sitech s.r.o.	Production sequence analysis for Brose Sitech s.r.o.	0/0	0/0	0/0	0/0	70/ 2 761
Total		11 506/ 453 885	17 072/ 673 452	13 625/ 537 476	15 562/ 613 886	10 416/ 410 888

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the period of 2019–2023, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts¹⁵⁷, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

The presented research demonstrates a strong dedication to societal impact and technological innovation, with notable achievements in healthcare technology, infrastructure safety, and computational advancements during the evaluation period.

The research consistently prioritizes sustainability and gender considerations. Many solutions actively contribute to environmental sustainability through energy efficiency or preventive maintenance, while also addressing gender-specific needs and promoting equitable access to technology and safety measures.

All research results demonstrate well-documented economic impacts, with clear paths to commercialization and proven cost savings during subsequent implementation. The international reach of several innovations, particularly in computational tools and healthcare technologies, indicates strong potential for broader market impact.

This portfolio reflects a balanced approach to research and development, successfully bridging academic excellence with practical applications while maintaining focus on societal benefits and sustainability.

1. Phantom for Continuous Generation of Fetal and Maternal Electrocardiogram

This groundbreaking development in prenatal care technology represents a significant advancement in non-invasive fetal monitoring. Emerging from contractual research (HS4501907) at FEECS in partnership with BABY patron s.r.o., and further supported by a TAČR TREND 3 project submission, this phantom system offers revolutionary capabilities in simulating both fetal and maternal cardiac electrical activity.

The technology's societal impact is particularly noteworthy in its enhancement of medical training and patient safety. Healthcare professionals, including doctors and midwives, can now develop and refine their skills in a risk-free environment that accurately replicates various cardiac conditions. This advancement significantly reduces the reliance on invasive procedures, while also providing

¹⁵⁷ See Terms definition.

invaluable training opportunities that were previously inaccessible or potentially dangerous.

The system's contribution to healthcare sustainability is evident in its multifaceted applications. By enabling safer diagnostics in obstetrics and increasing access to high-quality prenatal care, it directly addresses the critical goal of reducing perinatal mortality. The phantom's capability to simulate realistic training scenarios has accelerated the adoption of modern medical practices and fostered innovation in digital medicine through the development of advanced fetal ECG analysis algorithms.

From an economic perspective, the commercialization through BABY patron s.r.o. has created new market opportunities in medical technology. Implementation of this technology is expected to optimize prenatal care costs, while simultaneously creating employment opportunities in the medical technology industry.

The gender dimension is inherently addressed in this innovation, as it specifically targets improvements in women's healthcare during pregnancy. It promotes equal access to advanced diagnostic methods and contributes to reducing pregnancy-related complications, thereby supporting long-term healthcare sustainability and improved maternal outcomes.

This system represents a sustainable approach to medical education and diagnostic advancement, combining reduced resource requirements with improved healthcare outcomes and professional training efficiency.

2. Night Safety Inspection of Roadways – Implementation Methodology

This innovative methodology, developed through the Ministry of Interior's research project VI20172019071, represents a significant advancement in road safety assessment and implementation. Following its approval by the Czech Ministry of Transport in January 2020, this methodology has been successfully integrated into real-world applications, focusing on enhancing nighttime visibility for all road users.

The methodology's societal impact is substantial and far-reaching, serving as a crucial tool for objective assessment of nighttime road safety elements. Its implementation spans across multiple groups, including the Czech traffic police, regional traffic engineers, road administrators, and various public administration bodies. This widespread adoption has led to establishment of a standardized approach for evaluating and enhancing road safety in low-light conditions.

The sustainability aspect of this methodology is particularly evident in its dual application - both for existing road inspection and new construction planning. Its long-term value has been reinforced through comprehensive training programs conducted in collaboration with the Faculty of Transport Engineering at the Czech Technical University in Prague, the Czech Police, and BESIP (the national road safety coordinator). This systematic approach ensures continued improvement in road safety standards and practices.

Economically, the methodology demonstrates clear benefits through the reduction of accident-related costs. The financial impact is measurable through decreased infrastructure reconstruction needs and reduced healthcare expenses associated with road accidents. This preventive approach represents a significant cost-saving measure for public resources.

The gender dimension has been thoughtfully integrated into the methodology's framework, acknowledging and addressing the specific safety needs of vulnerable road users, including women, children, and seniors. By focusing on improving nighttime safety conditions, the methodology

particularly benefits these groups who often face higher risks during night travel. This approach promotes equal access to safe transportation infrastructure regardless of gender or age.

3. Device for Detecting and Sending Sensed Alarm States with Wireless Data Transmission

This innovative monitoring system, developed through the APPLICATION project under the Operational Program Enterprise and Innovation for Competitiveness, represents a significant advancement in geological safety monitoring. Its success led to a follow-up project focusing on complex monitoring systems for rock mass and underwater building structures, demonstrating its proven effectiveness and potential for broader applications.

The technology's societal impact is particularly evident in its deployment at the Dlouhé Stráně pumped storage hydroelectric power plant operated by ČEZ, a.s., where it actively protects both visitors and infrastructure in the Jeseníky Mountains. The system employs wireless sensors for continuous monitoring of rock mass stability and protective networks, transmitting real-time data to a control center. This enables rapid response to potential hazards such as landslides or falling rock blocks, fundamentally enhancing public safety and infrastructure protection.

The sustainability aspects of this technology are demonstrated through its use of low-power IoT technologies, ensuring minimal energy consumption while maintaining continuous operation. This approach not only supports environmental sustainability but also ensures the system's long-term viability for risk management in vulnerable areas. The ongoing pilot projects across the Czech Republic further validate its sustainable implementation potential.

From an economic perspective, the system delivers significant cost savings through preventive detection of unstable geological formations, substantially reducing expenses associated with emergency remediation and infrastructure repairs. This proactive approach contributes to the economic stability of tourist areas and infrastructure zones by minimizing potential damage and associated downtime.

The gender dimension is addressed through the system's comprehensive approach to public safety, particularly considering the needs of more vulnerable populations including women, children, and seniors in areas with unstable terrain. The technology ensures equal access to safe environments across all demographic groups, supporting inclusive public safety measures.

4. System for Monitoring Cardiorespiratory Activities of the Human Body in Magnetic Resonance Environments

This innovative diagnostic system, developed through the Operational Program Enterprise and Innovation for Competitiveness, represents a significant breakthrough in magnetic resonance imaging technology. The project, focused on developing a comprehensive sensory system for effective MRI control, has produced a solution that fundamentally transforms cardiorespiratory monitoring during magnetic resonance procedures.

The societal impact of this technology is particularly significant in its enhancement of diagnostic capabilities in cardiology and radiology. By eliminating the need for traditional ECG electrode attachment, the system overcomes a major barrier in patient care, especially benefiting those for whom electrode application is challenging or impossible. The resulting improvement in magnetic resonance image quality enables healthcare specialists to achieve more precise diagnoses, directly contributing to enhanced treatment outcomes.

The system's sustainability is demonstrated through its versatile applications beyond MRI environments, extending to sleep laboratories and intensive care units. Its cost-effective design,

compared to existing solutions, promotes wider adoption across healthcare facilities, making advanced diagnostic capabilities more accessible. This approach supports the development of personalized medicine while minimizing the need for invasive diagnostic procedures.

Economically, the system delivers measurable benefits through improved efficiency in medical examinations, reducing both time and financial costs in healthcare delivery. The technology's commercialization potential opens new markets in medical technology, driving innovation and economic growth in the healthcare sector.

The gender dimension is effectively addressed through the system's contactless monitoring capabilities, making it particularly valuable for diverse patient groups including pregnant women and elderly patients. This feature promotes equal access to advanced diagnostic procedures while maintaining patient comfort and dignity, regardless of gender or physical condition.

5. Composite Fiber Optic Sensor for Detecting the Pressure Force Generated by the Passage of a Rail Vehicle Wheel

This groundbreaking sensor technology, developed through a Technology Agency of the Czech Republic project (CK01000098) in partnership with Prodin a.s., represents a significant advancement in rail transport monitoring systems. The innovation's recognition through utility model 36242 registration and ongoing patent protection process underscores its technical significance.

The societal impact of this technology is substantial, fundamentally enhancing rail traffic safety through advanced detection capabilities. The sensor's ability to detect vehicle movement, monitor presence in defined areas, track individual axes, and measure passage speeds provides unprecedented precision in rail transport control. Its electrical passivity and high electromagnetic interference immunity make it particularly valuable for high-speed lines and ETCS signaling systems, addressing critical safety needs in modern railway operations.

The sustainability of this innovation is demonstrated through its readiness for widespread deployment across both Czech and EU railway networks. The exclusive licensing agreement with Hroší stavby Morava a.s. validates its commercial viability and potential for broad implementation. The technology's durability and reliability in demanding railway conditions ensure long-term operational sustainability.

Economically, the sensor system delivers significant benefits through reduced railway infrastructure maintenance costs and enhanced accident prevention capabilities. Its development strengthens the Czech railway industry's competitive position in the European market, creating opportunities for economic growth in the transportation sector.

The gender dimension is addressed through the sensor's contribution to overall railway safety, particularly benefiting frequent public transport users across all demographic groups, including women, children, and seniors. This universal safety enhancement supports equal access to secure and efficient transportation infrastructure, promoting inclusive mobility solutions.

6. FaultCoverPattern Classifier

This innovative software solution, developed within the National Center for Energy project (TN01000007) through collaboration among 26 institutions and private entities, represents a significant advancement in electrical grid maintenance and reliability. Funding from the Technology Agency of the Czech Republic enabled the development of a sophisticated fault detection system

for medium-voltage overhead power lines.

The societal impact of this technology is demonstrated through its successful implementation by major utility providers ČEZ, EG.D, and VSDS, with 69 systems currently operational across the Czech and Slovak Republics. The system's effectiveness is clearly evidenced by data from 2018-2020, which showed prevention of 28 outages across 13 monitored overhead lines. By enabling early detection of potential faults caused by vegetation contact or falling trees, the system allows dispatchers to implement preventive measures before power disruptions occur.

The sustainability aspect is particularly noteworthy in its contribution to maintaining reliable energy infrastructure. By preventing outages and enabling proactive maintenance, the system reduces the need for emergency repairs, thereby minimizing environmental impact. This approach aligns with long-term infrastructure sustainability goals while optimizing operational efficiency for transmission system operators.

Economically, the system delivers significant benefits through reduced maintenance and repair costs, enhanced energy transmission reliability, and minimized economic losses from power outages. The preventive nature of the technology results in substantial cost savings by avoiding emergency repairs and related infrastructure damage.

The gender dimension is addressed through the system's contribution to maintaining uninterrupted power supply, which is particularly crucial for vulnerable populations including children, elderly individuals, and those with medical needs. This universal benefit ensures stable power access across all demographic groups, supporting equal access to reliable electrical infrastructure.

7. Active Set Expansion Strategy in the MPRGP Algorithm

This mathematical optimization advancement, developed through international collaboration and implemented in the PERMON library, represents a significant breakthrough in large-scale numerical computing. The development, supported by multiple international projects including PRACE-2IP, PRACE-3IP, EXACT, READEX, and EURAD, emerged from cooperation with the Institute of Geonics of the Academy of Sciences of the Czech Republic.

The societal impact is demonstrated through its widespread adoption by leading research institutions. The technology's implementation at Los Alamos, Argonne, and Oak Ridge National Laboratories for modeling sea ice changes and fire detection using NASA datasets showcases its practical significance. The strategy's achievement of up to 78% reduction in Hessian operations marks a substantial improvement in computational efficiency, dramatically reducing processing time for supercomputer simulations.

The sustainability aspect is particularly noteworthy in two dimensions. First, the improved computational efficiency directly translates to reduced energy consumption in supercomputing operations. Second, the technology enables complex hydromechanical simulations for radioactive waste management, contributing to environmental sustainability solutions. The open-source nature of the PERMON library ensures sustainable access to these advanced computational capabilities.

Economically, the strategy delivers significant cost reductions in supercomputing operations through improved computational efficiency. Its applications in energy, engineering, and materials research accelerate technological advancement across these sectors, creating cascading economic benefits through faster innovation cycles.

The gender dimension is addressed through PERMON's role in democratizing access to advanced

computational tools. By providing open-source, efficient computational resources, it promotes broader participation in computational mathematics, particularly supporting the inclusion of underrepresented groups, including women, in mathematics and computer science fields.

8. Classification and Aggregation of Public Mobile Network End Terminals into Territorial Units

This innovative data analytics system, developed through contractual research with T-Mobile Czech Republic and Future Software Distribution (2020-2022), has proven its critical value during the COVID-19 pandemic through its implementation in the Atlas of Mobility project. The technology represents a breakthrough in population mobility analysis using anonymized mobile network data.

The societal impact of this system has been particularly significant in its support of evidence-based decision-making during the pandemic crisis. Government institutions utilized the technology to monitor population movements and assess the effectiveness of implemented measures, providing crucial data for national-level strategic decisions. Beyond pandemic response, the system continues to deliver valuable insights for regional planning, transport optimization, and crisis management across both public and private sectors.

The sustainability aspects of this technology are evident in its contributions to smart urban development and infrastructure planning. By enabling continuous monitoring of population mobility patterns, it supports sustainable transport planning and urban development strategies. The system's ability to capture mobility data that would be otherwise unobtainable makes it an invaluable tool for long-term regional development planning.

Economically, the technology delivers significant benefits through optimization of public transport routes and capacity utilization, leading to reduced infrastructure costs. Its application in crisis management enables rapid, data-driven emergency response, resulting in more efficient allocation of local government resources and potential budget savings.

The gender dimension is thoughtfully integrated through the system's contribution to inclusive urban planning. The collected mobility data helps to ensure balanced infrastructure development that considers the needs of diverse population groups, including women, seniors, and individuals with mobility limitations. This approach promotes equal access to public services and transportation, enhancing social inclusion and safety for all citizens.

9. Sentiment Analysis of COVID-19 Tweets Using Deep Learning Classifiers

This influential research in social network analysis and artificial intelligence has received significant academic recognition, with over 450 citations on Google Scholar, demonstrating its substantial impact on text and sentiment analysis. This study represents a significant advancement in understanding of social media communication dynamics during the COVID-19 pandemic.

The societal impact of this research is particularly notable in its contribution to understanding public discourse during the pandemic crisis. Through the comparison of various sentiment analysis algorithms and the development of a novel fuzzy rules-based algorithm, the study achieved enhanced accuracy in emotion detection within text data. This advancement has provided valuable tools for both academic researchers and software developers working in social network analysis, enabling better interpretation of public discussions during crisis situations.

The sustainability of this research extends beyond pandemic-specific applications, offering broader utility in monitoring disinformation, analyzing political discussions, and detecting crisis situations on social networks. The developed methodologies contribute to the creation of more accurate

predictive models for public opinion analysis, enabling faster response times to emerging crisis situations.

Economically, the research has significant implications for organizational communication strategies, providing tools for more effective marketing campaign targeting and brand reputation management. The developed sentiment analysis techniques contribute to innovations in text data analysis and artificial intelligence applications, offering practical solutions for managing disinformation impacts.

The gender dimension is reflected in the research's revelation of differentiated pandemic responses across population groups, including gender-specific variations in risk perception. These insights provide valuable data for developing targeted protection strategies for vulnerable groups, including healthcare personnel and at-risk populations.

10. Wireless Device for Measuring Oxygen Concentration in Closed Rooms

This critical safety innovation, developed through collaboration between FEECS and the Faculty Hospital Ostrava (FNO) in response to the COVID-19 pandemic, represents a significant advancement in medical facility safety monitoring. Its successful deployment across five FNO units and ongoing negotiations with additional facilities, including the Faculty Hospital Pilsen, demonstrate its practical value in healthcare settings.

The societal impact of this technology is particularly evident in its life-saving capabilities within intensive care units. The system has already prevented several potential fires that could have resulted from dangerous oxygen concentrations in rooms utilizing intensive oxygen therapy. Through continuous O₂ monitoring and early warning mechanisms, the device significantly reduces the risk of explosions and fires in medical facilities, protecting both patients and healthcare workers.

The sustainability of this innovation extends beyond its immediate application in COVID-19 units, showing promise for broader implementation in industrial operations and other enclosed spaces where high oxygen concentrations pose risks. Its successful deployment in hospital crisis management demonstrates its long-term viability and adaptability to various high-risk environments.

Economically, the system delivers substantial benefits through fire prevention, reducing potential damage costs and facility repair expenses. The technology's potential for international commercialization, particularly in medical technology markets, indicates significant economic opportunities for further development and implementation.

The gender dimension is addressed through the technology's contribution to workplace safety for medical personnel, particularly significant given the high proportion of women in healthcare professions. The system's protection extends equally to all patients, with special consideration for vulnerable populations including seniors and individuals with chronic conditions.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ¹⁵⁸	Year of application	Name
Prototype	2023	Phantom for continuous generation of fetal and maternal electrocardiogram.
Methodology	2020	Night safety inspection of roadways – implementation methodology.
Prototype/Utility model	2020	Device for detecting and sending sensed alarm states with wireless data transmission.
Patent	2020	System for monitoring cardiorespiratory activities of the human body in magnetic resonance environments.
Patent	2020	Composite fiber optic sensor for detecting the pressure force generated by the passage of a rail vehicle wheel.
Software and Prototype	2022	FaultCoverPattern Classifier.
Software	2020	Active set expansion strategy in the MPRGP algorithm.
Software	2022	Classification and aggregation of public mobile network end terminals into territorial units.
Article/Review/Research methodology	2020	Sentiment Analysis of COVID-19 Tweets Using Deep Learning Classifiers.
Prototype/Utility model	2021	Wireless device for measuring oxygen concentration in closed rooms.

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)¹⁵⁹, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).¹⁶⁰

Additionally, the evaluated unit shall briefly comment on the funds received during the period of 2019–2023 from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

¹⁵⁸ Specify the specific type of result. Add rows as needed.

¹⁵⁹ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

¹⁶⁰ If the commercialisation of R&D&I results is carried out in this way.

Commercialization and promotion of results for the purpose of technology transfer

The faculty leadership systematically supports the commercialization of achieved results and knowledge transfer towards partners in the application sphere. The outputs of contractual research projects can be commercialized using intellectual property protection. This area is handled for the faculty by the Technology Transfer Center (CTT) in accordance with university directive TUO_SME_06_002 Intellectual Property Protection. This directive specifies the procedure for securing rights to a developed industrial property and the financial benefits for the developer or developing team.

CTT provides methodological support in disclosing inventions and ensures their subsequent legal protection. This assistance covers the administration of obtaining legal protection for industrial property, such as patents, utility or industrial designs, and trademarks, both domestically and internationally.

To educate students and employees, FEECS, in partnership with CTT, organize hands-on seminars featuring experts from the Industrial Property Office who explain industrial property protection.

FEECS systematically expands the transfer of results into practice through direct cooperation with industrial partners. This system is based on three pillars: direct contractual relationships with commercial entities, provision of comprehensive technical support, and ensuring the long-term sustainability of implemented solutions.

The FEECS faculty heads also support the establishment of spin-off companies, which can utilize both the infrastructure of the VSB-TUO business incubator and the infrastructure of the Moravian-Silesian Innovation Centre (MSIC), of which VSB-TU Ostrava is a shareholder.

FEECS employees and students have the opportunity to regularly participate in the [Greenlight Start or Greenlight Accelerator programs](#), which are held annually and where participants learn how to transfer the results of their projects into real commercial practice.

The methodology of self-entrepreneurship is also taught to FEECS students in the elective course 'Conceptual design and development of innovative products,' which builds upon the foundation laid by annual international summer schools organized by six European technical universities in collaboration with Bang & Olufsen. A similar methodology is offered in the university course 'Start-up Entrepreneurship' conducted by the VSB-TUO Career Centre, which students can take as an elective subject.

The FEECS management actively supports interdisciplinary and cross-sectoral contractual research projects that connect the academic and industrial sectors. Examples include long-term intersectoral collaboration projects that were carried out at FEECS in cooperation with a consortium of commercial partners from industrial practice. These partners include both renowned and multinational companies operating in the Ostrava agglomeration (SKODA AUTO, SIEMENS, BROSE, VALEO, and others), industrial subject associations (Moravian-Silesian Automotive Cluster, Moravian-Silesian Innovation Centre), and, last but not least, renowned foreign organizations engaged in applied research (Fraunhofer Institute from Germany).

These projects investigated and explored solutions based on the Industry 4.0 concept, even up to the proof of concept level.

Examples of project output commercialization:

1. A typical example of successful commercialization is **the development and implementation of a prototype system** for automatic detection of flat spots on tram wheels for **Dopravní podnik Ostrava a.s. (DPO)**. The project includes a non-exclusive, irrevocable, geographically and temporally unlimited license worth CZK 680,000 excluding VAT. The system enables automatic detection of mechanical damage to tram wheels during real-time operation, significantly contributing to the increased safety of urban public transport. Cooperation with DPO demonstrates the faculty's ability to address specific technical problems from practice, provide comprehensive solutions including hardware, software, and service support, and ensure the long-term sustainability of implemented solutions. The project generates regular income from service support according to established hourly rates for various types of experts. The developed flat spot detection system was presented at the FT Safety international conference in Ostrava 2024 as an innovative solution for enhancing rail transport safety. The presentation attracted significant interest from industry professionals and led to the establishment of contacts with potential users in the tram and railway transportation sectors. Further information was published in a conference paper, which detailed the technical solution, achieved results, and potential for broader application in railway infrastructure.
2. Building on the successful implementation of the previously mentioned flat spot detection system at DPO, a new collaboration has been established with **Starmon company**. Together, a project proposal will be prepared for the Transport 2030 program, where the target end-user is the Railway Administration. The project wants to adapt the existing solution for the needs of railway transport and further expand it with additional functionalities specific to railway operations. The anticipated project value and potential commercialization significantly exceed current implementations in the urban transport segment.
3. Another example is the **collaboration with BABY Patron s.r.o.**. The collaboration between FEECS and BABY Patron s.r.o. serves as a clear example of effective commercialization of research results with high social and economic value. The research team at VSB-TUO developed an innovative technology for non-invasive fetal ECG monitoring, which resulted in the patent called "Phantom for continuous generation of fetal and maternal electrocardiogram" (PV 2019-240). This patented technology was licensed to BABY Patron s.r.o. in 2019, which invested in its commercialization and market availability. Based on the license agreement, contractual research titled "Development of a device for fetal monitoring in a home environment" was signed with a budget of approximately CZK 2 million to develop a device prototype that would enable safe and effective fetal ECG monitoring in home environment. This also includes the development of phantom technology, which represents a key component of the entire fetal ECG monitoring ecosystem. This unique biosignal simulator for pregnant women allows to not only model the electrical activity of the fetal and maternal heart but also to simulate specific risk conditions, which are essential for testing of new diagnostic methods.
4. Another example of successful commercialization at FEECS is the application of a new type of photonic sensor system for monitoring of selected parameters of tram traffic, which offers higher reliability than conventional solutions, mainly in the detection of axles and bogies of tram sets. The technical solution was developed in **collaboration with the industrial partner Prodin a.s.**, and testing took place in the real-world operation of Dopravní podnik Ostrava a.s. The resulting technical solution is under patent protection within the Czech Republic and has been granted as an exclusive license to Hroší Stavby Morava a.s. for a total amount of CZK

1,210,000. This company utilizes the technical solution within its operations in the field of transport infrastructure development. Collaboration between the research organization and the industrial partner was a key driving factor for successful commercialization. Within this collaboration, FEECS further participates in providing technical support during implementation, conducts employee training, and assists with sensor configuration and calibration on-site. Typical users of the technical solution include transport companies or transport infrastructure managers.

SPIN-OFF

Since 2019, FEECS has been collaborating on significant contractual research and experimental development activities with the R&D center of VALEO (PRAGUE, Czech Republic). This collaboration was in the field of cutting-edge development, research, and innovation for connected, cooperative, and autonomous mobility (C-CAM). Based on the excellent results achieved by the FEECS R&D team, VALEO initiated a business strategy for mobile technologies used in the development of automated vehicle control, and as a result, the SPIN-OFF company autinno s.r.o. (www.autinno.eu) was established in September 2022.

The role of the SPIN-OFF company is to ensure the production, distribution, and service of commercialized outputs from contractual and collaborative research. The university's financial interest is contractually secured, as autinno s.r.o. is paying fees to the university based on the company's total turnover.

Video of the launch of the VSB-TUO SPIN-OFF company: [Spin-off company VSB-TUO](#)

Donations

The faculty is supported by private companies through financial and non-financial/material gifts (software and hardware resources, especially for teaching). From 2019 to 2023, the faculty received financial gifts totaling CZK 11.737 million / EUR 463,913. The gifts are intended for the development of laboratory infrastructure, seminar rooms, offices, and leisure spaces. Furthermore, the gifts are designated for special scholarship programs for exceptionally gifted students.

The prominent energy company ČEPS a.s. supported the faculty from 2020 to 2023 with CZK 6 million / EUR 237,154 in the form of scholarships for a total of 120 students with outstanding academic results, who were involved in solving of practical topics in laboratories, particularly in the so-called living labs of the FEECS operated CPIT TL3 industrial testbed. Furthermore, the company supported the development of laboratory infrastructure with CZK 3.352 million / EUR 132,490 during the same period.

ŠKODA AUTO a.s. supports the faculty through financial and non-financial gifts. For laboratory teaching, experimental development, and research, the company donated several vehicles, including a Škoda Superb iV, 3x Škoda Enyaq iV, and a Škoda Kamiq, during the observed period from 2019 to 2023. Furthermore, during this period, it provided a total of 5 financial gifts with a total value of CZK 1.1 million / EUR 43,478, which were used to support the development of selected expert groups specializing in several segments of the automotive industry.

Huawei Technologies (Czech) s.r.o. donated a financial gift of CZK 1.275 million / EUR 50,395 to the faculty for the development of modern communication mobile infrastructure for experimental and educational purposes.

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
Sale of patent license to Hroší stavby Morava a.s.: 'Composite optical fiber sensor for detecting the compressive force generated by the passage of a railway vehicle wheel, its arrangement and method of detecting this compressive force using this arrangement', Protection document number 309746.	0/0	0/0	0/0	0/0	500/ 19 724
Sale of patent license to Baby patron s.r.o. 'Phantom for continuous generation of fetal and maternal electrocardiogram', Protection document number 308074	150/ 5 917	0/0	0/0	0/0	0/0
Sale of patent license to Dopravní podnik Ostrava a.s. 'System for recognition and classification of flat spots on railway vehicle wheels, Protection document number 309233	0/0	0/0	0/0	0/0	350/ 13 807
Patent license fees from ČEZ Distribuce, a.s. 'Method and device for detecting faults in high-voltage overhead insulated conductors'. (patent no. 302419, European patent no. EP 2 187 225)	0/0	207/ 8 166	119/ 4 694	115/ 4 536	136/ 5 365
Financial donations from Škoda Auto a.s. to support the development of selected expert groups specializing in several segments of the automotive industry. 5x financial donation	0/0	0/0	375/ 14 793	250/ 9 862	475/ 18 738
Financial donations from ČEPS a.s. for a scholarship program for exceptionally gifted students. 4x financial donation,	0/0	1 500/ 59 172	1 500/ 59 172	1 500/ 59 172	1 500/ 59 172
Financial donations from ČEPS a.s. for the development of infrastructure in laboratories for teaching and experimental development. 4x financial donation.	0/0	838/ 33 057	838/ 33 057	838/ 33 057	838/ 33 057
Financial donation from Huawei Technologies (Czech) s.r.o. for the development of modern communication mobile infrastructure for experimental and educational purposes.	0/0	0/0	1 275/ 50 296	0/0	0/0
Financial donation from ATEsystem s.r.o. for faculty development.	0/0	0/0	10/ 394	0/0	0/0
Total	150/ 5 917	2 545/ 100 395	4 117/ 162 406	2 703/ 106 627	3 799/ 149 862

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF R&D&I

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the period of 2019–2023 and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

Popularization of science and research

FEECS places emphasis on communicating science to the public and actively supports the popularization of research among students, experts, and the general public. The Faculty has

implemented a number of activities aimed at making our research results and innovations accessible. It organizes popularization lectures and workshops, and offers students excursions, competitions, and professional internships. The goal of the activities is not only to bring science closer to the public, but also to inspire the young generation to discover new technologies and scientific research. The examples also show the international outreach of many events, whether it is FEECS's participation in international fairs, promotion of international projects, or organization of international summer schools.

FEECS also takes an active role in promoting science and research through participation in university-wide public engagement events like **Night of the Scientists**, **Art&Science**, **Art&Life** and **Improve Your Technology**.

Among the other core activities are the following:

CAERPIN

In 2023, the Faculty of Electrical Engineering and Computer Science (FEECS) actively engaged in the [CAERPIN](#) consortium, a strategic alliance that, in addition to fostering cutting-edge research, aims to inspire young individuals to pursue careers in technical fields and contribute to space exploration. The faculty organizes interactive workshops, lectures, and exhibitions to emphasize the significance of space exploration and its interdisciplinary applications. By engaging with high school students, university students, and the broader public, FEECS strives to cultivate curiosity and enthusiasm for aerospace technology and research.

On **December 7, 2023**, FEECS hosted [Space Day](#), a groundbreaking event aimed at advancing Czech aerospace research and preparing experiments for the potential mission of Czech astronaut **Aleš Svoboda** to the **International Space Station (ISS)**.

A highlight of the day was the **presentation of research teams from CAERPIN (Czech Aerospace Research Institute)**, representing **VSB-TUO, Masaryk University, Czech Technical University, Brno University of Technology, and the University of Defense**. These teams outlined their plans for conducting scientific experiments aboard the ISS, focusing on microgravity research, material science, and biomedical engineering. The event concluded with a **guided tour of the CPIT-TL3 laboratories**, where participants explored cutting-edge research in **Industry 4.0, biomedical engineering, and autonomous systems**.

Cybernetics, Programming, and 3D Printing Clubs

FEECS is committed to nurturing the next generation of engineers and innovators by organizing year-round educational clubs focused on cybernetics, programming, and 3D printing. These clubs cater to children aged six and older, providing them with hands-on experience in robotics, software development, and additive manufacturing. During summer vacations, FEECS extends these opportunities through specialized summer schools, where children can immerse themselves in the world of modern technology. These initiatives serve to build foundational skills in STEM disciplines and stimulate interest in engineering from an early age.

Biomedical Hackathon

FEECS regularly organizes Biomedical Hackathons, providing students with a platform to tackle real-world challenges in healthcare technology. These hackathons leverage the cutting-edge infrastructure of the CPIT-TL3 testbed, allowing participants to prototype applications and solutions using the latest advancements in biomedical engineering, artificial intelligence, and signal processing. By engaging students in interdisciplinary collaboration, these hackathons foster

innovation in medical diagnostics, patient monitoring, and wearable health technologies.

International Summer School on Geothermal Energy

FEECS successfully hosted an international summer school titled **“Research & Innovation in Geothermal Energy”**, focusing on current developments and future prospects in sustainable energy technologies. The program featured expert lectures on geothermal energy systems, renewable energy integration, and innovative drilling technologies. Participants included researchers, industry professionals, and students, creating a dynamic learning environment. Collaboration with companies from the Ostrava region enriched the program with practical insights into real-world geothermal applications. The summer school was part of the European Union’s Horizon 2020-funded **GeoUS project**, further emphasizing FEECS's commitment to advancing sustainable energy solutions.

Project Days, Excursions, and Workshops

To strengthen collaboration between academia and secondary education, FEECS develops strategic partnerships with high schools and provides talented students with unique opportunities to explore modern technologies. Through **project days, excursions, and interactive workshops**, students gain hands-on experience in electrical engineering, computer science, and robotics. These activities take place in the faculty’s state-of-the-art laboratories, where students can experiment with IoT devices, AI algorithms, and robotic systems under expert supervision.

ŠKOMAM – School of Mathematical Modeling

Each year, **dozens of high school students graduate from the School of Mathematical Modeling (ŠKOMAM)**, where they engage in advanced topics in computational mathematics and applied modeling. The program combines lectures, practical exercises, and excursions to research centers, exposing students to real-world applications of mathematical theories. By integrating theoretical knowledge with computational techniques, ŠKOMAM plays a crucial role in preparing students for careers in engineering, data science, and scientific research.

Teaching High School Students

Throughout the academic year, FEECS actively supports **high school education by offering specialized courses** designed to enhance students’ understanding of advanced technical concepts. This initiative enables students to work with cutting-edge laboratory equipment and deepen their knowledge in fields such as automation, embedded systems, and artificial intelligence. By providing early exposure to university-level research and technology, FEECS bridges the gap between secondary education and higher learning.

FEI Journal Club

The **FEI Journal Club** serves as an intellectual hub where students, faculty members, and industry professionals come together to discuss recent research publications. Inspired by leading international universities, the journal club fosters critical thinking, analytical discussions, and scientific networking. Participants present and critique research papers, engage in interdisciplinary dialogues, and gain valuable insights from guest speakers, including industry leaders, scientists, and scholars. By encouraging rigorous debate and knowledge sharing, the FEI Journal Club strengthens research culture and academic excellence at FEECS.

Week for Digital Czech Republic

FEECS actively contributes to the **Week for Digital Czech Republic**, a prominent event dedicated to advancing digital transformation and technological literacy. As part of this initiative, the faculty

organizes lectures, hands-on demonstrations, and expert panels covering topics such as cybersecurity, artificial intelligence, and digital industry trends. Additionally, FEECS played a significant role in the **Unique Summit Ostrava 2023**, an international conference focused on innovation and digitalization, further reinforcing its leadership in digital education and research.

Industrial testbed CPIT TL3

In 2020, the FEECS expanded its research and Innovation portfolio through construction a unique testbed for timeless laboratory activities called CPIT TL3.

This project adhered to the VSB-TUO Long-term Plan for Educational, Scientific, Research, Development, and Innovation Activities (2016-2020) and the Strategic Development Plan until 2020 (2030). **Many education lectures and practical exercises, training programs and popularization events are carried out from these premises.**

CPIT TL3 is a comprehensive testbed with a Smart Factory Lab section (robotic digitized production process with elements of Industry 4.0 - IoT, digital twin, big data processing, robotics, predictive maintenance, virtual and augmented reality, image recognition and 3D object identification, machine learning, operation of autonomously guided vehicles and more), Health Lab (observation apartments for monitoring behavioural patterns of humans, used for the development and teaching of new biomedical engineering technologies) and Mobility Lab (laboratories focusing on e-mobility, modern autonomous driving systems for cars and industrial vehicles, functional safety of automotive systems, quality in development, sophisticated simulations and testing of automotive electronic systems) and AIM Lab (AI/ML in manufacturing).

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

The Faculty of Electrical Engineering and Computer Science (FEECS) at VSB – Technical University of Ostrava has proactively responded to the recommendations from the previous evaluation period for Module 3. By implementing targeted improvements, FEECS has enhanced research visibility, strengthened interdisciplinary collaboration, and expanded its impact on industry and society. The faculty has adopted strategic measures to optimize knowledge transfer, industrial cooperation, and public sector engagement.

1. Strengthening Research Impact and Knowledge Transfer

1.1 Increased Participation in International Conferences

FEECS has significantly expanded its involvement in international research forums, with faculty members presenting papers at leading global conferences. This has not only increased the visibility of its research outputs but has also facilitated networking with key academic and industrial partners worldwide.

1.2 Enhanced Publication Strategies

A systematic approach to publication has been adopted, emphasizing high-impact journals and open-access platforms. The faculty has introduced internal incentives for publishing in top-tier journals, leading to an increase in publications indexed in Scopus and Web of Science.

1.3 Support for Patent Applications and Commercialization

Recognizing the importance of intellectual property protection, FEECS has actively encouraged faculty members to pursue patents. Over the evaluation period, the number of patents filed has increased, and several research outcomes have been successfully commercialized in collaboration with industrial partners.

2. Strengthening Interdisciplinary Collaboration

2.1 Joint Research Initiatives

In response to recommendations, FEECS has initiated several interdisciplinary research projects in collaboration with other faculties and external research institutions. These projects focus on cutting-edge areas such as artificial intelligence, cybersecurity, sustainable energy, and biomedical engineering.

2.2 Interdisciplinary Research Projects

The faculty has launched projects that integrate expertise from various fields, facilitating innovation and enhancing the applicability of research findings. Notable projects include the development of AI-driven diagnostic tools in healthcare and the integration of cybersecurity measures in smart energy grids.

2.3 Strengthening Internal Financial Support for Interdisciplinary Research

To further support interdisciplinary collaboration, FEECS has established internal grant schemes that prioritize research initiatives involving multiple disciplines. These initiatives have resulted in an increase in collaborative publications and joint research proposals submitted to international funding bodies.

3. Increasing Collaboration with Industry and Societal Engagement

3.1 Expansion of Contract Research with Industrial Partners

FEECS has strengthened its relationships with key industrial players, including global technology firms and national enterprises. The faculty has successfully expanded contract research agreements, leading to an increase in industry-funded projects.

3.2 Applied Research Projects with Direct Economic and Technological Impact

Several applied research projects have been undertaken in direct collaboration with industry partners, focusing on the development of next-generation technological solutions. Examples include advancements in autonomous vehicle control systems and industrial automation solutions.

3.3 Public Lectures and Science Communication

To enhance the societal impact of its research, FEECS has organized public lectures and workshops aimed at bridging the gap between academic research and public understanding. These events have covered topics such as artificial intelligence ethics, cybersecurity threats, and the role of digitalization in modern industry.

4. Improving Internal Evaluation and Strategic Development

4.1 Regular Self-Assessment and Alignment with National and International Standards

FEECS has implemented a rigorous self-assessment framework to continuously evaluate research output and strategic alignment. This includes periodic internal reviews that benchmark faculty performance against leading international institutions.

4.2 Development of Research Strategy Based on Evaluation Feedback

The faculty has revised its long-term research strategy to incorporate recommendations from previous evaluations. This has led to a more focused approach in defining key research priorities, ensuring alignment with both national research agendas and European funding programs.

4.3 Improved Monitoring Mechanisms for Long-Term Research Impact

A robust monitoring system has been introduced to track the long-term impact of research projects. This includes post-project assessments and industry feedback mechanisms to evaluate the effectiveness and applicability of research outcomes.

Conclusion

The implementation of these recommendations has significantly strengthened FEECS' research ecosystem, interdisciplinary engagement, and industry collaboration. The faculty remains committed to continuous improvement, ensuring that its research contributes meaningfully to scientific advancements, industrial innovation, and societal progress.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
Department of Computer Science	3.1	https://www.fei.vsb.cz/460/en/
Department of Cybernetics and Biomedical Engineering	3.1	https://www.fei.vsb.cz/450/en/
Department of Electrical Power Engineering	3.1	https://www.fei.vsb.cz/410/en/
Department of Telecommunications	3.1	https://www.fei.vsb.cz/440/en/
Department of Applied Electronics	3.1	https://www.fei.vsb.cz/430/en/
Department of Applied Mathematics	3.1	https://www.fei.vsb.cz/470/en/
Department of Physics	3.1	https://www.fei.vsb.cz/480/en/
Nanorobots	3.1	https://nanorobots.vsb.cz/en
Austrian Institute of Technology	3.1	https://www.ait.ac.at/en
Delft University of Technology	3.1	https://www.tudelft.nl/en/
ETH Zurich	3.1	https://msrl.ethz.ch/
Fraunhofer-Gesellschaft	3.1	https://www.fraunhofer.de/en.html
Graz University of Technology	3.1	https://www.tugraz.at/en/home/
Medical University of Vienna	3.1	https://www.meduniwien.ac.at/web/en/
Nanyang Technological University	3.1	https://www.ntu.edu.sg/
Princeton University	3.1	https://www.princeton.edu/
Ton Duc Thang University	3.1	https://www.tdtu.edu.vn/en

Torrens University Australia	3.1	https://www.torrens.edu.au
Université de Toulouse	3.1	https://en.univ-toulouse.fr/
Université Grenoble Alpes	3.1	https://www.univ-grenoble-alpes.fr/english/
University of Alberta	3.1	https://www.ualberta.ca/en/index.html
University of Aveiro	3.1	https://www.ua.pt/en/
University of California	3.1	https://www.universityofcalifornia.edu/
University of Cambridge	3.1	https://www.cam.ac.uk/
University of Minnesota Duluth	3.1	https://discoverccaps.umn.edu/
University of Texas at Arlington	3.1	https://www.uta.edu/
Prof. Seyedali Mirjalili	3.1	https://seyedalimirjalili.com/
ABB	3.1	https://new.abb.com/
Brose CZ	3.1	https://www.brose.com/cz-en/brose-in-cz/
CEPS	3.1	https://www.ceps.cz/en/
CEZ	3.1	https://www.cez.cz/en/
FORVIA/HELLA	3.1	https://www.hella.com/en/
FUTTEC a.s.	3.1	https://futteccz.cz/en/
Korea Automotive Technology Institute	3.1	https://www.katech.re.kr/eng
ON SEMICONDUCTOR CZECH REPUBLIC	3.1	https://www.onsemi.com/
Schaeffler CZ s.r.o.	3.1	https://www.schaeffler.com/fork/
Siemens	3.1	https://www.siemens.com/global/en.html
Skoda Auto	3.1	https://www.skoda-auto.com/
TATRA TRUCKS	3.1	https://www.tatratrucks.com/
Thermo Fisher Scientific	3.1	https://www.thermofisher.com/cz/en/home.html
T-Mobile Czech Republic	3.1	https://www.t-mobile.com/
TRL SPACE	3.1	https://www.trlspace.cz/
Unicorn	3.1	https://unicorn.com/en/
Valeo	3.1	https://www.valeo.com/en/
Vitesco Technologies	3.1	https://www.vitesco-technologies.com/en-us
Vítkovice Cylinders	3.1	https://www.vitkovicecylinders.cz/en/

Volkswagen AG	3.1	https://www.vw.com/en.html
RAYNET CRM	3.1	https://raynetcrm.com/
Smart Factory	3.1	http://smartfactory.vsb.cz/index.html
Autinno	3.1, 3.3, 3.5	https://www.autinno.cz/
HPC technologies	3.1	https://www.vsb.cz/en/news-detail/?reportId=40646&linkBack=/en/index.html
IT4Innovations	3.1	https://www.it4i.cz/en
Prof. Martin Pumera	3.1	https://scholar.google.cz/citations?user=wunBkF4AAAAJ&hl=cs&oi=ao
Prof. Seyedali Mirjalili	3.1	https://scholar.google.cz/citations?user=TJHmrREAAAAJ&hl=cs&oi=ao
Prof. Carlos A F Marques	3.1	https://scholar.google.cz/citations?user=myM2tiEAAAAJ&hl=cs&oi=ao
Prof. Arnaldo Leal-Junior	3.1	https://scholar.google.cz/citations?user=cdjsYHcAAAAJ&hl=cs
Prof. Mazin Abed Mohammed	3.1	https://scholar.google.cz/citations?user=ZVS5_3wAAAAJ&hl=cs
Dr. Abdullah Raza Lakhan	3.1	https://scholar.google.cz/citations?user=g1iVOlcAAAAJ&hl=cs
Prof. Muhammet Deveci	3.1	https://scholar.google.cz/citations?user=af8GvdgAAAAJ&hl=cs
Politechnika Warszawska	3.2	https://eng.pw.edu.pl/
PROGRESS Consortium	3.2	https://progres3.vsb.cz/export/sites/progres3/.content/.new/MEMORANDUM-2013.pdf
StanfordUniversity	3.2	https://topresearcherslist.com/
Alexandria Engineering Journal	3.2	https://www.sciencedirect.com/journal/alexandria-engineering-journal
Computers and Electrical Engineering	3.2	https://www.sciencedirect.com/journal/computers-and-electrical-engineering
Frontiers in Artificial Intelligence I	3.2	https://www.frontiersin.org/journals/artificial-intelligence
Reliability Engineering & System Safety	3.2	https://www.sciencedirect.com/journal/reliability-engineering-and-system-safety
Remote Sensing	3.2	https://www.mdpi.com/journal/remotesensing
Sensors	3.2	https://www.mdpi.com/journal/sensors
ACS Nano	3.2	https://pubs.acs.org/journal/ancac3
Small	3.2	https://onlinelibrary.wiley.com/journal/16136829
Materials Today	3.2	https://www.sciencedirect.com/journal/materials-today
Frontiers in Signal Processing	3.2	https://www.frontiersin.org/journals/signal-processing
Third Tübingen Conference on Proof-Theoretic Semantics	3.2	http://ls.cs.uni-tuebingen.de/PTS3/overview.html

The Genetic and Evolutionary Computation Conference	3.2	https://gecco-2020.sigevo.org/index.html
Medical University of Vienna	3.2	https://www.meduniwien.ac.at/web/en/
26th International Domain Decomposition Conference	3.2	https://www.math.cuhk.edu.hk/conference/dd26/?Conference=Home
Computational Methods in Applied Mathematics	3.2	https://www.degruyter.com/journal/key/cmam/html
SRM IST	3.2	https://www.srmist.edu.in/
LUT University	3.2	https://www.lut.fi/en
Ghent University	3.2	https://www.ugent.be/en
Dr. Abdulaziz Atabani	3.2	https://scholar.google.cz/citations?user=TgQcMYAAAAJ&hl=cs&oi=ao
Prof. Frank Coolen	3.2	https://scholar.google.cz/citations?user=axQ3nTgAAAAJ&hl=cs&oi=ao
Prof. Frederic Magoules	3.2	https://scholar.google.cz/citations?user=Nqu5zWwAAAAJ&hl=cs&oi=sra
Prof. Giuseppe Orlando	3.2	https://scholar.google.cz/citations?user=UqfM7_oAAAAJ&hl=cs&oi=ao
Doc. Mariusz Pelc	3.2	https://scholar.google.cz/citations?user=ikv9LOMAAAAAJ&hl=cs&oi=ao
Dr. Pavol Szomolanyi	3.2	https://scholar.google.cz/citations?user=tFQBoAcAAAAJ&hl=cs&oi=ao
Prof. Riste Skrekovski	3.2	https://scholar.google.cz/citations?user=O_Vsy1MAAAAAJ&hl=cs&oi=ao
Prof. Ulrich Rude	3.2	https://scholar.google.cz/citations?user=CiztzwAAAAJ&hl=cs&oi=ao
Greenlight	3.5	https://greenlight.vsb.cz/en/
Spin-off company VŠB-TUO	3.5	https://www.youtube.com/watch?v=VU76ng8OtjE
CAERPIN	3.6	https://www.caerpin.cz/en/
Space Day	3.6	https://www.caerpin.cz/en/planned-events/space-day/

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Faculty of Civil Engineering (FCE)

FORD: 2 - Engineering and technology

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.¹⁶¹ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

The Faculty of Civil Engineering of VSB-TUO focuses on innovative research and education in the field of civil engineering, with the main goal of contributing to sustainable development, modern technologies and improving the quality of life. The faculty aims to provide excellent education in the field of civil engineering, supported by cutting-edge research and close cooperation with industrial and public partners. The long-term vision of the faculty is to become a recognized leader in research and education in the fields of civil engineering, advanced building materials and technologies.

Key research activities of the faculty include the development and application of advanced building materials, technologies improving energy efficiency, building and infrastructure safety, sustainable development of transport networks, cities and regions, and methods of prevention and assessment of environmental impacts. The faculty is engaged in both, basic research, focusing on new theoretical knowledge in the fields of structural mechanics, geotechnics and environmental engineering; and applied research, contributing to the solution of practical problems in collaboration with industry.

The social contribution of the Faculty of Civil Engineering consists in active participation in the decision-making processes of public institutions, popularization of science through lectures, workshops and other professional activities and in cooperation with industrial partners. Research projects have a direct impact on improving the quality of life, for example in the field of building structures, transport safety, urban planning, civil engineering, energy infrastructure and environmental protection.

The faculty also focuses intensively on international cooperation which is supported through

¹⁶¹ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

projects implemented in collaboration with leading universities and research institutions around the world. This collaboration enables knowledge sharing, innovation development and strengthening of the global scientific community.

The long-term goal of the faculty is to contribute to the development of the construction industry through research focused on sustainability, modern technologies and improving the quality of life. The faculty has modern laboratories, which enables the implementation of advanced research projects. The Faculty of Civil Engineering is thus profiling itself as a dynamic and innovative unit that contributes to the development of science, education and practice in the field of civil engineering at national and international level.

Table 3.1.1 - Staffing per FTE¹⁶²

Academic/ Professional position	Total / Of which women					
	2019	2020	2021	2022	2023	Total
Professor	4,6/1,5	7,0/2,2	8,3/3,0	8,5/3,0	9,1/3,0	9/3
Associate Professor	23,0/4,9	22,6/6,1	22,1/6,0	22,7/6,7	21,8/6,1	23/6
Assistant Professor	68,2/33,5	65,9/31,1	65,6/29,9	66,8/29,3	65,0/29,1	68/33
Assistant	1,5/0,5	0,9/0,5	0,7/0,5	1,0/0,5	0,9/0,4	1/0,5
R&D Personnel¹⁶³	0,0/0,0	2,1/1,1	0,2/0,0	0,0/0,0	0,0/0,0	2/1
Researchers in other categories¹⁶⁴	7,3/3,4	3,1/1,4	2,4/0,8	3,1/0,6	2,2/0,0	7/3
Technical and economic staff¹⁶⁵	32,5/24,7	32,4/25,0	33,1/25,8	30,3/24,8	28,3/23,4	33/25
Scientific, research and development staff involved in teaching activities	97,29/40,45	96,38/39,94	96,68/39,41	98,96/39,51	96,73/38,61	98/40
Early career researchers¹⁶⁶	4,88/2,63	6,54/3,62	5,31/1,95	5,45/1,11	8,95/3,07	8/3
Total¹⁶⁷	137,1/68,6	134,0/67,5	132,4/66,0	132,5/64,9	127,8/62,0	134/68

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

¹⁶² The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

¹⁶³ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁶⁴ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁶⁵ Who participates in the management and support of R&D&I in the institution.

¹⁶⁶ See Definition of Terms in Methodology HEI2025+.

¹⁶⁷ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the first year of the evaluation period (numbers of physical employees and personnel)¹⁶⁸

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor							5	2	2		1	
Associate Professor			2		7	1	13	5	4		2	
Assistant Professor	1	1	37	17	25	11	13	8	4	1		
Assistant			1	1	1		1					
R&D Personnel ¹⁶⁹												
Researchers in other categories ¹⁷⁰	5	3	3		2	1	1	1				
Technical and economic staff ¹⁷¹	7	4	11	8	9	8	9	7	2	2		
Scientific, research and development staff involved in teaching activities	1	1	40	18	33	12	32	15	10		3	
Early career researcher ¹⁷²			3	1	2	1	2	1				
Total ¹⁷³	13	8	54	26	44	21	42	23	12	3	3	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

¹⁶⁸ The total number of employees/workers as of 31st December of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

¹⁶⁹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁷⁰ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁷¹ Who participates in the management and support of R&D&I in the institution.

¹⁷² See Definition of Terms in Methodology HEI2025+.

¹⁷³ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the last year of the evaluation period (numbers of physical employees and personnel)¹⁷⁴

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor					1		3	1	6	1		
Associate Professor			1		10	2	8	3	5	1		
Assistant Professor	1		34	18	37	12	12	7	7	3		
Assistant					2	1						
R&D Personnel ¹⁷⁵												
Researchers in other categories ¹⁷⁶	1		2									
Technical and economic staff ¹⁷⁷	3	1	4	2	12	10	11	10	2	2		
Scientific, research and development staff involved in teaching activities	1		34	18	40	13	15	8	13	5		
Early career researcher ¹⁷⁸	1		12	6	1		2	1	1			
Total ¹⁷⁹	5	1	41	20	62	25	34	21	20	7		

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	772	303	712	300	783	328	792	340	948	410	4007	1681
Master's ¹⁸⁰	344	131	329	115	342	118	363	129	322	119	1700	612
Doctoral	81	36	75	31	72	28	72	24	74	26	374	145

¹⁷⁴ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

¹⁷⁵ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁷⁶ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

¹⁷⁷ Who participates in the management and support of R&D&I in the institution.

¹⁷⁸ See Definition of Terms in Methodology HEI2025+.

¹⁷⁹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

¹⁸⁰ All master's degree students are listed, regardless of the length of their programme of study.

Lifelong Learning Courses												
Total	1197	470	1116	446	1197	474	1227	493	1344	555	6081	2438

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ¹⁸¹ / Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate	4/3		4/2		4/2		4/2		4/2		3/3	
Master's	10/10		11/11		11/11		9/9		9/9		11/11	
Doctoral	4/4		3/3		3/3		3/3		3/3		4/4	
Lifelong Learning courses												
Total	18/17		18/16		18/16		16/14		16/14		18/18	

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	1	Basic Research	26
	1.2 Computer and information sciences	8	Basic Research	
	1.3 Physical sciences	9	Basic Research	
	1.4 Chemical sciences	5	Basic Research	
	1.5 Earth and related environmental sciences	3	Basic Research	
	1.6 Biological sciences			
	1.7 Other natural sciences			
2. Engineering and Technology	2.1 Civil engineering	22	Balanced basic and applied research	74
	2.2 Electrical engineering, Electronic engineering, Information engineering	2	Balanced basic and applied research	
	2.3 Mechanical engineering	5	Balanced basic and applied research	
	2.4 Chemical engineering	10	Balanced basic and applied research	
	2.5 Materials engineering	20	Balanced basic and applied research	

¹⁸¹ The total number of study programmes for which admissions have been announced in a given academic year.

	2.6 Medical engineering			Balanced basic and applied research
	2.7 Environmental engineering	13		
	2.8 Environmental biotechnology			
	2.9 Industrial biotechnology			Balanced basic and applied research
	2.10 Nanotechnology			
	2.11 Other engineering and technologies	2		
3. Medical and Health Sciences	3.1 Basic medicine			
	3.2 Clinical medicine			
	3.3 Health sciences			
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries			
	4.2 Animal and Dairy science			
	4.3 Veterinary science			
	4.4 Other agricultural sciences			
5. Social Sciences	5.1 Psychology and cognitive sciences			
	5.2 Economics and Business			
	5.3 Education			
	5.4 Sociology			
	5.5 Law			
	5.6 Political science			
	5.7 Social and economic geography			
	5.8 Media and communications			
	5.9 Other social sciences			
6. Humanities and the Arts	6.1 History and Archaeology			
	6.2 Languages and Literature			
	6.3 Philosophy, Ethics and Religion			
	6.4 Arts (arts, history of arts, performing arts, music)			
	6.5 Other Humanities and the Arts			
Total		100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the previous five-year period based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

3.2.1 Prestigious R&D&I awards granted during the evaluation period

Two awards were achieved in the given period. These are the award given from the Czech Chamber of Authorized Engineers and Technicians Active in Construction (ČKAIT) to prof. Ing. Radim Čajka, CSc., for the contribution to the development of civil engineering and implementation of innovative design solutions. Doc. RNDr. František Kresta, Ph.D., was awarded by the Czech Road Society for long-term activity and achievements in the road sector. The faculty strategically supports its staff in participating in competitions that reward innovation and increase the economic and social impact of the results. The goal is an economic and social impact to increase the visibility of the Faculty of Civil Engineering.

3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Academics are regularly invited to join international boards of scientific journals in various fields of civil engineering. Such membership includes journals listed in Web of Knowledge database and other outstanding high impact factor publications. Faculty members act in councils of journals focusing on areas such as sustainable building industry, modern building materials or transport infrastructure. Some workers are addressed to be guest editors of special issues focusing on new research topics. This activity reflects the professional qualification of the staff, strengthens international scientific cooperation and increases the prestige of the faculty,.

3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

During the time period, several invited lectures were given either at the invitation of the assessed research organization/institution or invited lectures were given at international conferences. The selected lectures confirm the representation of academics across different areas of civil engineering. Invited lectures by academics have had a significant response from the professional community.

3.2.4 The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Among the most important lectures given by foreign scientists and other guests relevant to the field of R&D&I at the evaluated unit were contributions focused on innovations in architecture and education, such as the creation of an inclusive university ecosystem and the use of Hi-Flex methods in lessons of architecture, or the application of trenchless technologies in practice. The presentations also covered key topics such as the design of earthquake-resistant structures, recent

developments in the design of road superstructures and the use of smart concrete capable of detecting stress and damage, bringing new opportunities in the field of sustainability and building safety. Lectures on concrete typology and the implementation of Building Information Modelling (BIM) methods in Finland also made an important contribution to the knowledge of modern approaches to design and management of construction projects.

Another important area was the contributions focused on the robustness of building frame structures to extreme loads, which provided new insights into securing structures against unexpected events and increasing their reliability. In addition to technical and engineering topics, papers with a cultural and historical focus were also presented, such as an analysis of folkloristic Art Deco in Latvia or contemporary urban and architectural design in Poland. A mathematical approach to engineering applications through differential equations was also important.

On the basis of these lectures mentioned in section 3.2.3 and 3.2.4, it was possible to create a space for the interconnection of science and research between our institution and foreign experts, which contributed to the expansion of scientific contacts and the establishment of new and promising collaborations. The participation of our staff in these lectures not only deepened their expertise, but also enabled the sharing of experience, approaches and innovative ideas in key areas of research and development. In this way, the scientific environment has been enriched and the competences of our team have been strengthened, which has a direct benefit for the development of sustainable and innovative research.

3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Academic staff of the Faculty of Civil Engineering actively participate in the evaluation of R&D&I in project and programme calls. Faculty experts serve as members or chairs of evaluation panels of major grant agencies and institutions, contributing to shaping the strategic direction of research and innovation. In the evaluated period, the faculty members were involved, among others, in chairing and membership in the evaluation panels P104 and P105 of the Czech Science Foundation (GA ČR), membership in the Expert Panel II of the Radioactive Waste Repository Authority (SÚRAO), assessment of projects within the Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences, and also as evaluators of projects of the Technology Agency of the Czech Republic. At the European level, the faculty is involved in the activities of the European Committee for Standardization (CEN TC 396 Earthworks), focusing on alternative materials in earthworks. This active participation of the faculty staff in R&D&I evaluations at national and international level confirms the professional quality and prestige of the faculty, contributes to the development of research and innovation and supports the transfer of research results into practice.

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
Prof. Ing. Radim Čajka, CSc.	The Medal of the Czech Chamber of Authorized Engineers and Technicians Active in Construction (ČKAIT) on the occasion of 30th anniversary of ČKAIT 1992–2022, Prague 2022	ČKAIT (the Czech Chamber of Authorized Engineers and Technicians Active in Construction)
doc. RNDr. František Kresta, Ph.D.	Prof. Špůrek bronze medal	Czech Road Society

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
doc. Ing. Petr Konečný, Ph.D.	Periodica Polytechnica – Civil Engineering, ISSN: 1587-3773 (online)
doc. Ing. Vlastimil Bílek, Ph.D.	Cement lime concrete (Cement wapno beton) ISSN-1425-8129, (Editorial Board Member)
doc. Ing. Vít Křivý, Ph.D.	Materials, ISBN 978-3-0365-6405-3, 2023, Corrosion Properties and Mechanism of Steel
doc. Ing. Bc. Oldřich Sucharda, Ph.D.	Materials, ISSN: 1996-1944
doc. Ing. Bc. Oldřich Sucharda, Ph.D.	Buildings, ISSN: 2075-5309
Ing. Kristýna Vavrušová, Ph.D.	Buildings, ISSN 2075-5309, Special Issue: Experiment and Analysis of Building Structures
prof. Ing. Martin Krejsa, Ph.D.	Transactions of the VSB – Technical University of Ostrava, Civil Engineering Series, ISSN: 1213-1962 (print), 1804-4824 (online)
prof. Ing. Martin Krejsa, Ph.D.	European Scientific Journal, ISSN: 1857-7881 (print), 1857-7431 (online)
doc. Ing. Pavlína Matečková, Ph.D.	Construction Materials, ISSN 2673-7108.
prof. Ing. Naďa Rapantová, CSc.	Groundwater (Podzemná voda), ISSN 1335-1052

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
doc. RNDr. Pavel Pospíšil, Ph.D.	Engineering Geological and Geotechnical Assessment of Rock Environment	Akademia Gorniczo-Hutnicza AGH Krakow	2019
prof. Ing. Naďa Rapantová, CSc.	Hydrodynamic Testing of Rock Environment	Akademia Gorniczo-Hutnicza AGH Krakow	2019
doc. Ing. Pavlína Matečková, Ph.D.	<i>Complex design of beams made of high - performance concrete.</i>	The 3 rd International Conference on Sustainable Development in Civil, Urban and Transportation Engineering, CUTE 2020. October 21-23, 2020, Ostrava, Czech Republic	2020
doc. RNDr. František Kresta, Ph.D.	Coal combustion products in road construction (keynote lecture)	State Road Agency of Ukraine. Kyiv	2020
doc. Ing. Petr Konečný, Ph.D.	Experimental investigation and modelling of concrete exposed to chlorides	Workshop on Engineering Optimization WEO 2021 IPPT PAN, Warsaw	2021
Ing. Stanislav Endel, Ph.D.	Current Trends in Housing in Central Europe	Frankfurt University of Applied Sciences; Urban Comon Schools	2021
doc. RNDr. František Kresta, Ph.D.	Alternative materials in earthworks – state of the art (keynote lecture)	5th International Seminar on Earthworks in Europe	2022
doc. RNDr. Pavel Pospíšil, Ph.D., prof. Ing. Naďa Rapantová, CSc.	Geothermal Energy Research at VSB Technical University of Ostrava and Vaasa University	International Conference on Geoenergetics and ground-geothermal heat pumps,	2023

		Krakow, Podhale	
doc. Ing. Jan Petrů, Ph.D.	Designing Transport Structures Using The Bim Method	Universidade, Lusófona, Portugal	2023
doc. Ing. Vlastimil Bílek, Ph.D.	Long-term development of mechanical properties of concrete with different water to cement ratio and internal curing ability	Wuhan University and TU Eindhoven, 3rd Int. Conf. On Sustainable Building Materials (ICSBM 2023)	2023

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Heikki Vehmas, M.Sc.	Saimaa University of applied Sciences	Typology of concrete, BIM in Finland	2019
Prof. Florea Dinu, Ph.D.	Politehnica University of Timisoara	Robustness of building frame structures against extreme loading events	2019
Assoc. Prof. Burak Asiliskender	Abdullah Gül Üniversitesi	Generating an Inclusive University Ecosystem: AGU Sumer Campus; Teaching Hi-Flex in Architecture: AGU Arch Remote and Active Education	2021
Doç. Dr. Gökhan Yazıcı	İstanbul Kültür Üniversitesi	Fundamentals of Earthquake Resistant Design	2022
doc. Ing. Jozef Švajlenka, Ph.D.	Technická univerzita v Košiciach, Slovakia	Trenchless Technology in Practice	2022
Prof. Dr. Murat Karacasu	Eskişehir Osmangazi Üniversitesi	Highway superstructure design and project	2022
Doc. Renāte Čaupale	Latvia University of Life Sciences and Technologies, Institute of Landscape Architecture and Environmental Engineering	Folcloristic Art Deco in Latvia	2023
dr inż. arch. Joanna Sokołowska-Moskwiak, prof. Oczelni	State University of Applied Sciences in Raciborz	Contemporary Urban and Architectural Design in Poland – Case of Upper Silesia	2023
Dr. Anda Zeidmane	Latvia University of Life Sciences and Technologies	Application of 1st order differential equation	2023
Assoc. Prof. Dr. Egemen Teomete	Dokuz Eylül University, Izmir, Turkey	Self Strain and Damage Sensing Smart Concrete	2023

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the contracting authority/guarantor of the project/programme call	Year
doc. Vlastimil Bílek, Ph.D.	The Chair of Evaluation Panel P104 – "Building materials, architecture and civil engineering"	Czech Science Foundation (GA ČR)	2019

prof. Ing. Jiří Brožovský, Ph.D.	Member of Evaluation panel P104 "Building materials, architecture and civil engineering"	Czech Science Foundation (GA ČR)	2020, 2021, 2022, 2023
prof. Ing. Antonín Lokaj, Ph.D.	Member of Evaluation Panel P 105 – "Structural Mechanics and Construction, Fluid Mechanics and Geotechnics "	Czech Science Foundation (GA ČR)	2019- 2023
prof. Ing. Radim Čajka, CSc.	Member of Evaluation panel P 105 – "Structural Mechanics and Construction, Fluid Mechanics and Geotechnics"	Czech Science Foundation (GA ČR)	2019- 2023
prof. Ing. Martin Krejsa, Ph.D.	Member of Evaluation Panel P105 „Structural Mechanics and Construction, Fluid Mechanics and Geotechnics"	Czech Science Foundation (GA ČR)	2023
doc. RNDr. František Kresta, Ph.D.	Alternative materials in earthwork	CEN TC 396 Earthworks – European Committee for Standardization	2021- 2023
doc. Ing. Petr Konečný, Ph.D.	The tasks of basic research in universities	Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences	2021
prof. Ing. Nad'a Rapantová, CSc.	Member of Expert panel II	Radioactive Waste Repository Authority (SÚRAO)	2023
prof. Ing. Antonín Lokaj, Ph.D.	Assessor of projects (VEGA)	Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences (VEGA)	od 2011
doc. Ing. Jan Petrů, Ph.D.	Assessor of projects Transport 2020+ (1–4 public competition)	Technology Agency of the Czech Republic (TA ČR)	2019- 2022

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research¹⁸²) that it has implemented or participated in during the evaluation period¹⁸³. This should be done from the full list in annex tables (Table 3.3.1-3.3.2)¹⁸⁴, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

¹⁸² For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

¹⁸³ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

¹⁸⁴ The evaluated unit shall only fill tables that are relevant to it.

The evaluated unit Faculty of Civil Engineering of VSB-TUO chose the most important research projects that it implemented or participated in during the assessed period. These projects were chosen with regard to their achievements, application potential and contribution to the fulfilment of the mission and purpose of the existence of the faculty. The faculty's research activities focused on current challenges in civil engineering, urban planning, sustainable development and modern technologies, which significantly contributed to the expansion of scientific knowledge and its application in practice.

One of the key aspects of these projects has been their funding from diverse sources, which has enabled projects across a wide range of fields. The faculty has successfully participated in projects supported by, for example, the Czech Science Foundation (GA CR), the Technology Agency of the Czech Republic (TA CR), as well as international programmes funded by Horizon 2020 and the International Visegrad Fund. This wide range of funders demonstrates the ability of the faculty to obtain funding from both national and international sources and reflects the interdisciplinary nature of research.

Experts from all departments of the faculty participated in the implementation of these projects, which stresses out the interdisciplinary nature of the research. For example, the Department of Structures, the Department of Structural Mechanics, the Department of Building Materials and Diagnostics of Structures, the Department of Geotechnics and Underground Engineering, the Department of Transport Constructions and the Department of Building Environment and Building Services, among others, were involved, which enabled the integration of diverse expertise and approaches. The projects also included cooperation with other parts of VSB-TUO and important partners from academia and industry, which contributed to the effective transfer of results into practice and strengthening the position of the faculty in the national and international context.

An important part of these projects has been to link theoretical research with practical applications, resulting in advances in areas such as the development of more durable building materials, efficient use of industrial by-products, advanced numerical modelling, urban planning and water resource management. The results of these projects have a direct impact on improving the safety and sustainability of buildings, contributing to environmental protection and promoting innovation in construction industry and related fields.

The interdisciplinary nature of the projects, the broad involvement of experts from different departments of the faculty and the collaboration with external partners have strengthened the faculty's ability to respond to the complex challenges of the present time. Through this research, the Faculty of Civil Engineering VSB-TUO has profiled itself as an important centre of science, research and innovation, contributing to the development of sustainable construction and solving current problems at both national and international level. Thanks to these activities, the faculty has significantly enhanced its prestige and increased its visibility in the academic and industrial environment.

3.3.1 Projects supported by public funds

In the role of beneficiary

The project **“Development of iterative algorithms for solving contact problems emerging in the analysis of steel structures bolt connections”** (GA CR) brought significant progress in the field of modelling and numerical solution of contact problems associated with the behaviour of bolted connections in steel structures. This research addresses the limitations of analytical methods,

which often rely on simplifying assumptions and fail to fully capture the real behaviour of connections. Modern numerical approaches typically use penalization methods to approximate non-penetration conditions, but this approach encounters stability problems and high computational demands.

The main contribution of the project was the development of innovative algorithms that exploit non-penetration conditions based on Lagrange multipliers. This approach provides improved numerical stability and physical accuracy of the calculations. The developed algorithms allow for more accurate analysis of the behaviour of bolted joints, especially in the areas of compression, shear and slip loading. With regard to the complexity of real steel structures, which often involve millions of degrees of freedom, the algorithms have been parallelized to increase computational efficiency.

An important aspect of the project was the validation of the numerical results through real-scale experiments, which strengthened the credibility and application potential of the developed methods. These results have direct applicability in advanced design of steel structures where stability, accuracy and efficiency of calculations are crucial.

The project contributed to the mission of the faculty by addressing current challenges in structural engineering and the development of advanced numerical methods. The research results support the sustainability and safety of structures and reinforce the faculty's role as a leader in research on steel structures and their simulations.

The project **“Influence of material properties of high strength steels on durability of engineering structures and bridges”** (GA CR) contributed significantly to the understanding of the material properties, durability and reliability of selected types of load-bearing structural elements made of high strength steels (HSS). The aim of the project was not only to investigate the influence of fatigue damage and corrosion on these elements, but also to develop reliable and theoretically based simulation tools for the analysis of durability and reliability of structures as a function of time, especially under repeated loading.

The project has provided new insights through experiments and a combination of stochastic and numerical simulations. A key contribution was the development of alternative approaches based on the Scalable Probabilistic Approximation method, which allows the fatigue resistance of corrosion damaged details to be assessed without the need for destructive sampling. In addition, new computer models and numerical methods were developed to analyse the durability and reliability of structures as a function of time.

The uniqueness of this project lies in the combination of different aspects – such as the influence of corrosion, fatigue, material properties and long-term reliability – into an integrated analysis framework. Unlike the often-used ad-hoc approaches to assessing the service life of new and existing structures, the project provides comprehensive tools and insights that can be immediately applied in practice.

The project has made a major contribution to the faculty's mission, which focuses on the sustainability and safety of engineering structures. The project results have direct application potential, particularly in the design and maintenance of bridges and other load-bearing structures. The faculty thus strengthens its role in research and development of advanced structural materials and technologies.

The project **“Probabilistic Modeling of the Durability of Reinforced Concrete Structures Considering Synergic Effect of Carbonation, Chlorides and Mechanical Actions”** (GA CR) focused on the development and improvement of the methodology for durability assessment of

reinforced concrete structures, especially with regard to the risk of corrosion of steel reinforcement. A key aspect of the project was to investigate the effect of a combination of carbonation, chloride penetration and mechanical loading on the degradation of reinforced concrete elements, with a focus on transportation structures in temperate climates where structures are exposed to deicing agents and atmospheric carbon dioxide.

Laboratory experiments were focused on the initiation of reinforcement corrosion and the effect of chlorides related to carbonation. In-situ experiments were devoted to measuring chloride deposition and penetration into the structures. The project also made use of an extensive database of chloride profiles obtained from bridges of different ages, which allowed efficient calibration and validation of the computational models. The methodology developed included probabilistic approaches such as Monte Carlo simulation and Latin Hypercube Sampling, and was integrated with finite element methods for analysing the behaviour of the structures.

The key contribution of the project was the development of an effective tool for predicting the service life of reinforced concrete structures which allows fully probabilistic estimation of the durability of both existing and newly designed structures. The project results have direct application potential in the design and maintenance of transport structures, contributing to their reliability, safety and sustainability.

The project has made a major contribution to the faculty's mission and its priorities in the area of durability and reliability of structures. By combining experimental and numerical methods using advanced probabilistic approaches, the project has strengthened the faculty's position as a leader in structural engineering research.

The project **“Sustainable Transformation of Housing Estates of the City of Ostrava”** (TA CR) focused on creating the conditions for the long-term sustainable development of the city of Ostrava by improving the quality and attractiveness of its environment. The main objective was to develop proposals for non-legislative measures for the long-term sustainable transformation of housing estates in Ostrava based on a comprehensive assessment of the current urban, technical, demographic and social situation. These proposals were created so that they could be subsequently implemented by the authorities of the city of Ostrava in their decision-making mechanisms. The project also included the preparation of proposals for specific changes for the three selected housing estates in accordance with the results of the analyses and decisions of the city.

The project involved interdisciplinary cooperation that linked the fields of urban planning, public administration and architecture. A significant contribution was the close cooperation of the research team with the Statutory City of Ostrava as an application guarantor of the project. The results of the project have a high professional level and their application in public administration practice can contribute to the long-term sustainable transformation of Ostrava's housing estates. One of the key aspects of the project was to develop proposals that reflect the current needs of the residents and provide solutions to improve the quality of life in the settlements. The project results include recommendations in the areas of urban planning, technical design and social interventions. These proposals have significant potential to contribute to the sustainability and increased attractiveness of the settlements as a residential part of the city.

The project **“Research and application of Water Information Management as a strategy of smart rainwater management in urban areas of the Moravian-Silesian Region”** (TA CR) focused on improving the efficiency of rainwater management in urbanized areas of the Moravian-Silesian Region in order to address the problem of stormwater and drought. The main objective of the

project was to propose methods of controlled slowing down of surface runoff of rainwater through easily sustainable surface water absorption and retention facilities supplemented with greenery. The proposals also included the use of permeable surfaces as a replacement for impermeable paved areas.

The project also aimed to increase the volume of groundwater, thereby reducing the risks associated with climate change. An important contribution was the development of general sustainable practices for rainwater management that can be applied in different urbanised areas. Another key objective was to develop and implement analytical and predictive tools for smart management of urbanized areas, called Water Information Management, which will enable effective management and planning for water management in urban environments.' focused on improving the efficiency of rainwater management in urbanized areas of the Moravian-Silesian Region in order to address the problem of stormwater and drought. The main objective of the project was to propose methods of controlled slowing down of surface runoff of rainwater through easily sustainable surface water absorption and retention facilities supplemented with greenery. The proposals also included the use of permeable surfaces as a replacement for impermeable paved areas.

The project also aimed to increase the volume of groundwater, thereby reducing the risks associated with climate change. An important contribution was the development of general sustainable practices for rainwater management that can be applied in different urbanised areas. Another key objective was to develop and implement analytical and predictive tools for smart management of urbanized areas, called Water Information Management, which will enable effective management and planning for water management in urban environments.

The project has contributed to improving the sustainability of urbanised areas, supported long-term planning and increased resilience to climate change. The project results include practical proposals for the implementation of rainwater management measures that combine technological solutions with ecological approaches. In addition, the use of green and permeable surfaces has a positive impact on improving the quality of life of urban residents.

This project has significantly strengthened the faculty's position in research on urban planning, water resources management and sustainable development. The project outputs provide valuable tools and methodologies for effective stormwater management in a changing climate.

In the role of another participant

The project **"Influence of Self-Healing effects on structural fatigue life extension of structures made from high performance concrete (InShe)"** (GA CR) was focused on the development of reliable and experimentally based simulation tools that allow time-dependent failure probability analysis of high-value concrete structural elements subjected to repeated loading. The key objective of the project was to investigate the phenomena of autogenous healing of high-value concrete during fatigue damage of structural elements, both through experiments and computer simulations. The results were intended to quantify the self-healing effects and their influence on the life extension of structures.

The project was carried out in cooperation with the Institute of Physics of Materials of the CAS, v. v. i., while the Faculty of Civil Engineering of VSB-TUO acted as another participant in the project. The faculty participated mainly in the development of mathematical models, computer simulations and analysis of experimental data. In addition, the faculty focused on validation of the results and linking the obtained data with practical applications, which contributed to the creation of a comprehensive framework for the study of fatigue behaviour of structures.

The interdisciplinary nature of the project combined materials engineering, structural mechanics

and applied mathematics. This approach allowed detailed investigation of not only the global response of structural elements, but also local processes at the microstructural level. As a result, the project provided new insights into the relationships between microstructure, self-healing processes and fatigue behaviour of high-value concrete.

The results of the project include publications in impacted journals on topics such as fatigue behaviour of high-value concrete, fracture parameter development and experimental validation of microstructural changes. These outputs contribute to the advancement of sustainable construction and the design of structures with extended service life.

The project "**Methods for the verification of safety criteria regarding a geological repository for high level waste and spent nuclear fuel**" (TA CR) was focused on creating a methodology for assessing the safety of deep geological repositories for radioactive waste. The aim of the project was to develop tools and procedures to facilitate the evaluation of whether the proposed operational solutions meet legislative requirements and ensure the repository's adequate safety. This project was an important step in preparing the safety documentation that will serve as the basis for obtaining the necessary permits from state institutions, such as the State Office for Nuclear Safety.

The project focused on developing technical designs and indicators for assessing the safety functions of the geological repository. The Faculty of Civil Engineering at VSB-TUO, which participated in the project as another participant, contributed to establishing key safety indicators, developing software tools, and applying advanced methods for data analysis. Among the main contributions of the faculty was also the evaluation of the long-term stability of the repository and criteria for meeting legislative requirements.

The project had a strongly interdisciplinary character, involving the interconnection of the fields of geotechnics, structural mechanics, nuclear safety and environmental engineering. This approach allowed for a comprehensive safety assessment of the repository, both from an engineering and environmental perspective.

The main results of the project include the development of software tools, such as the "Cluster analysis software LHSforFEFLOW", and expert studies focusing on indicators and criteria to ensure the safety of the different components of a deep-sea repository. These outputs contribute to the development of technologies for the safe management of radioactive waste and support the long-term sustainability of these systems.

The project "**Determination parameters of the backbone routes for transporting heavy and oversized loads**" (TA CR) was aimed at mapping and analysing routes suitable for the transport of heavy and oversize loads in the Czech Republic. The main objective of the project was to create a map of the main backbone routes, which should be subsequently protected, and to elaborate technical recommendations for the design of transport structures in order to adapt these routes as much as possible to the specific requirements of oversized transport.

The project included several key deliverables. The first was the mapping of existing routes, identifying critical points such as junctions, roundabouts, underpasses or bridges. Subsequently, a map of major spine routes was created that included transportation sources and destinations and critical points. The next step was to create vehicle models for software verification of the hauling curves of the transports, which allowed simulation of the throughput at critical points. The project concluded with the development of technical recommendations that included design parameters for transportation structures, including details for ensuring the passability and load capacity of bridges or overpasses.

The project was implemented in cooperation with the main beneficiary, MORAVIA CONSULT Olomouc a.s., the co-principal was the Faculty of Civil Engineering of VSB-TUO. The faculty contributed in particular to the analysis of critical points of routes, creation of maps, modelling of towing curves and creation of technical recommendations for the design of transport structures. The research team of the faculty also focused on the assessment of the passability of at-grade and off-grade crossings and marginally also dealt with the assessment of the load capacity of bridge structures.

The project was multi-disciplinary in nature, combining the fields of transport planning, civil engineering and structural mechanics. This enabled the problem of overloading to be addressed comprehensively from both the engineering and planning aspects.

The main results of the project include a backbone route map, vehicle software models and technical recommendations for the design of transport structures. These outputs represent a significant contribution to optimising over-carriage and ensuring efficient and safe operation on Czech roads.

The project **"Utilization of secondary raw material in geopolymers production"** (H2020) dealt with research and testing of the use of industrial wastes and by-products, namely cement bypass dust (CBPD) and other industrial wastes, in the production of alkali-activated concretes. This project responds to current environmental challenges, in particular the high CO₂ emissions and energy consumption associated with the production of Portland cement, and offers alternative solutions in the form of greener materials.

The aim of the project was to use CBPD, which is produced as a by-product of cement production and contains substances such as KCl, free lime and dicalcium silicate, to produce concrete that meets European standards. The aim was to develop a cement without the use of Portland cement that would meet the quality and performance requirements for industrial use. Emphasis was placed on optimising formulations, developing technological processes and testing the resulting materials for strength, durability and resistance to different conditions. The project was coordinated by the Brno University of Technology. Among the project co-researchers, in addition to the Technical University of Ostrava, the following cooperating partners participated: CEMMAC AS (Slovakia), ZPSV SRO (Czech Republic) and Agencia Estatal Consejo Superior de Investigaciones Cientificas (Spain).

During the implementation of the project, emphasis was placed on linking the academic environment with industrial partners. This approach enabled the exchange of knowledge and experience, which led to the successful implementation of the results into practice. The research team has developed new types of concrete based on alkali-activated slag (AAS) that do not require curing at elevated temperatures, while creating pilot products such as precast railway elements and protective barriers. These products were tested under real production conditions in concrete plants.

The project contributed to enhancing sustainability in the construction industry by reducing the consumption of natural resources and CO₂ emissions. The results of the project include not only new technological processes, but also publications and long-term experiments on the durability and resistance of the developed materials. These outputs have the potential to contribute to the wider use of geopolymers and other green alternatives in practice and to support the transition to a more sustainable construction industry.

The project **"Research and development of a system solution for building structures made of polymers"** was implemented with the support of the Ministry of Industry and Trade of the Czech

Republic. The main objective of the project was to design and develop innovative system solutions for building structures based on the use of polymer materials. These materials are characterized by specific properties such as low weight, high strength, resistance to environmental influences and flexibility, which makes them an ideal choice for modern construction. The organizations involved in the project were Brno University of Technology (VUT), Czech Technical University in Prague (ČVUT), Institute of Polymeric Materials of the Czech Academy of Sciences, PREFA KOMPOZITY, a.s. and STRIX Chomutov, a.s.

The project focused on interdisciplinary cooperation between experts from the fields of materials engineering, structural mechanics and chemical engineering. During the implementation, experimental tests focused on the properties of polymers in various applications of building structures were carried out, and the results of these tests were used for the development of new structural solutions.

An integral part of the project was also the development of mathematical models describing the behaviour of polymer structures under various loading conditions. The project brought significant benefits both for the scientific sphere and for practical use in industry. The results of the project enable a wider use of polymer materials in construction, improving the efficiency of construction and contributing to the sustainability and environmental aspects of construction projects. Emphasis was placed on the application of the results in real construction projects, which contributed to the implementation of modern technologies and innovative approaches in the field.

3.3.2 Contract research activities

During the evaluated period, the Faculty of Civil Engineering of VSB-TUO was involved in a number of significant contract research projects that contributed to the development of the construction industry, infrastructure solutions and environmental protection. All key departments of the faculty were involved in these projects, including the Department of Structures, the Department of Urban Engineering, the Department of Building Materials and Building Diagnostics, the Department of Geotechnics and Underground Engineering, the Department of Civil Engineering, the Department of Architecture, the Department of Transport Engineering, the Department of Structural Mechanics, the Department of Building Environment and HVAC, the Department of Mathematics and the Faculty Laboratories.

One of the projects was "Diagnostics of ZIPP trusses", carried out for Rada Building Ltd. This project involved the diagnosis of structural elements of the prestigious ZIPP system, which provided important insights for the development and safety of modern buildings. Another interesting project was "Performance of special stress tests in the Experimental and Diagnostic Building Centre of VSB-TUO", also realized for Rada Building s.r.o. This project included special stress tests performed in the Experimental and Diagnostic Centre of the Faculty, which enabled precise verification of the durability and reliability of these structures, which are very common in the Czech Republic and Slovakia.

The project "Endoscopy of post-tensioned roof trusses", also carried out for Rada Building s.r.o., focused on the endoscopic examination of prestressed roof trusses. The results of the project contributed to the optimization of diagnostic methods and proposals for improving structural safety. Another important project was the project "Stability analysis of the rock environment of the roadway", implemented for the Road and Motorway Directorate of the Czech Republic. This

project focused on the stability analysis of the rock environment, which is crucial for ensuring the safety of road infrastructure.

Another very well evaluated contract research was the project entitled "Diagnostics of prestressed trusses and roof sheathing of reinforced concrete hall structure", implemented for EKOVA ELECTRIC a.s., focused on the diagnostics of beams and roofing of reinforced concrete hall, which provided important findings for improving the reliability and safety of these structures. Among the projects with architectural overlap is the "Architectural 3D model of the Breda department store in Opava", realized for the statutory city of Opava. This project involved the creation of a detailed 3D model of an architecturally significant building of great heritage value, which contributed to its management and restoration.

In the field of environmental monitoring, we can mention for example the project "Installation of two micrometeorological stations in the CSA quarry area", implemented for Severní energetickou a.s. This project helped to monitor climatic conditions and their impact on the mining area, which contributes to the sustainable development of mining.

These projects, implemented in cooperation with major industrial partners and public administration, not only strengthen the position of the Faculty of Civil Engineering of VSB-TUO as a key partner for practice, but also contribute to the transfer of scientific knowledge into real applications. The involvement of experts from various departments of the faculty has enabled an interdisciplinary approach and effective solutions to complex technical challenges. The results of these projects have a major impact on the construction industry, environmental protection and the development of sustainable infrastructure.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ¹⁸⁵	Project name	Support (in thousands CZK/EUR) ¹⁸⁶				
		2019	2020	2021	2022	2023
Czech Science Foundation (GA ČR)	Probabilistic Modeling of the Durability of Reinforced Concrete Structures Considering Synergic Effect of Carbonation, Chlorides and Mechanical Actions	1 456/ 57 435,89	1 457/ 57 475,34	0	0	0
GA ČR	Effect of gaseous and traffic induced pollutants on the durability of selected construction materials	0	0	0	996/ 39 289,94	1 329/ 52 426,03
GA ČR	Development of iterative algorithms for solving contact problems emerging in the analysis	0	0	0	1639/ 64 654,83	1 663/ 65 601,57

¹⁸⁵ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

¹⁸⁶ Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

	of steel structures bolt connections					
GA ČR	Influence of material properties of high strength steels on durability of engineering structures and bridges	0	0	890/ 35 108,48	1801/ 71 045,36	1 801/ 71 045,36
Technology Agency of the Czech Republic (TA ČR)	Research of siliceous fly ash after denitrification utilisation as a binder, as a blend to cement and alkali activated systems	1 421,3/ 56 067,06	0	0	0	0
TA ČR	Sustainable Transformation of Housing Estates of the City of Ostrava	826/ 32 583,82	1 219/ 48 086,78	422/ 16 646,94	0	0
TA ČR	Community-based participatory planning in urban areas	465/ 18 343,19	499/ 19 684,41	469/ 18 500,98	0	0
TA ČR	Research and application of Water Information Management as a strategy of smart rainwater management in urban areas of the Moravian-Silesian Region	0	0	456/ 17 988,16	919/ 36 252,46	882/ 34 792,89
TA ČR	Research of information modelling in public space with a focus on infrastructure	0	0	0	1 331/ 52 504,93	1 512/ 59 644,97
Total		4 168,3/ 164 429,98	3 175/ 125 246,54	2 237/ 88 244,57	6 686/ 263 747,53	7 187/ 283 510,84
In the role of another participant						
Provider ¹⁸⁷	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
GA ČR	Influence of Self-Healing effects on structural fatigue life extension of structures made from high performance concrete (InShe)	0	0	1 269/ 49 483,3	1 329/ 52 426,03	1 329/ 52 426,03
TA ČR	Methods for the verification of safety criteria regarding a geological repository for high level waste and spent nuclear fuel	0	660/ 26 035,5	1 528,5/ 59 602,26	1 501,5/ 59 230,76	804/ 31 715,97
TA ČR	Impact of geosphere evolution on radionuclide transport from deep repository of radioactive	700/ 27 613,41	1 388/ 54 753,45	1 398,5/ 54 533	1 003/ 39 566,07	0

¹⁸⁷ Ibid.

	waste to biosphere					
TA ČR	Determination parameters of the backbone routes for transporting heavy and oversized loads	810/ 31 952,66	731/ 28 836,29	143/ 5 576	0	0
TA ČR	Research of the gradual flooding of the Karviná part of OKR with the high salinity water on the environment country and the stability of the HDD	0	675/ 26 627,21	990/ 38 604	293/ 11 558,18	0
TA ČR	The development of tool for identification of the main water management risks at the Dyje basin and the methodology addressing their systematic solution in the conditions of climate change	0	120/ 4 733,72	281/ 10 957,3	372/ 14 674,55	122/ 4 812,62
TA ČR	Development of a remote-controlled timber-concrete bridge	0	0	0	0	903/ 35 621,30/
H2020	Utilization of secondary raw material in geopolymers production	562,5/ 22 189,34	654,7/ 25 826,42			352/ 13 885,6
Visegrad Grant	Development of regional network on autonomous systems for structural health monitoring	0	0	0	0	0
Ministry of Culture CR	Historical Landscape in Moravian-Silesian Borderland	621/ 24 497,04	621/ 24 497,04	621/ 24 215,2	583/ 23 732,9	0
Ministry of Trade and Industry CR	Utilisation of fluidized coal combustion products in earthworks	0	0	0	301/ 11 873,76	1 253/ 49 428
Ministry of Trade and Industry CR	Research and development of a system solution for building structures made of polymers	0	0	0	0	1 544/ 60 907,29
Ministry of Trade and Industry CR	The New Generation Modular System for Effective Timber Houses Constructing	0	0	0	0	801,5/ 31 617,35
Total		2 693,5/ 106 252,46	4 849,7/ 191 309,66	6 414,2/ 245 798,81	5 382,5/ 212 327,41	7108,5/ 280 414,2

Table 3.3.2 - Contract research activities

Client ¹⁸⁸	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
ABM VL s.r.o.	Calculation and stability assessment of two gabion wall profiles in the premises of BAKAERT Petrovice s.r.o.			40/ 1577,9		
Agel projekt, s.r.o.	Sealing of the core holes from the floor structure and carrying out a compressive strength test (4 core holes)					2,8/ 110,45/
ARMING spol. s r.o.	Summary of more projects	20/ 788,95		499,5/ 19704,14		
AS PROJECT s.r.o.	Assessment of securing the construction pit of the ice rink in Opava					47,4/ 1869,82
Atelier DEK	Analysis of colour spots on the façade system		10/ 394,47			
AZ GEO, s. r. o.	Providing analysis of seepage and stability conditions of the proposed measures using a mathematical model		60/ 2366,86			
BETOCHEM s.r.o.	Laboratory tests of the functionality of recrystallization mixtures for concrete.					20/ 788,95
Betotech s.r.o.	Laboratory tests and surface treatments	70/ 2761,34				
BETOTECH, s.r.o	Cutting and grinding concrete samples		23,3/ 919,13			
Brno University of Technology	Summary of more projects	40/ 1577,9	12,3/ 485,2	10,7/ 422,09		
CIDEM Hranice	Testing the combination of lightweight slab floor systems	48/ 1893,49				
CIDEMAT Hranice	Floor system resistance tests	4/ 157,79				
City council of Valašské Meziříčí	Analysis and diagnostics of the plasterwork of Žerotín Castle	16/ 631,16				
Czech Association of Engineering Geologists	Preparation of the text of Technical Conditions TP 76 B		110/ 4339,25			
ČEZ Energetické služby, s.r.o.	Analysis of a steam pipe insulation sample					5/ 197,23
DAKR spol. s r.o.	Summary of more projects			36,5/ 1439,84		42/ 1656,8
DEKPROJEKT s.r.o.	Summary of more projects			4,5/ 177,51	4/ 157,79	
DIAMO, státní	Flooding study					2 585/

¹⁸⁸ If the client is from abroad, indicate in brackets the country of origin of the client.

podnik						101972,38
EKOSTYREN s.r.o.	Determination of particle size of ecostyrene particles, bulk density, water content					2 CZK 78,89 EUR
EKOVA ELECTRIC a.s.	Summary of more projects	302,8/ 11944,77	7/ 276,13			
ENVlprojekt CZECH s.r.o.	Mapping of landslides, preparation of landslide maps, calculations of landfill stability in 2D sections and hydrogeological assessment.		145/ 5719,92			
G E T s.r.o.	Numerical model of Halámky - Krabonoš			120/ 4733,37		
GASCONTROL, společnost s r.o.	Assessment of the foundations of the DN500 pipeline bridge – Cukrovar Opava, probes and sampling				129,6/ 5112,43	
GasNet Služby, s.r.o.	Assessment of the influence of seismic activity during blasting of the Děpoltovice quarry on the nearby high pressure gas pipeline DN 100 Nejdek, 2nd stage					99,9/ 3940,82
GEOoffice,s.r.o.	Design of the Berliner wall for the Kopřivnice WWTP – construction of the DN-3 dosing tank.		20/ 788,95			
GePS-Geotechnik, s.r.o.	Update of the computational model of the sewer collector D.		15/ 591,71			
GME s.r.o.	Laboratory testing of concrete					6/ 236,68
Groundwater Consulting Services s.r.o.	Development of hydrogeochemical models and interpretation of monitoring data - Mine water protection		150/ 5917,15			
Heimstaden Czech s.r.o.	Summary of more projects					150/ 5 917,15
HG partner s.r.o.	Analysis of seepage and stability conditions in profile No.4 for the action "Flood protection of the village Lužec nad Vltavou"			5/ 197,23	170/ 6 706,1	
Honeywell International s.r.o.	Corrosion details analysis		260/ 10256,41			
Hrušická stavební spol. s r.o.	Determination of physical and mechanical properties of the material		22/ 867,85			
I.F.T. Pískovny	Summary of more projects	28,9/ 1140,03	30/ 1183,43			
IDS - Inženýrské a dopravní	Inclinometric measurements in the area of Strání, Dolina				135/ 5325,44	54/ 2130,17
IMECON Containers	Mechanical connections of frame corners of steel thin-walled	107/ 4220,9				

	containers					
ING & PARTNERS s.r.o.	Design and assessment of recycled material for use in pavement construction layers					32/ 1262,32
Ing. Tomáš Ryž	Semi-destructive measurement of wood			4,9/ 193,29		
Ing.arch. TZOUMASOVÁ TAťANA	Summary of more projects	3/ 118,34			3/ 118,34	
IPG technik s.r.o.	Tests-Application of concrete as part of a mould for plastic injection moulding		10/ 394,47			
ITAS STORE, s.r.o.	Determination of mechanical-physical properties of structural elements made of polyurethane including numerical simulations of material properties and solved geometry.					26/ 1025,64
Kovoprojekta Brno a.s.	Assessment of the method of establishing the galvanizing plant in Brno-Kuřim					25/ 986,19
LADISLAV PROCHÁZKA	Mycological assessment of the sampled rafters		36/ 1420,11			
LB Cemix, s.r.o.	Geodetic and geotechnical monitoring of the closing slopes of the Kotouč limestone quarry	110/ 4339,25	190/ 7495,06	90/ 3550,29	190/ 7495,06	90/ 3550,29
LB MINERALS, s.r.o.	Geotechnical monitoring of the dam					10/ 394,47
Liberty Ostrava a.s.	Determination of bearing capacity of 3 types of mine reinforcements.					52/ 2051,28
Maxion Wheels Czech s.r.o.	Endoscopic investigation of corrosion of prestressing reinforcement of trusses in the Maxion company					85/ 3353,05
Mgr. Lucie Augustinková, Ph.D.	Preparatory building-technical survey of the ice house building p.no.2/2 and the gatehouse building p.no.10, Nová Horka				16,5/ 650,88	
MINOVA BOHEMIA	Determination of the mechanical properties of the product "ADIBET TP-T" after 6 and 24 hours - completion of documents	17/ 670,61				
Moravia Containers, a.s.	Evaluation of container load tests		27/ 1065,08			
MORYS s. r. o.	Determination of compressive strength of ceramic bricks	5/ 197,23				
Municipal cinema Kosmos Třinec	Diagnostics and structural engineering survey of the roof structure		78/ 3076,92			69/ 2721,89
Municipality of Vojkovice	Summary of more projects					90,20/ 3558,17

OKD, a.s.	Monitoring and measures to stabilize the reinforcement of the ČSM Sever intrusion pit		100/ 3944,77			
P - PROJEKTA spol. s r.o.	Stability assessment of the slope in Orlová, Lesní and Školní streets in connection with anthropogenic interventions into the slope.				50/ 1972,38	
Pokorný Martin, Ak. soch.	Analysis of historical surface finishing		32/ 1262,32			
Povážská cementáreň, a.s. (SLOVAKIA)	Research and Development - Cohesion of H-cement concrete with steel reinforcement and fibre concrete with H-cement 90KHI/2017			60/ 2366,86		
Projekce Guňka s.r.o.	Building and technical survey of the load-bearing steel structure of the production hall of Wienerberger s.r.o., Šlapanice.					72/ 2840,23
První inženýrská, s.r.o.	Analysis of concrete samples for the presence of aluminate concrete.			10/ 394,47		
PS BRNO, s.r.o.	Elaboration of a proposal for a solution to eliminate the cause of deformations on the gabion wall in the premises of Beakert Petrovice			5/ 197,23		
Rada Building s.r.o.	Summary of more projects			1 161/ 45 798,81	1 572,5/ 62 031,53	1 343 52 978,28
REVLAN s.r.o.	Summary of more projects		12,4/ 489,15	104,9/ 4 138,06	150/ 5 917,15	
Road and Motorway Directorate of the Czech Republic	Stability analysis of the rock environment of the roadway	205,7 8 114,39				
S.V.I.S. Trade a.s.	Summary of more projects		18/ 710,05	20/ 788,95	30/ 1 183,43	30/ 1 183,43
Severní energetická a.s.	Installation of two micrometeorological stations in the CSA quarry area					170/ 6 706,11
SG Geotechnika a.s.	Chemical analysis of tailings samples including electron microscope images of selected fly ash samples					48/ 3 789,98
SSI Schäfer s.r.o.	Diagnostics of standardized railings	29,6/ 1 167,65		243/ 9 585,79	165 CZK 6508,87 EUR	67,6/ 2 666,65
Stanislav Dobiáš	Removal of bores and strength tests, measurement of floor flatness Comparison with technical data sheet, proposal of measures					15/ 591,71
Statutory town	Assessment of defects of loggias			18/ 		

of Karviná	and balconies in ul. Fryštátská			710,05		
Statutory town of Opava	Architectural 3D model of the Breda department store in Opava					280/ 11045,36
Statutory town of Třinec	Diagnostics and building technical survey of the roof structure.	128/ 5 049,3				
Stavební a rozvojová s.r.o.	Diagnostics of the Bohumín-Pudlov water tower from 1961				163/ 6 429,98	
Strojírny a stavby Třinec, a.s.	Diagnostics of the lower structure of the footbridge over the Olše River near the school in Jablunkov		50,2/ 1 980,27			
Střední průmyslová škola a Obchodní	Diagnostic work - determining the load-bearing capacity of old panels					63/ 2 485,2
Technical University of Liberec	THMC process modelling method				91,3/ 3 601,57	
Technický a zkušební ústav	Summary of more projects		20/ 788,95		35/ 1 380,67	77/ 3 037,47
TESLICE CZ s.r.o.	Diagnostics of the palisade construction		20 CZK 788,95 EUR			
Tomáš STRAUB s.r.o.	Analysis of input raw materials, basic technological tests			49/ 1 932,93		
Transport Company of Ostrava	Summary of more projects			51/ 2 011,83	67,5/ 2 662,72	
TRITREG - TŘINEC, s.r.o.	30-days-long seismic monitoring in a building (390 Frýdecká Street), evaluation of the dynamic response of the company				65/ 2 564,1	
TÜV Rheinland Česká republika s.r.o	Visual reconnaissance, passportisation and visualisation of the blast furnace wall lining	20/ 788,95				
WITKOWITZ ENVI a.s.	Summary of more projects			120/ 4 733,72	149 5 877,7	
Značky Morava, a.s.	Concrete testing with the help of Calton VS		4/ 157,97			
ŽPSV s.r.o.	Summary of more projects	25/ 986,19			49,5/ 1 952,66	
Total		1 180,2/ 46 556,21	1 453,5/ 57 337,27	2 653,2/ 104 662,72	3 236/ 127 652,85	5 944/ 234 477,31

/Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the evaluated period, based on the overview annex table 3.4.1 (it is recommended to indicate

results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts¹⁸⁹, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

In the assessed period the Faculty of Civil Engineering of VSB-TUO has achieved a number of significant research results which have a real impact on society or are heading towards such an impact in the near future. Below are examples of the 10 most significant results, which have been selected with regard to their application in practice, contribution to different areas of society, support for sustainability and interdisciplinary approach.

The result of "**FSCProbCalc**" focused on the development of a software tool for probabilistic assessment of structural reliability using the POPV (Probabilistic Assessment of Failure Behaviour) method. This software allows risk analysis and reliability prediction of structural elements based on probabilistic calculations. Its main objective was to create an efficient tool that takes into account uncertainties and variability in materials, loads and other factors affecting the reliability of structures.

FSCProbCalc uses advanced algorithms to model and simulate scenarios of possible structural failures. This approach enables the identification of potentially critical areas and optimization of structural designs to be safe, efficient and meet the requirements of applicable safety standards. The software is particularly applicable to the design of structures with high demands on durability and safety, for example in the construction, energy or engineering sectors.

The main benefit of the project is the creation of a tool that provides engineers and scientists with the ability to analyse the reliability of structures in detail, helping to minimise the risk of failure and improving the overall safety and efficiency of structural designs. The results of the project are applicable in both research and practice, and the software contributes to the modernisation of approaches to structural design and to the development of innovative and sustainable technologies. FSCProbCalc represents a significant step forward in the field of probabilistic assessment and brings new possibilities for the analysis and design of reliable structural solutions.

Result "**Development and research of HPC and UHPC for the production of concrete sinks, kitchen countertops and concrete furniture**". The research led to the development of high-strength concrete mixes (HPC and UHPC) that are used for the production of subtle concrete elements such as sinks, kitchen countertops and urban furniture. These mixes allow for high design variability and long service life.

Positive impacts include the development of innovative and aesthetically appealing products that find a place on international markets. Users include concrete product manufacturers, architects and designers who use these materials to create modern and sustainable furnishings. The economic benefits lie in increasing the competitiveness of Czech products and supporting exports. In terms of sustainability, HPC and UHPC mixes contribute to the longevity of products and recyclability, thus reducing the consumption of natural resources. The gender dimension was not explicitly addressed, but the results support the development of design and technology accessible to all.

¹⁸⁹ See Terms definition.

Result **"Long-term sustainable transformation of the housing estates of the Statutory City of Ostrava"**. The project created a strategy for the long-term sustainable transformation of housing estates in the city of Ostrava. The strategy includes an analysis of current conditions, a proposal for measures and model pilot projects for three sites.

The positive impacts include an increase in the quality of life of the residents of the housing estates through the improvement of public space, adaptation to current conditions and the involvement of the residents in the management of the sites. Users include local authorities, architects and urban planners, who can use the results of the project to plan and implement revitalisations. The economic benefits consist in increasing the attractiveness of the settlements and improving their residential function, which promotes urban development.

The strategy contributes to sustainable urban development by promoting inclusion, participation of residents and improving environmental conditions. The gender dimension has been taken into account through the involvement of different groups of inhabitants in participatory planning.

Result **"The Toolkit of Participative Planning in Urban Space"**. The methodology of participative planning in urban space is an innovative tool that responds to the growing need for more effective public participation in the preparation and implementation of planning and strategic documents. Nowadays, municipalities and cities are increasingly required to involve the public in the decision-making process when planning projects. This methodology provides practical procedures for the use of various participatory techniques such as questionnaires, feeling maps, discussion meetings with residents, information stands or online platforms.

The positive impacts of this project on society are significant. The methodology allows for a deeper involvement of residents in the planning of public space, leading to a higher level of acceptance of the planned changes and an improved quality of life for urban residents. Users of the methodology include city and municipal authorities, planners, urban designers, as well as external companies in charge of preparing planning documents. Thanks to the methodology, these actors can better adapt their projects to the needs of citizens and plan resources more efficiently.

Result **"Certified methodology for evaluation of the degree of threat to the stability of disposed MMW during watering in KSB"**. The certified methodology offers a comprehensive approach to assessing the stability of the Main Mining Works (MMW) in the Karviná Sub-basin (KDP) as a result of their flooding. The methodology takes into account the risk of surface deformation or collapse of structures, which has a direct impact on the safety of the surrounding environment and public space.

Positive impacts on society include increased safety of the population and infrastructure in areas affected by mining activities. Users of the methodology include mining companies, administrative authorities and local authorities, who can use it for planning measures and risk prevention. The economic benefits include reducing the costs of repairing damage caused by deformation or collapse of mining operations, as well as preventing losses associated with threats to property and lives.

The methodology contributes to sustainability by minimising the negative impacts of mining activities on the environment and public space. The gender dimension was not explicitly addressed, but the research findings are relevant to a wide range of users and contribute to the protection of public health and safety.

Result **"Functional sample of fiber optic sensor"**. The development of a three-axis vibration sensor based on Michelson fiber optic interferometers represents an innovative solution in the field of

vibration measurement. This sensor enables accurate vibration sensing in three orthogonal axes with high sensitivity and a wide frequency range. This makes it suitable for applications such as monitoring underground structures, excavation of construction pits, mining blasting or demolition. The sensor is passive, which allows it to be used even in environments with high electromagnetic interference or explosion hazard.

Positive impacts on society include increased safety during construction or mining operations due to more accurate monitoring of seismic and acoustic effects. The technology enables optimization of work processes and reduction of risks to workers and the surrounding environment. Users of the technology include construction companies, mining companies and public administrations that ensure infrastructure safety. Measurable economic impacts include more efficient scheduling of construction and mining operations, which reduces repair costs and minimizes potential losses due to accidents.

In terms of sustainability, the sensor supports a safe working environment and contributes to the long-term protection of the infrastructure. The gender dimension was not explicitly considered in this project, but the results are universally applicable and contribute to improving the working environment conditions for all involved.

Result of **"A pilot plant of monitoring of small- and large-range blast parameters by fibre-optic sensors"**. The project focused on the development and testing of an optical fibre sensor system for continuous monitoring of small and large scale blasting. The system consists of a working sample of an optical fibre sensor (V1) and an evaluation unit (V5), which were implemented as part of a semi-operation in cooperation with Subterra a.s. for the D - PAD1b metro construction site in Prague. The sensor system was designed to measure vibrations in three orthogonal axes with high accuracy and without the need for an operator.

The key benefit of the project is to increase safety and efficiency in monitoring blasting operations. The fibre optic sensors were placed in buildings where there was no damage to the sensors and no restriction of construction work. Due to their passive operation and resistance to electromagnetic interference, the sensors could be installed even in challenging environments, such as near explosive materials. Data was recorded at 200 kHz and then processed by an evaluation unit that applied the Fingerprint module. This module, based on wavelet analysis, compared the acquired signals with reference blasting signals stored in a database. As a result, the search events were automatically detected with an accuracy of 85% on the Z-axis.

The project brings significant technological and economic benefits. It enables optimisation of construction processes, reduction of manual monitoring costs and minimisation of risks to workers and surrounding infrastructure. It also promotes sustainability by reducing environmental impacts and protecting the surrounding environment.

The gender dimension was not explicitly considered, but the project results contribute to a safer working environment for all involved. This project represents a significant step forward in the field of engineering seismicity monitoring and its results have a wide application potential in infrastructure and industrial projects.

Result of **"Determination of the functionality of recrystallization additives on artificially created cracks in concrete specimens"**. The aim of the project was to verify the functionality of recrystallisation admixtures for concrete on samples with artificial cracks. The research focused on two specific admixtures - H Crystal from Aplix and Xypex Concentrate from Xypex. As part of the project, the FCE VSB laboratory staff prepared concrete samples that were subsequently disturbed to simulate cracks. Subsequently, the aforementioned recrystallization products were applied to

these cracks and their performance was analysed in detail.

The main contribution of the project is the investigation of the properties and effectiveness of the recrystallisation compounds, which have the potential to contribute significantly to the durability and resistance of concrete structures. Recrystallisation admixtures allow the spontaneous healing of cracks in concrete, reducing the need for costly repairs and extending the service life of structures. This has significant implications for the sustainability of the construction sector as it contributes to minimising resource consumption and reducing environmental burdens.

The results of the project are particularly relevant for concrete producers, construction companies and designers working with concrete structures. The benefits include not only increased quality and durability of the structures but also reduced maintenance costs.

Although the gender dimension was not explicitly addressed, the project results support an inclusive and sustainable approach to construction. The project brings technological innovations with direct application in practice and contributes to the development of modern methods in the field of materials engineering.

Result "Determination of indicators and criteria for ensuring the security functions of the deep storage". This project defined indicators and criteria for the assessment of the safety of a deep repository for high-level radioactive waste. The results will be used by the State Nuclear Safety Authority (SNSA) in the assessment of the safety documentation of deep repositories.

Positive impacts on society include increased safety in the management of high-level radioactive waste, which has a direct impact on the protection of public health and the environment. Users of the results include governmental institutions that oversee nuclear safety and companies involved in the construction and operation of repositories. The economic benefits consist in a reduction of the risks associated with potential accidents and in more effective safety planning.

The project contributes to sustainability by ensuring long-term environmental protection and safe waste management. The gender dimension has not been explicitly addressed, but the results contribute to the protection of the whole society without discrimination.

Result "A model of pumped storage hydropower". The project focused on the design and implementation of a laboratory model of a pumped storage plant with a floating tank, which is intended to test and investigate the characteristics of this type of plant. The aim of the project was to create a scaled-down functional model to simulate the operation of the plant and measure key parameters.

The model consists of seven modules arranged in a hexagonal formation, with one module placed in the centre. Each module has an outer diameter of 608 mm and a height of 1520 mm. The individual modules are connected by water and air pipes, allowing water circulation and simulating the operation of a pumped storage plant. The entire model is housed in a base tank with a diameter of 2850 mm, where it floats on a water surface that simulates a lake or reservoir. The structure includes brackets for mounting the measuring equipment and a base frame to ensure stability.

The main contribution of the project is the creation of a laboratory facility that allows testing and research into innovative approaches to the design of pumped storage plants with floating tanks. This model provides important information on the behaviour of the power system and its optimisation, contributing to the development of renewable energy sources and increasing the efficiency of hydropower plants.

The results of the project are applicable in research and practice, especially in the development of sustainable and innovative technologies in the field of hydropower. The project has the potential

to contribute to increasing the operational efficiency of pumped storage plants and to promoting an environmentally friendly approach to energy production.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ¹⁹⁰	Year of application	Name
R Software	2019	FSCProbCalc.– probabilistic reliability assessment using the POPV method
Vsumm – summary research report	2020	Development and research of HPC and UHPC for the production of concrete sinks, kitchen countertops and concrete furniture
Outstanding analysis, survey, expert output for policy-making	2021	Ostrava: The housing estate, what's the next step? Long-term sustainable transformation of the housing estates of the Statutory City of Ostrava
NmetC – methodology	2021	The toolkit of participatory planning in urban space
NmetC – methodology	2022	Certified methodology for evaluation of the degree of threat to the stability of disposed MMW during watering in KSB
Gfunk Functioning sample	2022	Functioning sample of fibre-optic sensor
Zpilot – pilot plant	2023	A pilot plant of monitoring of small- and large-range blast parameters by fibre-optic sensors
Vsumm – summary research report	2023	Determination of the functionality of recrystallization additives on artificially created cracks in concrete specimens
Vsumm – summary research report	2023	Determination of indicators and criteria for ensuring the security functions of the deep storage
Find – Industrial design	2023	A model of pumped storage hydropower

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

¹⁹⁰ Specify the specific type of result. Add rows as needed.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)¹⁹¹, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).¹⁹²

Additionally, the evaluated unit shall briefly comment on the funds received during the evaluation period from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

The Faculty of Civil Engineering of VSB-TUO has a systematic approach to the transfer of research and development results into practice, which consists in active cooperation with industrial partners, public institutions and other actors. This transfer takes place through the implementation of joint projects, commercialization of R&D&I (Research, Development and Innovation) results, organization of courses, conferences and other professional events, but also through the provision of professional services such as expert opinions or consultations. The faculty also emphasises the systematic search for new users of the results and the development of cooperation with the application sphere.

Typical users of the results of the Faculty of Civil Engineering and the way of cooperation:

1. Industrial partners (e.g. implementation companies, design companies, material manufacturers)

The faculty collaborates with industrial partners on research projects focused on innovations in the field of building materials, structures and technologies. Collaboration includes joint development of new products, materials testing, building diagnostics and other professional and design activities.

2. Public institutions and local authorities

The faculty provides expert consultation and expertise for public procurement, infrastructure design and sustainable projects. It also collaborates on projects focused on regional development and environmental protection.

3. University environment

Research results are transferred into practice through educational activities such as professional courses, seminars and workshops organised for students and professionals.

4. Private entities and foreign users

The faculty cooperates with private entities and foreign partners in the use of research results, for

¹⁹¹ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

¹⁹² If the commercialisation of R&D&I results is carried out in this way.

example through software licensing, expert consultations and the implementation of specialised projects. Key activities also include the organisation of international courses, trainings and conferences focused on modern construction. This cooperation promotes innovation and extends the application of R&D&I results at a global level.

5. International students

The faculty actively attracts self-paying international students and provides education recognition, thus contributing to internationalisation and increasing professional qualifications on a global scale.

Finding new users of the results (examples):

1. Promotion of results through conferences and workshops

Organisation of professional events where research results are presented, such as innovations in UHPC concrete or a model of a pumped storage plant.

2. Collaboration on applied research

The faculty actively reaches out to industrial partners and offers to collaborate on solving current problems in construction practice, leading to new partnerships.

3. Marketing and promotion

Research results are promoted through professional publications, faculty websites, social networks and other communication channels.

4. International cooperation

The faculty develops international cooperation or by offering specialized courses for foreign experts.

5. Cooperation with graduates

The faculty maintains contact with graduates, who often work in the application sphere, and through them expands the range of users of the results.

Commercialisation and evaluation of R&D&I results:

The Faculty of Civil Engineering valorises research results through, for example, the sale of licences (software tools such as Korozeeneck-GUI and FSCProbCalc), the organisation of courses and conferences, the provision of expert opinions and expert consultations. It also supports the creation of spin-off companies and start-ups in the field of civil engineering and technology. An example of the use of the above software tools abroad is the application of Korozeeneck-GUI at California State University Fullerton.

Non-public revenues received during the period under evaluation

During the period under review, the faculty received funding from the following sources:

- **Foreign revenue:** the faculty regularly receives fee funding from international student self-payers, who form a significant part of the international dimension of the faculty. In addition, the faculty provides recognition of foreign education, which contributes to the internationalisation and development of professional qualifications of foreign students who become part of the academic environment of the faculty.

- **Other revenue:** this includes income from the organisation of graduation ceremonies, which are an important part of academic life and underline the prestige of the faculty. It also includes income from the IT department, for example from the use of plotters or other equipment, and rewards for students' professional work, which encourages faculty involvement in research and application activities.
- **Receipts:** The faculty generates revenues through licensing of software tools, which enables the transfer of innovations into practice and the expansion of their user base. Other revenue streams include fees for admissions, expert opinions, professional courses, conferences and activities related to the promotion and presentation of research results, which strengthens its position in the academic and industrial environment.
- **Donations.** These donations often come from industry partners or alumni of the faculty and help fund educational and research activities, thus contributing to the long-term sustainability and development of the faculty.

This comprehensive system of fundraising from non-public, non-grant sources contributes significantly to the sustainability of research activities and the development of the faculty as a whole.

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
Foreign revenues	40/ 1 577,9	46/ 1 818,18	28/ 1 104,53	54/ 2 130,17	92,4/ 3 644,97
Other revenues	59,2/ 2 337,79	60,1/ 2 373,57	49,7/ 1 962,64	76,2/ 3 005,44	86,8/ 3 427,02
Receipts (licences, admission procedure fees)	3 014,5/ 118 915,93	3 853,8/ 152 024,49	2 254,4/ 88 930,88	4 295,5/ 169 453,60	3 801,8/ 149 974,04
Donations	210,4/ 8 302,09	176,6/ 6 968,52	226,8/ 8 946,74	248,8/ 9 816,17	371,5/ 14 654,83
Total	3 324,2/ 131 133,72	4 136,6/ 163 181,18	2 558,9/ 100 944,81	4 674,7/ 184 405,4	4 352,6/ 171 700,86

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF R&D&I

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the evaluated period and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

The Faculty of Civil Engineering of VSB-TUO considers the popularization of science, research and innovation (R&D&I) as a key part of its activities and is actively involved in a wide range of activities aimed at awareness and communication with the general public. The aim of these activities is not only to bring science and technology to a wider audience, but also to motivate young generations to take an interest in technical fields, to promote lifelong learning and to build awareness of the benefits of research and innovation for society. The faculty regularly participates in national and regional events, organises its own popularisation programmes and uses modern communication channels to effectively reach both experts and the general public.

The university and also the faculty offers lifelong learning opportunities, some professional courses are accredited by the Czech Chamber of Authorized Engineers and Technicians active in Construction. The faculty also participates in various activities that connect the academic sphere with the public. The main forms of popularisation include the organisation of and participation in events such as "the Researcher's Night", science presentations at festivals such as Colours of Ostrava, local events such as "The Kopřivnice Technology Days" or specific programmes aiming at the youth, e.g. "Improve Your Technology Day", etc. The faculty also focuses on the popularization of R&D&I results through cooperation with primary and secondary schools, organizing workshops, conferences and exhibitions, online communication on social networks and publishing professional publications.

These activities are designed not only to raise awareness of the faculty's scientific and research activities, but also to promote technical education, strengthen links with the regional community and contribute to the development of society. The Faculty of Civil Engineering is thus not only a centre of research and education, but also an active partner in the popularisation of science and innovation.

Selected R&D&I popularization activities:

1. "The Researcher's Night" and "Improve Your Technology Day"

The faculty regularly participates in national events such as "the Researcher's Night", where it presents the fascinating world of civil engineering and technology to the general public, including children and young people. Similarly, it participates in "Improve Your Technology" events that motivate young people to pursue technical education.

2. Participation in festivals and local events

The faculty presents science at cultural and social events such as the Colours of Ostrava, where it popularises innovations in technical fields. It also participates in local events, such as the "Kopřivnice Technology Days", which promotes awareness of technical education at the regional level.

3. Presentations at primary and secondary schools

The faculty actively reaches out to the young generation through presentations at primary and secondary schools. These activities include lectures, interactive workshops, and demonstrations of research projects that promote interest in technical fields.

4. Conferences organised by departments

The faculty regularly organises professional conferences, such as "Modelling in Mechanics", "Geotechnics" and the new conference "Current Trends in Transport Engineering". These events connect the academic and application spheres and at the same time enable the dissemination of R&D&I results to the professional public.

5. Radio and television appearances

Eminent experts of the faculty, such as prof. Peřínková and doc. Fojtík, participate in radio and television interviews, where they communicate research results and their contribution to society.

6. Architectural and scientific workshops

The faculty organises workshops on architecture, urban planning and technical innovation, which are held in Ostrava and surrounding cities. These events bring together professionals, students and the public.

7. International Summer Schools

The faculty organises summer schools focusing on the built environment, building mechanics, construction, architecture and BIM issues. These schools attract participants from all over the world and promote international cooperation.

8. Architectural exhibitions

Every year the faculty organises architectural exhibitions in various places in the region, where it presents the work of students and professionals and introduces architecture to the general public.

9. Publication of books and handbooks

The faculty is engaged in publishing activities, including the publication of practical handbooks for engineers and the professional public. These publications present research results in a practical and accessible form.

10. Social networks and online communication

The faculty actively communicates on social networks, where it regularly presents research results, professional events and popularization activities. This form of communication reaches a wide spectrum of the public, including the young generation.

These activities of the faculty contribute to the popularisation of technical disciplines, build awareness of the importance of R&D&I and inspire public interest in science and innovation.

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

The Faculty of Civil Engineering VSB-TUO actively focused on the implementation of recommendations from the evaluation report of the International Evaluation Panel from the previous evaluation. These recommendations were reflected in the area of research, application and popularization activities, both at national and international level. The faculty took particular steps to improve in the following areas:

1. Increasing the number of contract research and developing collaborations with external partners.

One of the key recommendations was to increase the number of contract research projects, which the faculty has begun to pursue through increased collaboration with industrial partners and public administration. The faculty has expanded its activities in the field of applied research, especially in the areas of sustainable construction, environmental innovation and modern technologies in transport engineering. Within the framework of this cooperation, projects have been implemented, for example, on infrastructure safety, optimisation of construction processes

and reduction of environmental burdens. The faculty has also established closer cooperation with local authorities, which has led to the implementation of projects with a direct impact on the quality of life of the region's inhabitants.

2. Strengthening support for applied research with an economic impact on society

The faculty paid special attention to projects that have a real economic and social impact. Examples include the development of technologies for the safe storage of nuclear waste and projects aimed at reducing emissions in the construction sector. These activities have been supported both nationally and internationally, and the faculty has improved its ability to transfer technology and research results into practice through licensing and technology transfer.

3. Increase in the number of international projects and collaborations

Another recommendation was aimed at strengthening international collaboration. The faculty was heavily involved in projects funded by Horizon 2020 and other international grant schemes. Thanks to these activities, cooperation with renowned foreign institutions has been expanded, leading to mutual sharing of expertise and increasing the prestige of the faculty internationally.

4. Increased number of patents and intellectual property protection

In response to the recommendations regarding the low number of patents, the faculty has strengthened its activities in the area of intellectual property protection. Internal mechanisms have been put in place to promote the patenting of research results and to support researchers in the patent application process. However, many of the faculty's outputs are in the public domain and protecting them would limit their value and accessibility to the public.

5. Improve participation in prestigious scientific journals and editorial activities

The faculty has focused on improving the quality and visibility of its scientific publications. Incentive mechanisms for publishing in prestigious journals indexed in the WoS and Scopus databases have been introduced. The faculty also promoted the involvement of its academic staff in the editorial boards of international scientific journals, which led to an increase in the international prestige of the faculty.

6. Popularisation of R&D&I and communication with the public

The faculty continued its activities aimed at popularising science and innovation, which were very positively evaluated in the previous evaluation. It has expanded its activities in the area of communication of R&D&I results through events such as "The Researcher's Night" and "Improve your technology Day", as well as through regional activities such as workshops, conferences and presentations at primary and secondary schools. The faculty has also increased its presence on social media, where it regularly informs the public about its scientific and popularisation activities.

7. Supporting young scientists and improving institutional conditions for research

The faculty has established incentive programmes for young scientists and PhD students, which include financial support for the implementation of research projects and opportunities for international mobility. At the same time, research facilities have been improved, and conditions have been created for the effective involvement of young scientists in research.

8. Cooperation with regional governments and transfer of technology into practice

In line with the recommendation to develop cooperation with local authorities, the faculty has established more intensive partnerships with regional governments and other entities. This has resulted in projects aimed at improving the quality of life of the region's inhabitants, for example in the areas of urban planning, sustainable transport and the environment.

9. Support for individual awards for academics

Although previous evaluations have primarily recognised the achievements of PhD students, the faculty has focused on raising the profile of the work of its academics. Incentive schemes have been introduced to encourage their participation in prestigious competitions and awards for research and innovation.

Conclusion

The Faculty of Civil Engineering of VSB-TUO has successfully implemented a number of recommendations made in the evaluation report of the International Evaluation Panel. These measures have contributed to increasing the quality of research activities, strengthening cooperation with industrial partners and the public, raising the visibility of the faculty at national and international level and improving the conditions for research and education. The faculty will continue to strive for the development of these activities and the gradual elimination of identified weaknesses.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
Periodica Polytechnica – Civil Engineering	3.2.	https://pp.bme.hu/ci
Cement Wapno Beton	3.2	https://www.cementwapnobeton.pl/
SÚRAO Radioactive Waste Repository authority	3.2.	https://sura.gov.cz/en/
European scientific journal	3.2	https://eujournal.org/index.php/esj
Ministry of Education, Research, Development and Youth of the Slovak Republic	3.2	https://www.minedu.sk/about-the-ministry/
Projects (2020-2024)	3.3.	https://www.fast.vsb.cz/en/research/projects/2020-2024/
Projects (2016-2019)	3.3	https://www.fast.vsb.cz/en/research/projects/2016-2019/
Utilization of secondary raw material in geopolymers production H2020	3.3	https://cordis.europa.eu/project/id/958445

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Faculty of Safety Engineering (FSE)

FORD: 2 - Engineering and technology

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.¹⁹³ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

Our Mission is to educate creative professionals capable of addressing the security challenges of the modern world and to develop the common discipline of security.

The Visions of the Faculty are centered on our efforts to become a leading educational and research centre in the field of safety in the Czech Republic, recognized and respected internationally. Through high-quality education and scientific research activities, we contribute to the development of society at the regional, national, and international levels. To achieve and disseminate high-quality results, we foster partnerships with educational and research institutions, as well as with public and private sector organizations. We are forming a unified community based on the collaboration of faculty staff and students.

The Faculty is managed by the Dean, supported by four Vice-Deans responsible for key areas: Education, Science and Research, International and External Relations, and Development and Industry Collaboration. This leadership structure ensures effective management, coordination, and development of educational, research, and administrative activities. The faculty's organization, comprising the Dean's Office, academic departments, and specialized units, facilitates efficient decision-making and enables proactive responses to evolving educational and research challenges while upholding high academic standards.

The Faculty conducts multidisciplinary research across three priority areas: Fire Safety, Safety and Security Technologies, and Resilience. These research activities are closely connected with educational programs and long-standing traditions, ensuring that both teaching and scientific work reflect current advancements in the field. The faculty's focus extends from basic to applied research, addressing real-world challenges and strengthening societal resilience.

¹⁹³ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

A significant part of the faculty's research is conducted in collaboration with industrial partners, organizations, and institutions. This ensures practical applicability and alignment with the latest industry needs. High-quality, impactful research remains a core priority, not only for advancing knowledge but also for contributing to societal development. The Faculty also leverages advanced simulation, modelling, and simulator technologies available through the [CESIT](#) facility.

The number of research projects has grown steadily, but the most notable indicator of success is the significant increase in funding, which provides essential resources for further development and staff support. The most strategic projects are funded by national and international grant agencies, with a consistent rise since 2017. Additionally, the faculty focuses on projects supported by ministerial departments, particularly within the Security Research Program of the Ministry of the Interior of the Czech Republic. Project implementation involves teamwork across faculty departments, other university units, and external partners. The Projects Department plays a key role, assisting with identifying suitable grant opportunities, coordinating proposal preparation, and finding both domestic and international partners. This department also supports the economic management of awarded projects. In response to new project calls, the faculty continuously forms new research teams, such as the recently established group focused on alternative energy sources.

Given the increasing number of awarded projects, particularly international and departmental ones, the faculty expects further growth in publications in international journals, showcasing achieved results. This will also lead to the development of significant applied outcomes with practical relevance.

To ensure that research findings directly benefit students, academic staff integrate their expertise into teaching. This approach guarantees that the educational process reflects the latest knowledge and advancements in safety and security fields. The faculty also promotes its research through international and national conferences, regularly attended by representatives from academia, public administration, and industry.

Collaboration extends beyond research to include partnerships with industrial enterprises and public administration bodies. These partnerships often take the form of contract research and non-research economic agreements, strengthening the faculty's ties with the professional community.

The Faculty operates 33 experimental laboratories, with ongoing modernization and equipment upgrades. As part of a recent renovation, a new block of heavy laboratories was constructed, enhancing research capabilities. Some laboratories focus on basic research, such as the spectroscopy, gas chromatography, and thermal analysis laboratories. Others support applied research, particularly in fire-technical characteristics, fire reaction, and SBI testing. The Faculty also operates laboratories for explosion prevention, focusing on technical and safety parameters and conducting related measurements to assess material explosiveness comprehensively. Further laboratories address safety for people and property, such as the ballistic testing laboratory. These facilities are equipped with both stationary instruments and portable devices for fieldwork applications.

The Faculty is a technically oriented institution, building on a long-standing tradition of education in safety and fire protection disciplines. It offers unique programs designed to address modern security threats. The educational process is supported by specialized departments, including the Department of Fire Protection, Department of Occupational and Process Safety, Department of Civil

Protection, Department of Security Services, Laboratory and IT Operations, and the Centre of Simulation Technologies. These units prepare experts to meet the needs of public administration, local governments, and the private sector.

The Faculty offers bachelor's, follow-up master's, and doctoral study programs, all accredited and available in both full-time and part-time formats. It is authorized to conduct habilitation procedures and professor appointment processes in the field of Safety and Fire Protection. The doctoral program Fire Protection and Safety, the follow-up master's program HSE Professional, and the bachelor's program Safety and Security are accredited in English. Currently, the faculty offers four bachelor's, four follow-up master's, and one doctoral study program in Czech. Student enrolment has shown a significant upward trend, particularly in part-time study programs. This growth reflects the increasing demand for specialized education in safety and security fields.

To support the expanding student body, the number of faculty staff has also increased annually. This growth aligns with the expansion of study programs, rising research projects, and the development of specialized units. As the faculty continues to expand its activities, it remains committed to providing adequate support and infrastructure for all academic, research, and professional endeavours.

The faculty's continuous development, supported by international collaboration, modern facilities, and strong industry ties, ensures that it remains a leading institution in safety engineering education and research in the Czech Republic. Our mission is to educate creative professionals capable of addressing the safety and security challenges of the modern world and developing a shared safety and security discipline.

Table 3.1.1 - Staffing per FTE¹⁹⁴

Academic/ Professional position	Total / Of which women					
	2019	2020	2021	2022	2023	Total
Professor	2,9/0,3	3,4/0,5	3,7/0,6	3,7/0,8	4,4/1,0	4/1
Associate Professor	10,7/1,9	10,0/2,0	9,5/2,0	6,2/2,0	9,9/2,0	10/2
Assistant Professor	23,4/13,9	23,2/13,0	27,2/14,9	30,5/17,0	34,8/19,8	34/19
Assistant	0,2/0,1	0,0/0,0	0,7/0,1	0,0/0,0	0,0/0,0	0,7/0,1
R&D Personnel¹⁹⁵	1,5/0,5	3,3/0,7	2,8/0,6	3,7/1,0	3,9/0,8	3/1
Researchers in other categories¹⁹⁶	13,9/4,8	9,3/3,1	7,9/2,3	6,6/0,9	4,8/0,9	13/4

¹⁹⁴ The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

¹⁹⁵ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

¹⁹⁶ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

Technical and economic staff¹⁹⁷	19,9/13,6	20,7/13,8	20,3/13,9	22,8/15,7	24,0/17,6	24/17
Scientific, research and development staff involved in teaching activities	37,86/16,2	37,14/15,45	41,62/17,62	40,88/19,74	52,97/24,75	52/24
Early career researchers¹⁹⁸	2,87/1	2,95/0,95	2,75/0,9	2,29/0,9	2,37/0,98	2/1
Total¹⁹⁹	73,3/35,2	70,5/33,0	73,4/34,7	75,3/37,9	83,6/42,7	83/42

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 (numbers of physical employees and personnel)²⁰⁰

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor					1		3	1	2			
Associate Professor			1		5	1	4	1	2			
Assistant Professor			11	9	7	3	5	2	6	2	1	
Assistant												
R&D Personnel²⁰¹												
Researchers in other categories²⁰²			6	4	2	1	1		1			
Technical and economic staff²⁰³	1	1	5	3	8	8	3	1	2	1		
Scientific, research and development staff involved in teaching activities			12	9	13	4	9	3	12	3	3	
Early career researcher²⁰⁴			1				1		2	1		

¹⁹⁷ Who participates in the management and support of R&D&I in the institution.

¹⁹⁸ See Definition of Terms in Methodology HEI2025+.

¹⁹⁹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

²⁰⁰ The total number of employees/workers as of 31st December of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

²⁰¹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

²⁰² The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

²⁰³ Who participates in the management and support of R&D&I in the institution.

²⁰⁴ See Definition of Terms in Methodology HEI2025+.

Total²⁰⁵	1	1	23	16	23	12	16	5	13	3	1	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2023 (numbers of physical employees and personnel)²⁰⁶

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor							1		3		3	1
Associate Professor					5	1	3		1	1	2	
Assistant Professor	1	1	15	10	13	8	8	3	6	1	3	1
Assistant												
R&D Personnel ²⁰⁷												
Researchers in other categories ²⁰⁸			3	1	2				2			
Technical and economic staff ²⁰⁹	2	2	7	6	6	4	10	8	2			
Scientific, research and development staff involved in teaching activities	1	1	15	10	18	9	12	3	10	2	9	2
Early career researcher ²¹⁰			1				1		1	1		
Total²¹¹	3	3	25	17	26	13	22	11	14	2	8	2

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

²⁰⁵ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

²⁰⁶ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

²⁰⁷ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

²⁰⁸ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

²⁰⁹ Who participates in the management and support of R&D&I in the institution.

²¹⁰ See Definition of Terms in Methodology HEI2025+.

²¹¹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	645	203	702	213	814	264	967	349	1038	376	4166	1405
Master's ²¹²	218	86	245	101	270	105	235	89	201	79	1169	460
Doctoral	89	28	104	37	93	30	66	24	69	24	421	143
Lifelong Learning Courses	14	6	16	10	18	9	28	25	55	39	220	89
Total	966	323	1067	361	1195	408	1296	487	1363	518	5976	2097

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ²¹³ /Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate	1/0		4/0		5/0		5/1		5/1		7/1	
Master's	2/1		4/1		5/1		5/1		5/1		6/1	
Doctoral	2/2		2/2		3/3		3/3		3/3		3/3	
Lifelong Learning courses	2/0		2/0		2/0		2/0		2/0		2/0	
Total	7/3		12/3		15/4		15/5		15/5		18/5	

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics			15
	1.2 Computer and information sciences			
	1.3 Physical sciences	6	Balanced basic and applied research	
	1.4 Chemical sciences	4	Balanced basic and applied research	
	1.5 Earth and related environmental sciences	1	Balanced basic and applied research	

²¹² All master's degree students are listed, regardless of the length of their programme of study.

²¹³ The total number of study programmes for which admissions have been announced in a given academic year.

	1.6 Biological sciences			
	1.7 Other natural sciences	4	Balanced basic and applied research	
2. Engineering and Technology	2.1 Civil engineering	8	Applied Research	67
	2.2 Electrical engineering, Electronic engineering, Information engineering			
	2.3 Mechanical engineering	3	Applied Research	
	2.4 Chemical engineering	5	Applied Research	
	2.5 Materials engineering	3	Applied Research	
	2.6 Medical engineering			
	2.7 Environmental engineering	17	Balanced basic and applied research	
	2.8 Environmental biotechnology			
	2.9 Industrial biotechnology			
	2.10 Nanotechnology	5	Applied Research	
	2.11 Other engineering and technologies	26	Balanced basic and applied research	
3. Medical and Health Sciences	3.1 Basic medicine			5
	3.2 Clinical medicine			
	3.3 Health sciences	5	Applied Research	
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries			
	4.2 Animal and Dairy science			
	4.3 Veterinary science			
	4.4 Other agricultural sciences			
5. Social Sciences	5.1 Psychology and cognitive sciences			12
	5.2 Economics and Business			
	5.3 Education	2	Applied Research	
	5.4 Sociology			
	5.5 Law			
	5.6 Political science			
	5.7 Social and economic geography			
	5.8 Media and communications			
	5.9 Other social sciences	10	Balanced basic and applied research	
6. Humanities and the Arts	6.1 History and Archaeology			1
	6.2 Languages and Literature			
	6.3 Philosophy, Ethics and Religion			
	6.4 Arts (arts, history of arts, performing arts, music)			
	6.5 Other Humanities and the Arts	1	Applied Research	
Total		100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the period of 2019–2023 based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

The Faculty has long been a major player in the field of safety engineering and related research disciplines at national and international level, research activities cover a wide range of topics including fire protection, crisis management, critical infrastructure protection, personal and property security, industrial safety and risk prevention. The Faculty actively cooperates with research institutions, universities and professional organisations in the Czech Republic and abroad. A significant role is played by involvement in international research projects funded by the European Structural Funds, the Horizon Europe programme or within the framework of bilateral cooperation.

The results of scientific research are published in journals indexed in the Web of Science and Scopus databases. Faculty members also actively participate in national and international conferences and workshops. The Faculty is an organizer and co-organizer of a number of professional conferences, both at international and national level. Among the most important international conferences in which it has participated in recent years is the 2022 Loss Prevention Conference, which is one of the world's most prestigious events in the field of risk and safety in the chemical and process industries.

An important pillar of the Faculty's position in the research community is its emphasis on applied research and cooperation with industrial partners. The faculty cooperates closely with the Fire Rescue Corps of the Czech Republic, the Ministry of the Interior of the Czech Republic and other public sector entities. Research projects focused on safety are implemented in cooperation with major companies such as Třinecké železářny, ČEPRO, ABB Group, Honeywell, ArcelorMittal Ostrava, VÍTKOVICE IT SOLUTIONS, ORLEN UniCRE, Research Institute of Occupational Safety, CENIA, Czech Environmental Information Agency, Phonexia, Born Digital, Speechtech, SOFICO-CZ, Linde Gas, Pharmix, University Hospital Ostrava and many others.

The Faculty plans to strengthen its position in the international research community by expanding international cooperation, joining new research consortia and strengthening interdisciplinary research. The Faculty also provides specialised courses and training programmes for the scientific community and professionals, which are focused on new trends in the field of security and crisis management. It also contributes to the development of innovative technologies and methods, including sensor systems, predictive risk analysis and the use of artificial intelligence in crisis management.

The importance of the faculty's position is shown by the prestigious awards it has received in recent years.

In 2021, the State Security Council awarded the faculty with the prize for significant contribution to the development of science, research and education in the field of fire protection, occupational safety, community protection and security services.

In 2022, assoc.prof. Petr Kučera, was awarded the "Red Rooster" prize by the House of Technology České Budějovice in cooperation with the Fire Rescue Corps of the South Bohemia Region.

In October 2023, the Dean of the Faculty received the Golden Rescue Cross from the President of the Czech Republic. In 2023, the faculty was also ranked among the ten best schools in the Czech Republic in the "School recommended by employers" survey.

The voice-bot, developed by faculty experts in collaboration with Phonexia, won the Milipol Innovation Award at Milipol Paris 2023 for its cutting-edge voice biometrics technology. Awarded in the Crisis Management category, it highlights faculty's and Phonexia's innovation in security innovative solutions.

Faculty members are on the editorial and technical boards of the following international journals: Crisis Management (Slovakia), Delta Journal (Slovakia), Kosice Safety revue (Slovakia), Scientific Papers of the Main School of Fire Service (Poland), Safety & Fire Technique (Poland). In addition, academic staff are guest editors for special issues of journals such as Entropy, Polymers, Fire, or as members of the Topical Advisory Panel of Sustainability.

The Faculty publishes journal Transactions of the VSB - Technical University of Ostrava, Safety Engineering Series and participates in the preparation of the peer-reviewed journal Spektrum.

Academic staff of the faculty serve on the scientific boards of prestigious international organizations.

Notable memberships include: EFCE Working Party on Loss Prevention and Safety Promotion in the Process Industries (WPLP), European Emergency Number Association, United Nations Disaster Risk Reduction: Open-ended Intergovernmental Working Group on Terminology and Sendai Framework Indicators, OECD Working Group on Industrial Accidents, NATECH steering committee group, NATO Science for Peace and Security Programme's "Independent Scientific Evaluation Group", UNECE, Joint Expert Group of UNECE Trans-boundary Accident Convention, European Committee for Standardisation: CEN/TC 127/WG 8 - Fire Safety Engineering, ENETOSH The European Network Education and Training in Occupational Safety and Health, International Association of Critical Infrastructure Protection Professionals, Commission on Forest Fire Fighting of the International CTIF (International Technical Committee on Fire Prevention and Fighting) and many others.

The Faculty has established strategic partnerships with leading universities and research institutions around the world. Some of the most important partners include: University of Maryland, USA - Safety Engineering Collaboration, University of Bologna, Italy - Hydrogen Safety, National Technical University of Athens, Greece - Environmental Safety, Physikalisch-Technische Bundesanstalt, Germany - Research on Safety Parameters of Flammable Substances, German Aerospace Center, Germany - Marine Infrastructure Protection, Curtin University, Australia - Mine Water Treatment Technology, University of Stavanger, Norway - Environmental Safety or Akademia Pomorska in Slupsk and others.

The Faculty is one of the expert institutes of VSB-TUO, which provides expert activities in the fields of Occupational Safety and Fire Protection, and prepares expert opinions and analyses for both

public and private entities.

The Faculty collaborates with the integrated rescue system and public administration, working with firefighters, police, paramedics, and government authorities on security methodologies, training, and threat analyses. CESIT – the Centre for Simulation Technologies, a specialized workplace of the Faculty of Safety Engineering, plays a key role, providing long-term support to practitioners. Closely linked to the Department of Population Protection, CESIT primarily cooperates with the Fire and Rescue Corps of the Czech Republic and the Institute of Population Protection, especially through firefighter training held on its premises. Additionally, CESIT conducts training for crisis staff of public administration bodies.

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
Jiří Pokorný, prof. Ing., Ph.D., MPA, dr.h.c. (award given to the faculty, received from the position of Dean)	State Security Council Award	State Security Council, Ministry of Interior Czech Republic
Jiří Pokorný, prof. Ing., Ph.D., MPA, dr.h.c.	Golden Rescue Cross	President of the Czech Republic
Petr Berglowiec, Ing (result created with Phonexia within the project)	Milipol Innovation Award	Exhibition Milipol Paris (organised every two years under the auspices of the French Ministry of Interior)
Petr Kučera, assoc.prof., Ing. Ph.D.	Red Rooster	House of Technology České Budějovice (Fire Rescue Corps of the South Bohemia)

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Jiří Pokorný, prof. Ing., Ph.D., MPA, dr.h.c.	Krízový manažment, ISSN 1336-0019
Jiří Pokorný, prof. Ing., Ph.D., MPA, dr.h.c.	Delta Journal, ISSN 1337-0863
Aleš Dudáček, prof. Dr. Ing	Safety & Fire technique, ISSN 1895-8443
David Řehák, prof. Ing. Ph.D.	Krízový manažment, ISSN 1336-0019
David Řehák, prof. Ing. Ph.D.	Scientific Papers of the Main School of Fire Service, ISSN 0239-5223
Vilém Adamec, assoc.prof. Ing. Ph.D.	Krízový manažment, ISSN 1336-0019

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
Aleš Bernatík, prof. Dr. Ing.	Major Accident Prevention	Faculty of Resource & Safety Engineering, China University of Mining & Technology, Beijing, China	2019
Aleš Bernatík, prof. Dr. Ing	Safety of Hydrogen Technologies	Texas A&M University, USA	2022

Lenka Brumarova, assoc.prof. Ing. Ph.D.	Crisis management in the Czech Republic	Pomeranian University in Słupsk, Poland	2019
Lenka Brumarova, assoc.prof. Ing. Ph.D.	Preparedness in the Czech Republic	University of Delaware, Cybersecurity Initiative, USA	2020
Lenka Brumarova, assoc.prof. Ing. Ph.D.	Risk mapping in the Czech Republic	University of Aveiro, Portugal	2022
Marek Smetana, assoc.prof. Ing. Ph.D.	Possibilities of using virtual reality models in the field of security	Georgian Technical University Tbilisi, Georgia	2023
Marek Smetana, assoc.prof. Ing. Ph.D.	CESIT - Centre of simulation technology	International Scientific Conference: 'Crisis Management - Public Protection - Rescue', Auschwitz, Poland	2022

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Edison Sripaul, prof.	The Mary Kay O'Connor Process Safety Center	Safety in Involving Energy and Digitalised Systems	2023
Ernesto Salzano, prof.	University of Bologna	Hydrogen Sustainability and Safety	2023
Manuela Cecconi, prof.	University of Perugia	Safety engineering for civil protection against natural risks	2023
Luke Anthony Fiorini, dr.	L-Università ta' Malta	Psychosocial and ergonomic aspects related to remote working	2023
Nuno Caseiro, Dr.	portugalského Polytechnic Institute of Castelo Branco	FOREST FIRES - Behaviour drivers & challenges (on-line)	2022
Emiliya Siderova, assoc.prof.	Varna Free University	The Rights of Citizens and National Constitutional Identity	2022
Galina Mileva, assoc.prof.	Varna Free University	Organization and management of the protection of cultural heritage	2022
Dr. Luke A. Fiorini	University of Malta	Psychosocial and ergonomic aspects related to remote working (teleworking) Absenteeism and presenteeism (attending work sick)	2023

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the project/programme call research	Name of the authority/guarantor contracting of the project/programme call	Year
Hana Vykopalová, prof. PhDr. CSc,	SecPro	Safety research of the Ministry of the Interior of the Czech Republic	2023
David Rehak, prof. Ing. Ph.D.	Transport 2020+	Technological Agency of the Czech Republic	2020 - 2022
David Rehak, prof. Ing. Ph.D.	Transport 2030	Technological Agency of the Czech Republic	2023
David Rehak, prof. Ing. Ph.D.	TAČR Éta	Technological Agency of the Czech Republic	2019-2022
David Rehak, prof. Ing. Ph.D.	SECTECH	Safety research of the Ministry of the Interior of the Czech Republic	2021-2023
David Rehak, prof. Ing. Ph.D.	IMPAKT 1	Safety research of the Ministry of the Interior of the Czech Republic	2019-2023

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research²¹⁴) that it has implemented or participated in during the period of 2019–2023²¹⁵. This should be done from the full list in annex tables (Table 3.3.1-3.3.2)²¹⁶, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

1) CIRFI 2019: Critical Infrastructure Resilience Indication (Ministry of Interior of the Czech Republic, No. VI20192022151, 2020-2022)

The aim of the project is excellent research on critical infrastructure resilience. The project determines resilience indicators of selected critical infrastructure sectors (i.e. energy, transport and information and communication technologies) and develops a tool for early identification and assessment of the relevant indicators suitability for specific infrastructure subsystems.

The results of the project are Methodology for identifying the indicators of disrupting the critical infrastructure elements resilience, CIRFI Tool software, 1 book, 1 chapter in a book, 8 articles in journals, and 4 papers in proceedings.

²¹⁴ For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

²¹⁵ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

²¹⁶ The evaluated unit shall only fill tables that are relevant to it.

The application of the project results enables early identification of resilience disruption indicators of critical infrastructure elements. These indicators subsequently provide the assessor with predictive information on the factors that are expected to disrupt the resilience and function of the critical infrastructure element. The implementation of downstream security measures potentially prevents the occurrence of disruptions and thus reduces the cost of remediation caused by the potential occurrence of a disruptive event.

The interdisciplinarity of the project lies in the socio-economic perspective on critical infrastructure protection. Early indication of disruption of critical infrastructure resilience enables the maintenance of vital societal functions, health, safety, security, economic or social well-being.

The mission of the faculty is to educate creative professionals capable of addressing the security challenges of the modern world and to develop the common discipline of safety and security. In this context, the resilience and protection of critical infrastructure can be considered as one of the important tools for the development of safety and security for the benefit of modern society.

The Faculty of Safety Engineering was the coordinator of this project. Another project participant was the Technology Platform Energy Security, which brings together leading national energy companies, software and communication companies, public administration organisations and institutions, and leading Czech technical universities and research institutions.

2) Increasing resilience and safety of railway infrastructure and minimising impacts on other transport infrastructure sectors – SECURAIL (Technology Agency of the Czech Republic, No. CK01000015, 2020-2023)

The aim of the project is to increase the protection, resilience and security of railway infrastructure elements against current and potential future threats. The main results of this project are the Methodology for implementation of technical measures to increase protection of soft targets of railway infrastructure, Methodology for protection of persons during evacuation of passengers from railway stations using microscopic models of movement of persons, and Methodology of procedures for sharing and providing information on threats and incidents on elements of transport infrastructure.

The application potential of the project lies mainly in increasing the resilience and security of the railway infrastructure and minimising the impact on other sectors of the transport infrastructure. The practical application of the methodologies enabled the concerned entities to take practical measures to increase the security of passengers and employees.

The interdisciplinarity of the project lies in the socio-economic perspective on railway infrastructure security. Increasing the resilience of railway infrastructure and minimising the impacts on other transport infrastructure sectors enables the maintenance of health, safety, security, economic or social well-being of people.

The mission of the faculty is to educate creative professionals capable of addressing the security challenges of the modern world and to develop the common discipline of safety and security. In this context, the protection and resilience of railway infrastructure elements against current and potential future threats can be considered an important part of security for the benefit of modern society.

The coordinator of this project was the Czech Technical University in Prague. Other participants of the project were the Faculty of Safety Engineering and the Brno University of Technology. The Faculty of Safety Engineering was responsible for one of the three main project deliverables, which was "Methodology for implementation of technical measures to increase protection of soft targets of railway infrastructure".

3) Smart Spaces Safety and Security for All Cities - S4AllCities (HORIZON 2020, No.883522, 2020 - 2022)

S4AllCities project aims to revolutionize the way smart cities become more protected, prepared and resilient to both physical and cyber-attacks on City soft targets, smart spaces and critical infrastructure networks, by greatly augmenting City Spaces Situation Awareness with intelligence, context and evaluated real-time cyber and physical security threat levels.

The main results of this project are focused on creating 1) a modular yet integrated system of digital twins, 2) a wide array of novel sensing platforms for smart cities, and 3) physical and cyber-security management framework as a policy toolbox for the adoption of best practices and recommendations.

The application potential of the project lies primarily in increasing the preparedness, protection and resilience of smart cities against physical and cyber-attacks on the city's soft targets, smart spaces and critical infrastructure networks. The practical application of the above results is expected to increase the security of smart cities and related infrastructures.

The interdisciplinarity of the project lies in the socio-economic perspective on smart cities security. Increasing the smart cities resilience and minimising the impacts on society and other infrastructure sectors enables the maintenance of health, safety, security, economic or social well-being of people.

The mission of the faculty is to educate creative professionals capable of addressing the security challenges of the modern world and to develop the common discipline of safety and security. In this context, the protection and resilience of smart cities against current and potential future physical and cyber-attacks can be considered an important part of security for the benefit of modern society.

The coordinator of this project was the EXUS Software Monoprosopi Etairia Periorismenis Evthinis (Greece). Other 28 participants also contributed to the project. The Faculty of Safety Engineering was primarily responsible for addressing work package WP9: Impact Creation, Dissemination and Innovation Exploitation.

4) CEVOOH – Centre for Environmental Research: Waste and Circular Management and Environmental Safety (Technology Agency of the Czech Republic, No. SS02030008, 2021-2026)

The aim of the project was to develop methodologies for assessing combined risks, conduct research on safety culture in industrial enterprises, analyse the impact of aging, material degradation and maintenance of technological equipment on accident prevention, and assess cybersecurity in environmental prevention. The project has delivered a range of key results in the fields of circular economy, major accident prevention, and environmental safety. Among the most significant outcomes is the concept of major accident prevention for the Czech Republic, based on the implementation of the SEVESO III Directive, which includes methodological recommendations for risk prevention in industrial operations. The project also contributed to cybersecurity analysis in environmental protection, bringing benefits for securing key industrial and environmental infrastructures. Furthermore, the development of methodologies and software tools for risk assessment will help optimize accident prevention in the industry.

The project has also delivered practical results that are being applied in industrial practice, legislation, and policymaking. The Ministry of the Environment utilizes the findings to develop policies in the field of circular economy. Industrial enterprises can implement risk assessment methodologies into their processes, the academic sector uses the results to further develop scientific knowledge in environmental safety, and professional platforms can leverage analyses and software tools to improve risk prevention.

The project was implemented in collaboration with various university departments, leading to a

significant deepening of interdisciplinary cooperation. Our faculty worked with other partners, including the Faculty of Science at Charles University (environmental impact analyses); Masaryk University's Faculty of Economics and Administration (the economic aspects of the circular economy); the Institute of Chemical Processes at the Czech Academy of Sciences (chemical contamination analyses); and Brno University of Technology (technologies for monitoring and pollution removal).

5) Determination of requirements for the supply of fire water and other fire extinguishing agents to buildings (Ministry of Interior of the Czech Republic, No. VI20192021165, 2019-2021)

The primary objective of the project was to implement, in the form of a certified methodology, a system for dimensioning fire water and other extinguishing agents that accurately reflects the actual fire risk of a given building structure.

The main outcome of the project is the certified methodology: Determination of Requirements for the Supply of Fire Water and Other Extinguishing Agents for Building Structures. This methodology is based on up-to-date statistical data and the fundamental principles of fire dynamics. The first section presents an analysis of statistical data on fires that occurred in the Czech Republic between 2006 and 2020. Based on regression analysis of the collected data, requirements were established for the necessary volume and flow rates of fire water used for the suppression of building fires. A critical component of the methodology involves determining fire water source requirements based on specific geographical areas, ensuring a comprehensive assessment of water demand for firefighting across diverse fire incidents, including those affecting buildings. From these statistical data, clear and easily applicable threshold values were derived for practical use.

The project outcomes will be applied in the revision of ČSN 73 0873, a key technical regulation governing the design and planning of fire water supply systems for buildings. The research is closely linked to topics investigated at the Department of Fire Protection. As part of the project, several student theses, including doctoral dissertations, were completed. Furthermore, the project addressed contemporary issues related to the declining availability of water resources due to climate change, as well as the contamination of groundwater by fire suppression water.

6) Analysis of Safety Approaches in the Design of Fire Safety in Buildings and Proposal for Solutions for the Czech Republic (Ministry of Interior of the Czech Republic, No. VH20182020032, 2018-2020)

The project focused on modernizing and streamlining approaches to fire safety in buildings. Its objective was to optimize the processes of designing, assessing, and approving fire safety measures with an emphasis on building categorization based on risk profiles.

The project had a significant application impact. Its outcomes contributed to the systematization of fire safety approaches, supported more efficient regulation, and provided new foundations for public administration and professional practice. It was carried out in cooperation with VSB-TUO, CTU in Prague – UCEEB, PAVUS, a.s., CTN PO, and K.B.K. fire, s.r.o. The project results have been utilized in professional practice and legislative recommendations, the project contributed to the long-term enhancement of fire safety in buildings in the Czech Republic.

7) Innovative carbon-based sorbents as an effective way of wastewater treatment (Fm EEA/Norway Grants, No. 3213200008, 2022 – 2024)

The project aligned with the faculty's mission, particularly by delivering interdisciplinary outputs, integrating chemistry, environmental protection, AI, and occupational safety. It also produced real-world results, tested under real conditions in collaboration with an international partner, the Slovak University of Technology in Bratislava (STU). The interdisciplinary nature of the project is further

demonstrated by the diverse scientific fields it encompasses, including carbon-based sorbent preparation (chemistry), the development of an AI-controlled wastewater treatment unit for pollutant removal, the assessment of ecotoxicological impacts (ecotoxicology), and the creation of a treatment unit for the elimination of unwanted micropollutants (environmental protection).

The project resulted primarily in the development of two utility models: a device for the preparation of graphene oxide and its modifications, which enabled the production of the required types and quantities of carbon-based sorbents, and a wastewater treatment unit designed to remove pharmaceutically active compounds. This unit successfully eliminated 33 selected pharmaceutical substances and hormones from wastewater. The project outcomes are highly applicable due to their immediate usability in wastewater treatment plants (WWTPs), including industrial WWTPs. The developed technology is highly adaptable, allowing for the substitution of sorbents or ultrafiltration membranes based on the primary contaminants present in the wastewater. Additionally, the environmental impact of the treated water can be assessed in real-time, for example, through the use of test gardens located near the treatment unit. The unit, which operates using artificial intelligence, can be further digitized and equipped with additional sensors to optimize its functionality based on user requirements.

8) Innovation and Development of Tools in the Field of Fire Cause Investigation" (VJ01010046, IMPAKT 1 Program, Safety Research Ministry of Interior Czech Republic)

The project takes an interdisciplinary approach, as fire cause investigation requires expertise across various fields, including electrical engineering, physics, chemistry, and fluid dynamics. It combines theoretical knowledge with large-scale fire experiments, where real room fires are conducted and subsequently used to validate mathematical models of fire ignition and spread.

The project is carried out in collaboration with the Czech Technical University in Prague, with VSB-TUO serving as the main coordinator. Alongside researchers from the Faculty of Safety Engineering, experts from the Faculty of Electrical Engineering and Computer Science contribute to one of the key project outcomes - the development of the FING software application, which aims to simplify fire cause investigation directly at the scene of an incident. Specialists from the Fire Rescue Service of the Czech Republic with expertise in fire investigation are also actively involved.

The project's main results include the FING software and two certified methodologies: one focused on ensuring an efficient fire cause investigation process and the other establishing principles and procedures for on-site fire scene analysis. These key outputs are currently in their finalization phase and will be completed by the project's conclusion. In addition, the project has already produced several publications and two specialized databases: one containing fire-technical characteristics of materials for fire cause investigation and another compiling fire parameters of building furnishing elements. These databases serve as valuable resources in fire investigations and can also be utilized as input data for mathematical fire modeling, both for investigative purposes and research and development activities.

All project outputs are intended for practical application, with the primary end users being the Fire Rescue Service of the Czech Republic. The goal is to standardize fire cause investigation procedures at the national level and integrate best practices from abroad, including the adaptation of supportive investigative methods in Czechia.

9) Competent university teachers for digital learning in OSH (ERASMUS +, 2020-1-CZ01-KA226-HE-094463, 2021-2023)

The [OSHDIGIT](#) project was initiated as an immediate response to the challenges experienced in Occupational Safety and Health (OSH) education during the COVID-19 pandemic. The project brought together university educators and OSH professionals from various institutions, including

the VSB – Technical University of Ostrava (Czechia - coordinator), University of Minho (Portugal), Curtin University (Australia), AUVA (Austria), Stant Manufacturing (Czechia), and ENETOSH. The project aimed to gather experiences, develop practical guides and create new content for digital OSH education. OSHDIGIT aligns with the faculty's mission by supporting educational innovation, enhancing university teachers' competencies, fostering curriculum internationalization and advancing the digitalization of education.

The project delivered three key outputs: 1) OSH Digi Guides – Educational guidelines for teachers to help them navigate the digital environment, protect their health and well-being, and incorporate best practices in digital OSH education, 2) OSH e-Platform – A cloud-based platform designed to facilitate the sharing of digital OSH educational resources, 3) OSH e-Toolkit – A collection of ready-to-use tools to support teachers in digital OSH education, All project activities were complemented by roundtable discussions, focus groups and training workshops, ensuring a robust knowledge transfer and the sharing of best practices among international multidisciplinary teams.

The impacts of the project are reflected in the following areas: Enhanced digital pedagogic competencies (better knowledge of digital tools, critical assessment skills, and the ability to integrate digital resources into blended learning environments), Improved learning experiences for students (access to high-quality digital resources, fostering self-regulated learning and better preparation for their careers in OSH), Expanded access to educational materials and promoted inclusivity in OSH education, Strengthened professional community and Transfer of knowledge and good practices,

The project's outcomes have practical applications in university-level education and the professional training. The digital tools and resources contribute to the modernization of OSH education make it more effective and accessible.

10) Artificial intelligence in emergency call reception (Ministry of Interior of the Czech Republic, No. VI20192022169, 2019-2022)

The project was solved within the framework of the Security Research of the Czech Republic by a consortium of partners: VSB-TUO, VUT Brno, Phonexia, Born Digital and SpeechTech organizations. The project was focused on research and development of artificial intelligence technologies for automated reception and processing of emergency calls in the environment of the integrated rescue system using a voice chatbot (voicebot). The aim of the project was to make technological advances in all areas necessary for the creation of a voicebot, i.e. speech analytics, semantic analysis, dialogue management and voice synthesis. The project created a demonstrator analysing historical data supplied by the user and demonstrating the functionality of the system on real telephone calls in simulated target conditions. That is, without integration into the IRS system, but using information usually available to the IZS. The developed solution includes the integration of the following sub-components: telephony - interconnection of the system with the telephone system, speech to text conversion SpeechToText, dialogue logic module - processing and evaluation of text according to the current state and position in a controlled dialogue substituting real operator behaviour, text to speech conversion TextToSpeech and module for working with data sentence and metadata to the call.

The provider of the project evaluated the project as "excellent results". The project was awarded at the [MiliPol](#) exhibition in Paris (France) in 2023 in the Crises management category. In 2023, the project was also awarded at the DT4REGIONS conference - it was evaluated as the "Most Innovative Solution" out of 12 finalists selected by the committee.

Due to the great application potential of the project, the Ministry of the Interior of the Czech Republic decided on a second (follow-up) project to address the interconnection of the voicebot with the existing infrastructure of the emergency call reception system.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ²¹⁷	Project name	Support (in thousands CZK/EUR) ²¹⁸				
		2019	2020	2021	2022	2023
ERASMUS+	cumulatively	108/ 4 260	2 695/ 106 312	498/ 19 645		
Ministry of Interior	cumulatively	25 311/ 998 461	23 839/ 940 394	26 655/ 1 051 479	16 621/ 655 661	18 830/ 742 801
Technology Agency of the Czech Republic	cumulatively	732/ 28 876	609/ 24 024	56/ 2 209		1 395/ 55 030
EEA and Norway Grants	cumulatively				556/ 21 933	3 151/ 124 300
Total		26 151/ 1 031 598	27 143/ 1 070 730	27 209/ 1 073 333	17 177/ 677 594	23 376/ 922 130
In the role of another participant						
Provider ²¹⁹	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
ERASMUS+	cumulatively	554/ 21 854	138/ 5 444	301/ 11 874	218/ 8 600	138/ 5 444
Ministry of Interior	cumulatively	3 822/ 150 769	1 180/ 46 548	1 828/ 72 111	1 278/ 50 414	
Ministry of Labour and Social Affairs	cumulatively	2 250/ 88 757	2 250/ 88 757			
European Research Executive Agency	cumulatively		184/ 7 258	180/ 7 101		
Ministry of Industry	cumulatively		7 721/ 304 576	2 267/ 89 428	858/ 33 846	693/ 27 337
Technology Agency of the Czech Republic	cumulatively		747/ 29 467	7 196/ 283 866	10 086/ 397 870	10 098/ 398 343
Ministry of Education, Youth and Sports	cumulatively			400/ 15 779		
Total		6 626/ 261 381	12 220/ 482 051	12 172/ 480 158	12 440/ 490 730	10 929/ 431 124

²¹⁷ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

²¹⁸ Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

²¹⁹ Ibid.

Table 3.3.2 - Contract research activities

Client ²²⁰	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
K.B.K. fire	Preparation, Execution, and Evaluation of Large-Scale Fire Tests	95/ 3 748				
PETROTRANS	Expert Opinion Report – Analysis of Video Recordings	75/ 2 959				
TAMEH Czech	Training and Audit of Safety Management and Accident Prevention Systems	72/ 2 840				
Česká agentura pro standardizaci	Translation of European Standard: Workplace Air – Guidelines for the Determination of Inhalation Exposure to Chemical Substances for Comparison with Limit Values and Strategy Implementation	30/ 1 183				
AIVOTEC,S.R.O.	Verification of Adsorption Properties of Biochar		257/ 10 138			
VVUÚ, a.s. Ostrava Radvanice	Experimental Measurement of Radiation Intensity		10/ 394			
VVUÚ, a.s. Ostrava Radvanice	Experimental Determination of DMV and HMV of a Liquid Sample		14/ 552			
Rizzo Associates Czech, a.s.	Study on the Impact of External Explosion Sources on Reactor Buildings LVR-15 and LR-0			145/ 5 720		
CORMEN s.r.o.	Flash Point Measurement and Classification of Products According to the Criteria of the "Flammable Liquids" Class			115/ 4 536		
eniferBio oy, Sayuri Hayashi, Peuraniitty 5 B 25, 02750 Espoo	Determination of Minimum Ignition Energy (MIE)				11/ 434	
Linde Gas, a.s	Flow Rate of Cooling Nozzles				50/ 1 972	
CzechPak Manufacturing, s.r.o.	Determination of PTCH in Low-Calorie Sweeteners				41/ 1 617	
Energon Energy Solutions, s.r.o.	Testing of "HILTI CP 679A" Material				30/ 1 183	
VUT Brno	Flammability Measurement				21/ 828	
eniferBio Oy, Sayuri Hayashi	Determination of Laboratory Analyses of Flammability and Explosiveness					122/ 4 813
NONOCRE a.s.	Study of Second-Life Battery Behavior in Fire Scenarios					1 384/ 54 596

²²⁰ If the client is from abroad, indicate in brackets the country of origin of the client.

CTP Invest, spol. s r.o.	Implementation of Large-Scale Fire Tests					50/ 1 972
VVUÚ a.s.	Determination of the Lower and Upper Explosive Limits and Heating Value of Pyrolysis Oil					26/ 1 026
VVUÚ a.s.	Determination of the Lower Explosive Limit					22/ 868
Total		272/ 10 730	281/ 11 085	260/ 10 256	153/ 6 036	1 604/ 63 274

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the period of 2019–2023, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts²²¹, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

1) Methodology for the implementation of technical measures to increase the protection of soft targets of the railway infrastructure – certified methodology

The methodology approaches the implementation of technical measures to increase the protection of the soft targets of the railway infrastructure as an interrelated process, which will be implemented in four consecutive steps. First, the level of riskiness and security of the soft target is determined, and then the level of its technical protection is calculated, and absent technical measures will be recommended. The methodology is focused on the application of the concept of the CPTED method to selected types of railway infrastructure objects. The methodology is developed in accordance with national and international standards intended for planning and designing the layout of objects. The proposed measures are integrated into the overall concept of the design of the given object, including in relation to the possible misuse of means of transport. The draft measures are based on a strategy of natural supervision, control, management of space maintenance and division of areas.

Currently, the methodology is gradually being applied to selected railway stations in the Czech Republic. Based on the results of the application, technical measures are subsequently implemented at these railway stations to improve security. The application process is provided by the Railway Administration, which is a state organisation responsible for the operation of railway infrastructure in the Czech Republic. The supervisory authority is the Ministry of Transport of the Czech Republic, which has certified the methodology.

2) Rescue Destructive Charge – utility model

The rescue demolition charge is designed for the rapid remediation of structurally unstable buildings that have sustained severe structural damage due to extraordinary events, such as technological accidents, gas explosions, or terrorist attacks. Such critically damaged and structurally

²²¹ See Terms definition.

compromised buildings pose a significant risk to the surrounding area, particularly to emergency response units of the Integrated Rescue System and their equipment. The device consists of externally mounted, elongated, directed explosive charges that do not require drilling into the building's walls. Instead, they are affixed to the external surface of the structure using variably adjustable support arms. The charge assembly is equipped with handles to facilitate precise manual positioning during installation. The primary advantage of this design is in its structural simplicity, ensuring a rapid deployment process of the emergency services at the site of operation. Unlike conventional demolition charges, which must be embedded into the wall, this charge can be applied externally, significantly reducing preparation time. During detonation, the explosive energy does not cause hazardous fragmentation of the masonry; the shockwave dissipates entirely within 5 to 8 meters, thereby eliminating risks to nearby structures. This is an innovative product currently unavailable on the domestic market. It provides a safe, efficient, and time-effective solution for the controlled demolition of structurally compromised buildings, minimizing risks to personnel who would otherwise be exposed during demolition operations with conventional equipment. The economic parameters of the device are not quantifiable, as its primary purpose is to protect the lives and health of emergency response specialists during joint operations with the IRS.

3) Equipment for determining the selective magnitude of the explosion pressure and the speed of propagation of the pressure wave - patent

This apparatus is designed to determine the maximum parameters of a propagating pressure wave during an explosion event. It is useful in the field of explosion protection, where the determination of key technical safety parameters facilitates the implementation of further procedures aimed at safeguarding technologies and building structures from the effects of explosions. The device stands out for its unique design and is primarily applicable in the industrial testing, with broader applications in the field of safety engineering. The device enables the detection of pressure (shock) wave propagation under extreme conditions, including unfavourable climatic or operational circumstances, such as high humidity or the presence of solid fragments within the propagating pressure wave. The applicability of this designed device is offered especially in research or industrial laboratories dealing with the determination of technical safety parameters in the field of explosion protection.

Device can be used by all subjects dealing with explosion prevention of technologies and equipment and needing to operatively determine explosion or air pressure wave parameters under atmospheric or different operating conditions. The advantage of the device for determining the selective magnitude of the blast pressure and the velocity of the pressure wave propagation is its relatively low cost and considerable robustness. The device is suitable for measuring pressures (static and dynamic) in complex climatic, technical and operational conditions. Information on the measured quantities are immediately available (without the need for further evaluation operations). The use of the equipment will allow for more efficient measurement procedures and processes, resulting in better quality outputs at lower economic costs.

4) Combustion exhaust analysis line - patent

This apparatus contributes to increasing the safety of industrial operations associated with the heating of material, but is also related to the safety of emergency units in case of fire. This issue is related to the scope of activities of the faculty in connection with the processing, storage or transport of materials. The properties of materials handled by the industries range from safe to hazardous, including flammability, explosiveness, high reactivity, toxicity, etc. The main, though not the only, problem of controlling damage caused by the process industry is to prevent or reduce unwanted energy, mass or fire gas released by heating or burning. These leaks are often related to

spontaneous reactions, in which energy is released in the form of heat, especially in materials with tendency to self-ignite. These materials have become more widely used in the context of environmental policy, which includes the use of alternative biomass-based fuels (Directive (EU) 2018/2001) and on the basis of recycled municipal waste (Directive (EC) No 98/2008). The growing quantities of materials have led to a higher presence of hazardous substances in process industries, increasing overall risk, particularly for materials prone to spontaneous combustion, where "runaway" reactions can cause self-heating and the release of gaseous and liquid byproducts. The patented apparatus was created to perform a comprehensive analysis of the composition of gaseous products, which are prepared under conditions simulating the conditions and processes that take place in the evaluated material during storage, processing or transport. The information obtained in this way are intended for the proposal of preventive and repressive measures aimed at the protection of health, property and the environment.

5) Modular equipment for decontaminating water contaminated with soluble persistent fuel additives – utility model

The basis of the technology is the decontamination of water using synergistically acting three purification stages: (1) Pre-purification of water, the purpose is to remove mechanical impurities and residues of undissolved nonpolar phase (volatile organic hydrocarbons) on a series of sorption separators and gravity separator. (2) Physical separation of volatile pollutants and partial separation of semivolatile pollutants, including MTBE (methyl-tertiary-butyl ether), by gas phase conversion using hollow fiber membranes. Pervaporation/aeration achieves a significant reduction in the total pollutant concentration but is not sufficient to achieve high leaving water purity. (3) Chemical destruction of residual MTBE contamination in one or more photocatalytic reactors. This step is able to achieve low MTBE output concentrations, but the total amount of MTBE removed (decontamination capacity) is limited. The synergy of the individual steps lies in the following effects: the arrangement of the three purification stages in a given set enables the gradual removal of total contamination, and in the individual stages the ability to achieve low output concentrations of MTBE gradually increases. Capacity and efficiency can be increased by including retention tanks and the possibility of using solar heating to improve pervaporation/aeration. The system is modular and allows modification according to the degree of contamination. The equipment constructed within the project has been installed in real operation. Positive impacts on society can be seen in the very purpose of the facility, which is designed to decontaminate water contaminated with soluble fuel additives, with the decontamination of the environment or water in mind, since both the environment and water are essential components of society and human life. Fuel spill accidents are one of the most frequent accidents on the CIEP's records.

6) Database of air quality sensor collocation results - specialised public database

The essence of the result is a database of time series obtained by the response of sensors of the SOASENSE sensor network node located in the collocation at the site of immission monitoring carried out by the Health Institute Ostrava. It provides publicly available data needed to process the measurement results by the SOASENSE sensor network nodes in order to improve their accuracy and reliability. Publicly available air pollution data are usually post-processed and provide only hourly averages of monitored values. The data provided in this database will be used for testing data analytics tools (application of machine learning methods) with a focus on identifying conditions for the formation of secondary organic aerosols. As this is not pre-processed or already aggregated data, it will allow to study the influence of the type of aggregation and the use of signal filtering techniques, which will serve to optimize the sensor node parameters and the data transmission within the sensor network. The database is operated on-line in the form of a web

interface, which is publicly available at <http://soasense.vsb.cz> and serves as a non-commercial information support for the implementation of air quality sensor networks (e.g. in the framework of citizen science initiatives). It is envisioned that the database will be gradually expanded as more collocated measurements are made.

7) Air breathing apparatus for respiratory support HGFFBI 1000 - prototype

The prototype is the result of a project of the Ministry of the Interior of the Czech Republic in the Security Research Programme, the aim of which was to develop a new mobile modular device used for protection and isolation of the respiratory tract, which will be able to protect the user from bacterial and viral infection in the event of epidemiological threats, for infectious persons with the need for intra-hospital or inter-hospital transport, without endangering other persons. The apparatus is designed to protect the respiratory system and support the breathing of patients undergoing various types of examinations, during which the patient should not become infected, but also the patient should not spread the infection to the staff. This facility may also find application in acute and follow-up care for patients requiring respiratory support. Maximum emphasis in the prototype is placed on mobility, ease of application and modularity, while maintaining the highest level of comfort and maximum protection for the users of these systems. The prototype developed is an isolation self-contained breathing apparatus with pressurised air and an open breathing circuit. The device has a portable pressurised air reservoir and is completely independent of the surrounding atmosphere. The exhaled air leaves the protective mask through purified filtration into the ambient atmosphere.

8) Risk Mapping in the Czech Republic – certified methodology

The methodology introduces a new approach to assessing territorial safety systems through risk mapping, which classifies and quantifies risks in a given area. It uses input data from the Analysis of Threats for the Czech Republic, incorporating vulnerability and preparedness elements to adjust the assessed risk level. The resulting risk map visualizes expected losses and damages, identifying the type and magnitude of risks across the analysed territory. The methodology also quantifies vulnerability and preparedness elements and standardizes procedures by defining the steps for risk mapping based on territorial characteristics, describing calculation algorithms using mathematical models, recommending hazard types (per the Analysis of Threats for the Czech Republic) for inclusion and suggesting vulnerability and preparedness elements with suitable cartographic representations. It further provides guidelines for refining source data, presenting results, and applying colour visualization in risk maps. The methodology serves as a foundation for developing application software, including a desktop tool (ArcGIS Desktop Application for Risk Mapping) and a web-based version (Web Mapping Application for Risk Mapping). Risk mapping outputs offer a detailed overview of risk composition, supporting the development of regional emergency and crisis plans. They also aid in optimizing population warning systems, planning warning terminal construction or upgrades, and improving resource deployment for integrated rescue services. The primary users are the Ministry of the Interior—specifically the General Directorate of the Fire Rescue Service of the Czech Republic and regional fire rescue services—while state and local authorities form the secondary user group.

9) Methodology for Population Protection in Spatial Planning and Construction Management – certified methodology

One of the key tasks for the implementation of population protection set out in the Population Protection Concept until 2020 with a view to 2030 was to resolve specific aspects of population protection in spatial planning and technical requirements for buildings. This task was subsequently

incorporated into the current Population Protection Concept.

This task was addressed in the project Protection of the population in spatial planning and in the determination of technical requirements for building design. The final result was the certified "Methodology for the protection of the population in spatial planning and construction management".

The methodology is designed in four separate sections, which present both general provisions and the procedure for the application of population protection requirements in spatial planning and construction proceedings, the definition of areas of interest for population protection in the context of spatial planning and the definition of population protection requirements, the definition of buildings of interest for population protection in the context of construction proceedings and the definition of population protection requirements.

The methodology divides the territory into areas without external hazards and areas with external hazards, for which it sets out general and specific requirements for the protection of the population. Buildings are classified into vulnerable, strategic and other buildings of interest, including general, specific and strategic building technical requirements.

The Methodology is intended for the Fire Rescue Service of the Czech Republic, promoters of spatial planning documentation, owners and operators of vulnerable and strategic buildings.

The certified methodology was used as one of the bases for the preparation of Decree No. 460/2021 on the categorization of buildings in terms of fire safety and population protection and is currently being used as a basis for the preparation of a new decree concerning the protection of the population in Czechia.

10) Determination of requirements for the supply of fire water and other extinguishing agents to buildings – certified methodology

This methodology was developed as the main result of the project "Determination of requirements for the supply of fire water and other extinguishing agents to building structures. The methodology is based on current statistical data and general principles of fire dynamics. On the basis of statistical data, the requirements for the necessary quantities and flows of fire water used for extinguishing construction objects are determined, from which exhaustive, easy-to-use requirement values are compiled. The problem of transporting water to the fire site is addressed separately. The taxing approach, combined with consideration of the possibility of using a long-distance water shuttle, allows for greater variability in the design of fire water sources. In the case of buildings that differ significantly from the statistical population under study (e.g. buildings equipped with SSHZ systems, etc.), a detailed firefighting analysis can be used. The methodology also includes a procedure for assessing the possibility of capturing contaminated firefighting water.

The methodology was presented to the professional public at the international conference 2023 and at the webinar of the Czech Chamber of Chartered Engineers. On 19.2.2025 the methodology was presented at the meeting of the standardization committee Fire safety of buildings. On the basis of the presentation and the subsequent discussion, it was decided to initiate a revision of the standard ČSN 73 0873 Fire water supply, in which the procedures proposed in the methodology will be implemented. The implementation of the revised standard will have a significant impact on the location and especially the capacity of fire water points (hydrants and fire tanks). Better availability of fire water in buildings with high fire risk will enable fire protection units to fight fires faster. The implementation of the methodology will thus lead to a reduction in fire damage.

The consideration of the gender dimension is not relevant for any of the above mentioned results, the application of these results does not depend on the gender of the user.

The expert opinions listed below in Table 3.4.1. represent indirect results of research, development and creative activities, whose demonstrable application in practice is ensured directly by the requirement of the contracting authority, which also determines their social impact. An integral part of the processing of these assessments has always been expert scientific research activity, which has ensured a high level of quality and objectivity of the results.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ²²²	Year of application	Name
Certified methodology	2020	Risk mapping in the Czech Republic
Certified methodology	2020	Methodology for Population Protection in Spatial Planning and Construction Management
Certified methodology	2022	Determination of requirements for the supply of fire water and other extinguishing agents to buildings
Certified methodology	2023	Methodology for the implementation of technical measures to increase the protection of soft targets of the railway infrastructure
Patent	2020	Combustion exhaust analysis line
Patent	2021	Equipment for determining the selective magnitude of the explosion pressure and the speed of propagation of the pressure wave
Prototype	2022	Air breathing apparatus for respiratory support
Utility model	2019	Rescue destructive charge
Utility model	2020	Modular equipment for decontaminating water contaminated with soluble persistent fuel additives
Specialised public database	2023	Database of air quality sensor collocation results

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)²²³, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).²²⁴

Additionally, the evaluated unit shall briefly comment on the funds received during the period of

²²² Specify the specific type of result. Add rows as needed.

²²³ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

²²⁴ If the commercialisation of R&D&I results is carried out in this way.

2019–2023 from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1).

Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.

Key tools for effectively transferring research results into practice include professional training, collaboration with industrial partners and public administration, participation in safety standards and legislation development, and expert consultations. Research projects conducted with practical application partners enable the direct implementation of innovative solutions into real-world practice.

Key users of these results include organizations from both the public and private sectors. A major partner is the Fire Rescue Service of the Czech Republic, which collaborates with the Faculty on developing methodologies for fire prevention and crisis management. The Faculty also provides professional training for firefighters and participates in testing new safety technologies.

Another essential partner is the Police of the Czech Republic, which benefits from the Faculty's security risk analyses and crisis management expertise. This cooperation has led to improved procedures for handling emergencies in urban and industrial environments. An important partner is also the municipalities and crisis staffs, to which the faculty provides expert consultations in the field of public protection planning and crisis management. Together, they develop crisis plans and conduct emergency simulations, especially utilizing the Simulation Technology Centre.

Industrial companies, particularly in the chemical sector, form another significant group of users. The Faculty collaborates with these businesses on safety protocols for handling hazardous substances and implementing industrial accident prevention systems. By working with these industries, the Faculty helps strengthen workplace safety and reduce the risk of large-scale incidents.

In the academic field, the Faculty actively collaborates with universities and research institutions on international projects, facilitating the exchange of knowledge, research findings, and technological advancements. This global cooperation enhances scientific progress and strengthens the Faculty's role as a leading research institution in security and crisis management.

The Faculty has long-standing partnerships with several ministries and plays an active role in shaping national security legislation. A key collaboration exists with the Ministry of Industry and Trade, particularly in the SecureGas project under the European Horizon 2020 program. Czechia is represented in this initiative by the Technology Platform "Energy Security", of which our Faculty is a member. In 2019, the Faculty participated in a round table at the Ministry, providing expert analyses and recommendations to enhance gas infrastructure security.

Another key government partner is the Ministry of the Interior, with which the Faculty has long cooperated on security risk analyses. This partnership covers areas such as occupational safety, major accident prevention, and explosion protection. Similarly, there is active cooperation with the Ministry of the Environment in accident prevention and the Ministry of Labour and Social Affairs on workplace safety regulations.

The Faculty contributes in safety and crisis management legislation development, offering expert analyses and consultations that help shape new laws, decrees, and methodologies. Contributions include updating major accident prevention standards and developing safety methodologies for both public administration and the private sector. The Faculty's research is integrated into national

legislation, enhancing protection for the public and critical infrastructure.

The Faculty significantly strengthens national security and supports decision-making in state administration. By combining academic expertise with practical applications, it serves as both a research institution and a key partner in addressing contemporary security challenges.

Finding new partners to apply the results in practice

1) conferences, workshops, training

To find new users of research results, the faculty regularly presents its outputs at professional workshops and conferences. The faculty organises 6 conferences each year, two of which are international, organised in conjunction with the Fire and Safety Engineering Association.

The introduction of simulation technologies has created a comprehensive teaching and training platform that is designed not only to educate students in dealing with emergencies and crisis situations across the fields of study at FSE. It is a unique and unique methodological and professional workplace in the Czech Republic, whose contribution lies in increasing the level of professional practical skills and knowledge of existing and new subjects involved in dealing with emergencies and crisis situations (e.g. members of emergency staffs of Municipalities with Extended Powers, Integrated Rescue System units etc.), which unquestionably contributes to increasing the quality of coordination between the IZS units and self-government authorities, legal entities and natural persons engaged in business, to increasing the safety and preparedness of the intervening units, to increasing the professional and skill level of the personnel assigned to crisis staffs and thus increasing the level of safety of the population.

2) Memoranda and cooperation agreements

The Faculty has concluded long-term agreements or memoranda with a number of institutions and organizations from practice, with which it cooperates in the framework of scientific research activities on projects, economic contracts, uses national companies and firms for the practice of its students, foreign organizations also for internships and study stays. Through these processes, long-term strategic partnerships are maintained and awareness of the faculty is expanded through already established relationships, thus attracting additional partners.

3) applied projects, consortia formation, publishing activities

An important part of the strategy is the orientation towards applied research, which requires the involvement of new partners from practice within grant schemes. Cooperation on grant projects that are primarily application-oriented, e.g. projects in the programmes of the Czech Technology Agency, very significantly support the creation of applied results and their transfer into practice. Thanks to these activities, the faculty contributes significantly to increasing the safety of society, improving crisis preparedness and supporting innovations in the field of public safety and security. Publication of research results within the framework of project activities in prestigious peer-reviewed journals indexed in the Web of Science and Scopus databases contributes to the international visibility and reputation of the Faculty in the professional community, thus strengthening its scientific influence and expanding opportunities for international cooperation.

4) professional organization, expert activities

Active cooperation with professional associations enables the acquisition of new partners in the field of personal and property safety, security technology, fire protection, occupational safety and crisis management.

The Faculty has significantly strengthened and expanded its activities in the preparation of expert and expert opinions, studies and expert statements. Within the Expertise Institute, the faculty's

staff prepares expert opinions mainly for the needs of the Police of the Czech Republic and for court proceedings, in cases where high expertise is required. The Expert Institute prepares opinions for legal and natural persons. The Institute of Expertise has top experts among professors and associate professors with many years of experience in the fields of Occupational Safety and Fire Protection, which guarantees the high quality of the expert reports prepared in accordance with the Act on Experts and Interpreters. The expert authorization covers the following areas: causes of fires, explosions, and accidents; assessment of workplace conditions, including noise, workload, ergonomics, and environmental pollutants; psychological stress, work pace, and monotony; technical and safety requirements for personal protective equipment (PPE) such as eye, face, head, respiratory, body, hand, and foot protection; noise measurement in machinery and workplaces; and the evaluation of machinery safety.

5) spreading the brand and reputation

An unforgettable way of seeking contacts is on a personal level and creating a good name not only for the faculty but also for individual employees. Subsequently, thanks to the references of industrial and other partners, other companies and organisations contact us, e.g. in connection with economic contracts or expert opinions. The FSE is a member of a number of domestic and foreign institutions, bodies and associations, which enables it to share know-how, establish new contacts and participate in joint projects. The Faculty gains new partners from practice mainly by spreading its reputation in a number of areas of fire protection, occupational safety, crisis management and related topics, when experts from practice turn to the Faculty with requests for risk analyses, safety documentation, emergency plans, expert opinions. The range of industrial enterprises is wide, from large industrial partners such as Moravia Steel, TEVA, SUEZ to small enterprises handling chemical substances.

Commercialisation of results

1) Technology Transfer Centre

The university's Technology Transfer Centre is used by faculty staff to commercialise results - the application of functional samples, software, specialised databases or maps, prototypes, utility models and patents.

2) directly with a certification or authorization body in the Czech Republic

For certified methodologies, the author of the result submits the document himself directly to the certification institution. We announce the certification of the document to the Technology Transfer Centre.

All of the R&D results in the form of patents, utility models and other results of research projects are offered for practical use to industrial enterprises and state administration bodies.

Non-public sources:

Our faculty did not set up a spin-off company during the period under review and did not have any profits from non-public sources during the period under review as we failed to sell licenses to patents or utility models obtained.

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
Total					

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF R&D&I

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the period of 2019–2023 and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

Between 2019 and 2023, the Faculty of Safety Engineering actively contributed to the popularization of science, research, and innovation while engaging with the general public. Through various activities, the faculty introduced safety research to a broad audience, fostered interest in technical and safety disciplines, and increased public awareness of key aspects of security and crisis management. The faculty systematically develops its outreach activities to make its research results accessible not only to professionals but also to the general public, students, and prospective applicants.

Key Popularization Activities

1. **European Researchers' Night** – An annual event dedicated to the popularization of science and research among the general public. The faculty regularly prepares interactive exhibits featuring practical demonstrations, workshops, and themed lectures, allowing visitors to explore the world of safety technologies. Through collaboration with faculty experts and students, attendees can learn about modern crisis management methods, hazardous substance detection, and advanced fire protection technologies.
2. **Participation in NATO Days** – The faculty regularly takes part in this prestigious international event, showcasing innovations in safety research and collaboration with armed forces. Visitors can witness practical demonstrations of modern security technologies, learn about the work of experts in civil protection, and experience crisis management elements first-hand. The faculty also cooperates with other professional institutions and emergency response organizations at the event.
3. **Improve Your Technique** – A program designed for high school students to introduce them to technical disciplines, including safety engineering. The faculty regularly exhibits its research projects, allows participants to use modern technologies, and organizes thematic workshops. Students learn to operate thermal cameras, conduct risk analysis, and identify hazardous chemicals. The goal is to increase young people's interest in technical and

scientific fields.

4. **Heroes' Day** – An event focused on showcasing the activities of emergency response units, where the faculty contributes with expert demonstrations and lectures on security and crisis management. Visitors experience real-life scenarios encountered by rescue services and participate in crisis situation simulations. The faculty raises awareness about first aid, evacuation planning, and effective emergency response.
5. **Popularization Lectures and Public Events** – Faculty experts regularly give lectures at various public forums, conferences, and educational events on topics such as civil protection, crisis management, and fire safety. These lectures reach not only professional audiences but also the general public, increasing awareness of current security threats.
6. **Media Collaboration** – The faculty actively engages with the media, providing expert commentary on security issues and promoting science through articles, interviews, and reports. This collaboration ensures that expert knowledge reaches a broad audience, strengthening public awareness of the importance of safety research.
7. **Educational Workshops and Open Days** – The faculty organizes interactive workshops for prospective students and the public, presenting its study programs, research activities, and modern safety technologies. Participants can engage in hands-on research methods and discuss current trends in safety engineering with faculty experts.
8. **Collaboration with Primary and Secondary Schools** – The faculty organizes excursions, competitions, and lectures for students to spark their interest in science and technology. Students visit laboratories, participate in experiments, and discuss research with scientists. These activities help foster a strong connection between young generations and science.

Through these initiatives, the Faculty of Safety Engineering significantly contributes to the popularization of science and research in the field of safety engineering, raising public awareness of the importance of security in everyday life. The faculty not only supports professional education but also promotes a culture of safety within society.

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

The evaluation report detailing our recent performance across various areas, including applied research projects, results, awards, revenue streams, participation in editorial boards, public engagement and international impact, has been carefully reviewed. The strengths of our Faculty, particularly the significant applied research, strong collaborations with industry and government, and notable contributions to both economic and non-economic societal benefits, have been greatly appreciated.

It is emphasized that the recommendations provided by the panel have been taken very seriously, and measures have already been implemented to address them. Our efforts have manifested in the increased number of projects undertaken and, notably, in the significant rise in financial returns

from these projects. International projects are also being increasingly secured, with our Faculty frequently serving as project coordinators, which highlights the growing international recognition and capacity.

Although the number of prestigious awards remains relatively low, it is acknowledged that this can be improved through raising awareness within the professional community. The results of our activities are mainly in methodologies, procedures, research reports, etc. Those are outside the field of traditional competitions (techniques, technologies, products...). Most of our applied results correspond mainly to social relevance. We carry out basic research in only a few laboratories and very narrow working groups, few results are therefore evaluated according to the criterion of contribution to knowledge. Our results have an impact especially on society, increasing security in all possible forms. Efforts to enhance the quality of our publication outputs, organize international conferences, and participate in such events abroad are actively being pursued. These initiatives aim to strengthen our profile and, ultimately, increase the number of awards received.

Revenues from non-public sources remain low; however, these are not considered our primary funding source. Nevertheless, additional funding avenues are being actively pursued. Furthermore, efforts to diversify revenue streams are being intensified by focusing on increasing income from both public and non-public funding, and expanding our contractual research portfolio with international partners. In line with the emphasis on economic impact, dedicated programs aimed at developing and securing additional international patents have been initiated.

Significant efforts are also being made to support staff in project and publication activities through motivational rewards. The Faculty offers extensive support to all academic and research staff through a dedicated Project Department, which is a crucial and purpose-driven unit ensuring assistance in project management and financial management.

It should also be noted that the global COVID-19 pandemic had an impact on the evaluation period from 2019-2023, resulting in a decline in the number of outputs, supplementary activities, expert opinions, and overall contractual research. However, during this challenging period, the Faculty was very actively involved in addressing the pandemic and mitigating its effects. An Information Centre and a Support Tracing Centre were established within the Faculty, and staff members contributed to the production of protective face shields using 3D printers, as well as the manufacturing of disinfectants for healthcare facilities.

Continuous improvement remains our commitment, and we firmly believe that the strategic actions currently being undertaken will not only address the challenges identified but also further strengthen our position as a leader in safety engineering research.

The Faculty remains committed to continuous improvement, actively addressing identified challenges through strategic measures. Increased international project participation, enhanced publication efforts, and diversified funding initiatives strengthen our global recognition and impact. Despite setbacks, including the COVID-19 pandemic, our proactive response demonstrates resilience and societal contribution. By fostering innovation, expanding collaborations, and supporting academic excellence, we are well-positioned to advance safety engineering research. These efforts will further solidify our role as a leader in the field, ensuring lasting scientific and societal benefits.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
About Faculty of Safety Engineering	3.1.	Who we are - Faculty of Safety Engineering VSB-TUO
CIRFI - project	3.3.	CIRFI 2019: Indication of Critical Infrastructure Resilience Failure
OSHDIGIT – project	3.3.	oshdigit – Competent university teachers for digital learning in OSH
Milipol Paris – award, project	3.2.1., 3.3.	Lauréats Milipol Innovation Awards Milipol Paris
Centre of Simulation Technologies FSE - CESIT	3.1.	022 - Centrum simulačních technologií - Centre of Simulation Technologies FSE VSB-TUO

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

IT4Innovations National Supercomputing Center (IT4Innovations or IT4I)

FORD: 1 - Natural sciences

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.²²⁵ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

The **IT4Innovations National Supercomputing Center** (hereafter referred to as IT4Innovations; <https://www.it4i.cz>) is a leading European research centre active in the field of **high-performance computing (HPC)**, **advanced data analysis**, **artificial intelligence (AI)**, **quantum computing (QC)** and their applications to other scientific, industrial and social fields, operating the most powerful public supercomputing systems in the Czech Republic. IT4Innovations' core research topics are big data processing and analysis, machine learning, development of parallel scalable algorithms, energy efficiency, engineering simulations, advanced visualization, virtual reality, modelling for nanotechnology and development of new materials. Between 2019 and 2023, the Centre implemented **49 national** (mainly projects of the Technology Agency of the CR (TACR), Czech Science Foundation (CSF), and different programmes of the Ministry of Education, Youth, and Sports (MEYS) and Ministry of Industry and Trade (MIT)) and **32 international research projects** (mainly H2020, Horizon Europe and Digital Europe Programme projects). Examples are the European Centres of Excellence SPACE, MAX, and POP and the National Centre of Competence in HPC (see Chapter 3.3). IT4Innovations is **one of the biggest innovators** in European projects across the CR and EU according to the European Commission Innovation Radar. IT4Innovations participates in or is a member of major European infrastructures, initiatives, and organisations: the **EuroHPC JU**, **PRACE**, **BDVA**, **ETP4HPC**, **EUDAT CDI**, **EOSC**, **I4MS**, **VI-HPS**, **iRODS**, and **Women in HPC**. Together with CESNET and CERIT-SC form the CR's strategic research infrastructure **e-INFRA CZ** from 2019. The e-INFRA CZ provides capacities and resources for the transmission, storage, and processing of scientific and research data. It offers a transparent environment with a comprehensive portfolio of ICT services essential for modern research.

IT4Innovations operates the **Karolina** supercomputer (15.7 PFlop/s, installed in summer 2021) and **Barbora** (849 TFlop/s, installed in autumn 2019). The Karolina is one of the EuroHPC supercomputers ranked **69th** in TOP500 ranking and **8th** in Green500 ranking of the most energy-efficient supercomputers in 2021. IT4Innovations has also contributed to the acquisition and is

²²⁵ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

currently involved in the operation of the EuroHPC **LUMI** supercomputer. LUMI, with its theoretical peak performance of 531,5 PFlop/s, is one of the most powerful European supercomputers ranked **3rd** in TOP500 in 2021 and is located in Kajaani, Finland. IT4Innovations has also labs of advanced visualisation and virtual reality.

Concerning quantum computing, IT4Innovations operates the **EuroHPC quantum computer VLQ**, and the establishment of a **quantum computing laboratory** has been approved at the end of 2023.

To carry out excellent research in the field of high-performance computing and advanced data analysis, and to operate the leading national supercomputing infrastructure, mediating its effective use in order to increase the competitiveness and innovation of Czech science and industry.

Vision

To become a leading supercomputing center that provides professional services and conducts excellent research in the field of high-performance computing and processing of advanced data sets for the benefit of science, industry, and the whole of society.

Societal Contribution of R&D&I

By providing access to cutting-edge supercomputing infrastructure and SW technologies including IT4Innovations software tools (see Chapter 3.4), IT4Innovations enables researchers and industry professionals to tackle complex computational challenges, leading to innovations that benefit various sectors, including healthcare, engineering, and environmental sciences.

Long-Term Goals

IT4Innovations aims to maintain and strengthen its position as a premier supercomputing center by: 1) Continuously upgrading its computational infrastructure to meet evolving research and industry needs. 2) Expanding its research activities in emerging areas such as quantum computing etc. 3) Fostering collaborations with national and international partners to drive innovation. 4) Enhancing support for SMEs through initiatives like the Digital Innovation Hub Ostrava, providing access to advanced technologies and expertise to boost their competitiveness.

Distribution of Research Activities by Type

The center's research activities encompass a balanced mix of basic and applied research. Basic research focuses on developing new algorithms, computational methods, and exploring theoretical aspects of HPC, HPDA, AI, QC, and related disciplines. Applied research projects aim to solve practical problems in collaboration with industry partners, leading to innovations in product development, process optimization, and the creation of new services. This dual approach ensures that IT4Innovations contributes to scientific advancement while directly impacting economic growth and societal well-being.

Organizational Structure and Size

IT4Innovations is a university institute of the VSB – Technical University of Ostrava. The center employs ca 160 FTEs of professionals, including about 100 FTEs of researchers and innovation developers grouped in research labs, ca 20 FTEs of supercomputing services specialists, and 40 FTEs of administrative staff members and management. The organizational structure is designed to support both research excellence and efficient service delivery, ensuring that the center meets the needs of its users and stakeholders effectively.

Comments on Tables 3.1.1-3.1.6

Table 3.1.1: The "Technical and economic staff" includes FTEs of supercomputing services staff who ensure the operation of supercomputers including supporting infrastructure - this is approximately 20 FTE/year.

Table 3.1.2-3.1.3: The age distribution corresponds to the fact that IT4Innovations is a very young centre founded in 2011, when many young people from faculties moved to IT4Innovations.

Table 3.1.4-3.1.5: One of the goals of IT4Innovations was to build a doctoral study programme Computational Sciences in both Czech and English versions. This was opened in 2015.

Table 3.1.6: R&D&I capacities correspond to the scientific focus of IT4Innovations laboratories and their staffing.

Table 3.1.1 - Staffing per FTE²²⁶

Academic/ Professional position	Total/Of which women					
	2019	2020	2021	2022	2023	Total
Professor	1/0	1/0	1/0	1/0	1,16/0	1/0
Associate Professor	2/0	2/0	2/0	1,5/0	2/0	2/0
Assistant Professor	0,012/0	0,33/0			0,33/0	0,3/0
Assistant						
R&D Personnel ²²⁷	20,52/1,4	15,32/0,9	12,74/1,3	26,03/4,17	26,13/3,37	26/4
Researchers in other categories ²²⁸	81,38/9,37	81,91/10,79	78,05/10,53	63,59/10,79	66,94/12,27	81/12
Technical and economic staff ²²⁹	46,22/22,95	52,34/25,53	53,12/24,17	57,72/26,68	61,01/30,3	61/30
Scientific, research and development staff involved in teaching activities	3,013/0	3,33/0	3/0	2,5/0	3,49/0	3/0
Early career researchers ²³⁰	6,89/1,2	5,58/0,08	3,91/0	3,41/0,54	3,55/1,06	6/1
Total ²³¹	151,132/33,72	152,9/37,22	146,91/36	149,84/41,64	157,57/45,94	157/45

²²⁶ The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

²²⁷ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

²²⁸ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

²²⁹ Who participates in the management and support of R&D&I in the institution.

²³⁰ See Definition of Terms in Methodology HEI2025+.

²³¹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 (numbers of physical employees and personnel)²³²

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor					1							
Associate Professor							2					
Assistant Professor												
Assistant												
R&D Personnel ²³³	1		4	1	2							
Researchers in other categories ²³⁴	26	2	40	5	12	1	2	1	1			
Technical and economic staff ²³⁵	6	3	18	10	16	10	4		1			
Scientific, research and development staff involved in teaching activities					1		2					
Early career researcher ²³⁶			5		1		1					
Total²³⁷	33	5	62	16	32	11	10	1	2			

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

²³² The total number of employees/workers as of 31st December of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

²³³ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

²³⁴ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

²³⁵ Who participates in the management and support of R&D&I in the institution.

²³⁶ See Definition of Terms in Methodology HEI2025+.

²³⁷ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2023 (numbers of physical employees and personnel)²³⁸

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor					2							
Associate Professor					1		1					
Assistant Professor			1									
Assistant												
R&D Personnel ²³⁹	17	2	6	1			1				1	
Researchers in other categories ²⁴⁰	6		43	8	18	4	5	2	1	1		
Technical and economic staff ²⁴¹	6	3	19	9	28	20	7	1	3			
Scientific, research and development staff involved in teaching activities			1		3		1					
Early career researcher ²⁴²			4	1	1	1	1					
Total ²⁴³	29	5	69	18	49	24	14	3	4	1	1	

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate												
Master's ²⁴⁴												

²³⁸ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

²³⁹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

²⁴⁰ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

²⁴¹ Who participates in the management and support of R&D&I in the institution.

²⁴² See Definition of Terms in Methodology HEI2025+.

²⁴³ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

²⁴⁴ All master's degree students are listed, regardless of the length of their programme of study.

Doctoral	12/3	1/0	19/4	3/1	19/4	3/1	20/4	4/1	14/3	4/1	28/4	4/1
Lifelong Learning Courses												
Total												

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ²⁴⁵ /Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate												
Master's												
Doctoral	1/1		1/1		1/1		1/1		1/1		1/1	
Lifelong Learning courses												
Total												

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	8,60	Basic Research	76,57
	1.2 Computer and information sciences	42,06	Balanced basic and applied research	
	1.3 Physical sciences	19,74	Basic Research	
	1.4 Chemical sciences	6,17	Basic Research	
	1.5 Earth and related environmental sciences			
	1.6 Biological sciences			
	1.7 Other natural sciences			
2. Engineering and Technology	2.1 Civil engineering			23,43
	2.2 Electrical engineering, Electronic engineering, Information engineering	9,46	Applied Research	
	2.3 Mechanical engineering	4,96	Applied Research	
	2.4 Chemical engineering			
	2.5 Materials engineering	4,15	Balanced basic and applied research	
	2.6 Medical engineering			
	2.7 Environmental engineering			

²⁴⁵ The total number of study programmes for which admissions have been announced in a given academic year.

	2.8 Environmental biotechnology			
	2.9 Industrial biotechnology			
	2.10 Nanotechnology	4,86	Balanced basic and applied research	
	2.11 Other engineering and technologies			
3. Medical and Health Sciences	3.1 Basic medicine			
	3.2 Clinical medicine			
	3.3 Health sciences			
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries			
	4.2 Animal and Dairy science			
	4.3 Veterinary science			
	4.4 Other agricultural sciences			
5. Social Sciences	5.1 Psychology and cognitive sciences			
	5.2 Economics and Business			
	5.3 Education			
	5.4 Sociology			
	5.5 Law			
	5.6 Political science			
	5.7 Social and economic geography			
	5.8 Media and communications			
	5.9 Other social sciences			
6. Humanities and the Arts	6.1 History and Archaeology			
	6.2 Languages and Literature			
	6.3 Philosophy, Ethics and Religion			
	6.4 Arts (arts, history of arts, performing arts, music)			
	6.5 Other Humanities and the Arts			
Total		100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the period of 2019–2023 based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant.

Maximum 1000 words.

IT4Innovations is a **leading HPC research center**, internationally recognized for its scientific contributions, prestigious awards, and active engagement in shaping the research landscape. Over the 2019–2023 evaluation period, IT4Innovations' researchers have received multiple R&D&I awards, served on editorial boards of top-tier scientific journals, delivered invited lectures at major international conferences, and contributed to the evaluation of national and European research programs.

IT4Innovations researchers have been honored with **multiple prestigious R&D&I awards**, emphasizing the center's scientific excellence. Prof. Andrey Rogach was recognized as a Highly Cited Researcher (2019–2024) by Clarivate Analytics and elected as a Foreign Member of the Academia Europaea, a distinction awarded following a rigorous peer-review selection process. The research teams have received the Best Poster Award at Supercomputing 2022 in Dallas, the Most Innovative Solution award at DT4REGIONS for AI-based emergency call handling, and multiple European Commission Innovation Radar recognitions for outstanding innovations in HPC, AI, and computational workflows in projects such as LEXIS, EVEREST, LIGATE, and EXA4MIND. Additionally, the Werner von Siemens Award was granted for groundbreaking research conducted at the center.

IT4Innovations researchers play a critical role in the **editorial leadership** of renowned scientific journals. Prof. Andrey Rogach serves on the editorial boards of Aggregate (Wiley VCH), Particle and Particle Characterisation Systems (Wiley VCH), and Nanomaterials. Prof. Ivan Zelinka contributes to the International Journal of Parallel, Emergent and Distributed Systems and MENDEL Soft Computing Journal, while Prof. Miroslav Vozňák is an editor for Sensors and the Journal of Advanced Engineering and Computation. Prof. Tomáš Kozubek contributes to Lecture Notes in Computational Science and Engineering (Springer). These roles demonstrate IT4Innovations' strong academic leadership in HPC, AI, and computational sciences.

IT4Innovations researchers are regularly invited to deliver **keynote speeches and lectures** at prestigious international conferences, reinforcing their global influence in HPC and AI applications. Among the most significant lectures, Prof. Pavel Hobza presented at HBond2023 in Italy on hydrogen bonding, Prof. Tomáš Kozubek delivered a keynote at the AI in Science Expert Workshop (European Commission) on AI infrastructure access and sharing, and Prof. Michal Otyepka spoke at ACS Fall 2022 in Chicago on theoretical modeling of carbon dots. Doc. Lubomir Riha, Dr. Milan Jaroš and Dr. Petr Strakoš presented their GPU path tracing research at SIGGRAPH 2021 in the USA.

The center has also **hosted distinguished international researchers**, further strengthening its reputation as a hub for scientific exchange and collaboration. Among the invited speakers, Prof. Pinar Karagoz from Middle East Technical University in Turkey discussed NoSQL Databases and Trust-based Recommendation Methods, Prof. Carsten Burstedde from Universität Bonn presented on Adaptive Mesh Refinement in HPC and Applications in the Geosciences, and Prof. Tarek El-Ghazawi from George Washington University in the USA delivered a lecture on Rebooting Computing – The Search for Post-Moore's Law Computing Systems. Additional renowned experts included Dr. Stephan Hachinger from the Leibniz Supercomputing Centre in Germany delivered a lecture on Environmental Computing: Integrating HPC, IaaS-Cloud Services and Data Management and Prof. Garth N. Wells from the University of Cambridge, UK, on High-performance computing for complex engineering systems.

IT4Innovations staff have played a crucial role in **evaluating national and European research projects**, ensuring the allocation of funding to high-impact scientific initiatives. Prof. Michal Otyepka has served on the Scientific Advisory Board of the Czech Science Foundation (2020–2024), overseeing the approval of research calls and funding. Prof. Tomáš Kozubek and Prof. Michal Otyepka have reviewed projects for the Swiss National Science Foundation (SNSF), while Dr. Dominik Legut chaired the Czech Science Foundation Panel P204 in Condensed Matter and

Material Physics. Dr. Pavel Praks has evaluated international energy projects for CETPartnership, and Mgr. Martin Duda has been a board member at the Technology Agency of the Czech Republic and participated in research infrastructure evaluations for the Ministry of Education, Youth, and Sports.

Beyond research, IT4Innovations provides **essential services to the broader scientific and industrial communities**. The center has played a pivotal role in HPC education and training, offering specialized HPC, AI, QC, and data analytics courses and actively contributing to the European High-Performance Computing Joint Undertaking (EuroHPC JU) activities. IT4Innovations' role within e-INFRA CZ includes providing HPC resources, supporting data storage solutions, and ensuring secure and efficient data transmission. The center also contributes to the development of advanced computing technologies and methodologies, enhancing the overall capabilities of the e-infrastructure. IT4Innovations engages in public outreach programs, strengthening industry collaboration and making HPC technologies more accessible to researchers, businesses, and students.

Through its scientific excellence, engagement with international research networks (**EuroHPC JU, PRACE, BDVA, ETP4HPC, EUDAT CDI, EOSC, I4MS, VI-HPS, iRODS, and Women in HPC**), and leadership in HPC, HPDA, and AI, IT4Innovations has solidified its reputation as a leading research institution. With prestigious awards, strong editorial influence, significant invited lectures, and extensive participation in national and European project evaluations, IT4Innovations continues to drive cutting-edge innovations in computational science, supporting scientific discovery, industrial applications, and sustainable development.

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
Prof. Andrey Rogach	Highly Cited Researcher 2019 - 2024	Clarivate Analytics
Prof. Andrey Rogach	MAE (Foreign Member of the Academia Europaea), by invitation only following a rigorous peer-review selection process	Academia Europaea
Ing. M. Hrabánková, Ing. O. Meca, Ph.D., Ing. T. Brzobohatý, Ph.D., doc. Ing. L. Říha, Ph.D., Ing. M. Jaroš, Ph.D., and Ing. P. Strakoš, Ph.D.	Best poster award (<i>Toward Scalable Voxelization of Meshes with High Growth Rate</i>)	Supercomputing conference 2022, Dallas, Texas (the most prestigious HPC conference)
Mgr. Maximilián Lamanec, Ph.D. et al.	Werner von Siemens Award, The most significant result of basic research	Siemens, 2021
Mgr. Pierre Koleják, Ph.D.	1st prize for the best diploma thesis in the category Physics of Condensed Matter	Czech-Slovak Student Scientific Conference in Physics, 2020
Ing. Václav Svatoň, Ph.D. et al.	Most Innovative Solution - AI-based Voicebot for Emergency Call Handling	DT4REGIONS (a European Platform for Regions to enable AI and Big Data collective solutions) Final Conference in Brussel 2023
Ing. Jan Martinovič, Ph.D. (project coordinator)	Recognized innovations within the LEXIS project by European Innovation Radar, 1. LEXIS Platform : an HPC/HPDA/AI computing platform for Research, SMEs and Industries in a digitally sovereign Europe, and other 7 LEXIS innovations	European Commission
Ing. Kateřina Slaninová, Ph.D.; Ing. Jan Martinovič, Ph.D.; et al.	Recognized innovations within the EVEREST project by European Innovation Radar, 1. Highly accelerated advanced traffic model calculation from floating car data using smart	European Commission

	map matching and traffic simulator, 2. Open-source framework for accelerating computational kernels on FPGA-enabled computing platforms	
Ing. Ada Böhm, Ph.D.; Ing. Jakub Beránek, Ph.D.; Ing. Vojtěch Cima; Ing. Jan Martinovič, Ph.D.; Ing. Branislav Janský, Ph.D.	Recognized innovation within the LIGATE project by European Innovation Radar: HyperQueue: an efficient HPC task execution framework for task management of computational jobs	European Commission
Ing. Jan Martinovič, Ph.D. (project coordinator)	Recognized innovations within the EXA4MIND project by European Innovation Radar, 1. EXA4MIND Data and Workflow Management Toolbox , 2. AQIS: Advanced Query and Indexing System for extreme data analytics on HPC infrastructures	European Commission

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Prof. Andrey Rogach	Aggregate, Wiley VCH, ISSN: 2692-4560
Prof. Andrey Rogach	Particle and Particle Characterisation Systems, Wiley VCH, ISSN: 1521-4117
Prof. Andrey Rogach	Nanomaterials, ISSN: 2079-4991
prof. Ing. Ivan Zelinka, Ph.D.	International Journal of Parallel, Emergent and Distributed Systems, Taylor & Francis, ISSN 1744-5760
prof. Ing. Ivan Zelinka, Ph.D.	MENDEL Soft Computing Journal, ISSN 1803-3814
prof. Ing. Miroslav Vozňák, Ph.D.	Sensors, ISSN: 1424-8220
prof. Ing. Miroslav Vozňák, Ph.D.	Journal of Advanced Engineering and Computation, ISSN: 1859-2244
Prof. Ing. Tomáš Kozubek, Ph.D.	Lecture Notes in Computational Science and Engineering, Springer, ISSN: 2197-7100
Ing. Pavel Praks, Ph.D.	Journal of Marine Science and Engineering, ISSN 2077-1312
prof. RNDr. Marek Lampart, Ph.D.	Mathematics, ISSN: 2227-7390

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
prof. Ing. Pavel Hobza, DrSc.	Hydridic hydrogen bond	HBond2023, Italy	2023
prof. Ing. Tomáš Kozubek, Ph.D.	European AI infrastructure access and sharing	AI in Science Expert Workshop, European Commission's Scientific Advice Mechanism	2023
RNDr. Dana Nachtigallová, PhD.	Surprisingly increasing complex stabilities of the covalent/dative bond complexes with	WATOC 2020, Canada	2022

	increasing solvent polarity		
prof. RNDr. Michal Otyepka, Ph.D.	Multi-approach Theoretical Modelling of Carbon Dots	ACS Fall 2022, Chicago	2022
doc. Ing. Lubomír Říha, Ph.D.	Selected Cases of GPU Accelerated Parallel Applications at IT4Innovations	ASHPC 2022, Austria	2022
Ing. Milan Jaroš, Ph.D., Ing. Petr Strakoš, Ph.D., doc. Ing. Lubomír Říha, Ph.D.	GPU Accelerated Path Tracing of Massive Scenes	SIGGRAPH 2021, USA	2021
Ing. Jan Martinovič, Ph.D.	LEXIS project	Big Data Value Association Activity Group meeting, Brussels, Belgium	2019
prof. Ing. Ivan Zelinka, Ph.D.	Keynote on Evolutionary Control of Complex Systems	INCOS, India	2019
Ing. Dominik Legut, Ph.D.	Heat Transfer and Phase Stability of Early Actinides and Actinide Compounds	AVS 66th International Symposium & Exhibition, Columbus, OH, USA	2019

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Prof. Pinar Karagoz	Middle East Technical University, Turkey	1. NoSQL Databases and Querying: An Overview; 2. Trust-based Recommendation Methods	2023
Prof. Carsten Burstedde	Universität Bonn, Germany	Adaptive Mesh Refinement in HPC and Applications in the Geosciences	2022
Prof. Tarek El-Ghazawi	George Washington University, USA	Rebooting Computing – The Search for Post-Moore's Law Computing Systems	2022
Dr. Daniele Cesarini	CINECA Supercomputing Centre, Italy	Microarchitecture performance assessment and energy monitoring of MaX codes through Linux Perf and power management API interfaces	2022
Dr. Stephan Hachinger	Leibniz Supercomputing Centre, Germany	Environmental Computing: Integrating HPC, IaaS-Cloud Services and Data Management	2022
Dr. Andreas Lintermann	Center of Excellence RAISE, EU	AI and HPC in Engineering Applications: Contribution to CoE RAISE and Beyond	2022
Prof. Dominik Göttsche	University of Stuttgart, Germany	Enabling PDE software frameworks for exascale	2019
prof. Letizia Gonzalez	University of Vienna, Austria	How to compute UV optical properties in molecular systems	2019
Prof. Garth N. Wells	University of Cambridge, UK	High performance computing for complex engineering systems	2019
Prof. Andrea Bartolini	Università di Bologna, Italy	Datacenter Automation – AI, big-data, and application awareness for green and smart supercomputers	2019

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the research project/programme call	Name of the contracting Authority/guarantor of the project/programme call	Year
prof. RNDr. Michal Otyepka, Ph.D.	Member of the Scientific Advisory Board of the Czech Science Foundation, approval of all calls and projects for financial support	Czech Science Foundation	2020 - 2024
Ing. Pavel Praks, Ph.D.	Review of international projects in the energy sector	CETPartnership (representative for the CR is Technology Agency of the CR)	2022 - 2025
prof. RNDr. Michal Otyepka, Ph.D.	Review of SNSF projects	Swiss National Science Foundation	2022
prof. Ing. Tomáš Kozubek, Ph.D.	Review of SNSF projects	Swiss National Science Foundation	2020, 2023
prof. RNDr. Michal Otyepka, Ph.D.	Review of ERC Consolidator projects	ERCA	2020
Ing. Dominik Legut, Ph.D.	Chairman of the Czech Science Foundation Panel P204 - Condensed Matter and Material Physics, Plasma Physics and Low Temperature Physics, approval of all projects for financial support	Czech Science Foundation	2019
Mgr. Martin Duda	Member of the Board of Technology Agency of the Czech Republic - approval of all calls and projects for financial support	Technology Agency of the Czech Republic	2017 - 2021
Mgr. Martin Duda	Evaluation of projects in the research infrastructure call	The Ministry of Education, Youth and Sports / OP JAK (ESIF)	2023
Prof. RNDr. René Kalus, Ph.D.	Evaluation of project within the call: Appel à projets générique 2020 / Chimie : analyse, théorie, modélisation	ANR (Agence Nationale de la Recherche), France	2020
Prof. Andrey Rogach	Evaluation of projects within Postdoctoral Fellowship call	The Research Foundation Flanders (FWO)	2023 - 2024

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research²⁴⁶) that it has implemented or participated in during the period of 2019–2023²⁴⁷. This should be done from the full list in annex tables (Table 3.3.1-3.3.2)²⁴⁸, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

²⁴⁶ For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

²⁴⁷ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

²⁴⁸ The evaluated unit shall only fill tables that are relevant to it.

1. **LEXIS, ID 825532 (H2020-ICT-2018-2020), 2019-2021, 14 mil. EUR**

The **LEXIS (Large-scale EXecution for Industry & Society)** project developed an advanced engineering platform integrating HPC, cloud, and big data technologies to enhance computational capabilities. **Coordinated by IT4Innovations**, the project aimed to merge HPC and cloud computing, broadening access for academia and industry.

By leading LEXIS, IT4Innovations advanced its mission to provide cutting-edge supercomputing services and drive research in HPC, data analysis, and artificial intelligence. The project contributed to integrating novel computing infrastructures and resource orchestration, reinforcing IT4Innovations' role as a European supercomputing hub.

The LEXIS consortium included **17 partners from seven European countries**, such as the Leibniz Supercomputing Centre, CEA, European Centre for Medium-Range Weather Forecasts, Atos, and Fondazione LINKS. These partners collaborated to develop a federated computing platform integrating distributed HPC, cloud, and big data frameworks.

As project coordinator, **IT4Innovations led the development and deployment of the LEXIS Platform** (see Chapter 3.4), providing HPC infrastructure, including experimental infrastructure for testing cloud setups and Burst Buffer servers for storage acceleration. The center also ensured efficient resource management, data security, and system scalability.

LEXIS applied its **interdisciplinary approach** in aeronautics, weather and climate, and earthquake and tsunami simulations, enhancing simulations, improving forecasting models, and advancing disaster prediction. This demonstrated the platform's versatility in engineering, environmental sciences, and disaster management.

Awards: 8x by European Innovation Radar, see <https://innovation-radar.ec.europa.eu/innovator/999868144>.

2. **POP2, ID 824080 (H2020-INFRAEDI-2018-2020), 2018-2022, 7,6 mil. EUR**

The **Performance Optimisation and Productivity (POP) Centre of Excellence** is a European initiative dedicated to enhancing the performance of parallel applications for academic and industrial users. By offering free performance assessments, audits, and proof-of-concept projects, POP helps improve computational efficiency and scalability in HPC environments.

IT4Innovations plays a crucial role in the POP project by leveraging its expertise in HPC performance analysis, code optimization, and computational research. IT4Innovations contributes to more effective resource utilization, faster simulations, and improved large-scale computations by identifying and resolving inefficiencies in software execution. This effort aligns with IT4Innovations' mission to advance computational sciences and support innovative research. **One of the current flagship tools of the POP Centre of Excellence is MERIC** (see Chapter 3.4), an advanced energy efficiency analysis tool developed at IT4Innovations. MERIC enables detailed power consumption analysis and energy optimization in HPC applications, making computational workflows more sustainable and efficient.

The POP Centre of Excellence is **coordinated by the Barcelona Supercomputing Center** and **involves key European partners**, including Jülich Supercomputing Centre, RWTH Aachen University, HLRS, NAG, TERATEC, or Université de Versailles. IT4Innovations, as a core partner, collaborates with these institutions to provide detailed performance evaluations and recommendations that benefit scientific and industrial applications.

The impact of POP extends across **multiple disciplines**, including engineering, physics, computational chemistry, and artificial intelligence. By optimizing parallel software, the project

accelerates research, enhances industrial modeling, and improves the efficiency of scientific simulations, reinforcing the role of HPC in addressing complex computational challenges.

The POP Centre of Excellence continues by the POP3 project ID 101143931 (HORIZON-EUROHPC-JU-2023-COE-01).

3. **EXA4MIND**, ID 101092944 (HORIZON-CL4-2022-DATA-01), 2023-2025, 4,9 mil. EUR

The **EXA4MIND (Extreme Analytics for Mining Data Spaces)** project aims to develop an advanced platform integrating HPC, cloud, and big data technologies to enhance data analytics and automated data management. The project focuses on unifying data from heterogeneous storage systems and making it accessible for processing on European pre-exascale supercomputers and AI-processing systems.

By coordinating EXA4MIND, IT4Innovations advances its mission to provide cutting-edge supercomputing services and conduct research in HPC, data analysis, and artificial intelligence. The project contributes to the integration of novel computing infrastructures and resource orchestration methodologies, reinforcing IT4Innovations' role as a European HPC hub.

The EXA4MIND consortium includes **10 European organizations from six countries**, such as the Leibniz Supercomputing Centre, Middle East Technical University, AUSTRALO Interinnov Marketing Lab, Valeo.ai, Altrnativ, and Terraview. These partners collaborate to develop a federated computing platform integrating distributed HPC, cloud, and big data frameworks.

As the project coordinator, **IT4Innovations leads the development and deployment of the EXA4MIND platform** focusing on complex data processing pipelines including very large data stored in databases and processed using HPC infrastructure. The platform leverages on existing technologies such as LEXIS Platform or HEAppE (see Chapter 3.4), and extends them with connection to databases and advanced data indexes and caching mechanisms. The center plays a key role in performance evaluation and optimization, ensuring efficient and secure processing of large-scale datasets.

EXA4MIND applies an **interdisciplinary approach** across scientific research, industry, agriculture, and health. It enhances molecular simulations, enables automated annotation of automotive camera data, supports smart farming through sensor and satellite imagery, and ensures secure data mining for health applications. This demonstrates the platform's versatility in scientific and industrial advancements.

Awards: 2x by European Innovation Radar, see <https://innovation-radar.ec.europa.eu/innovator/999868144>.

4. **EuroCC**, ID 951732 (H2020-JTI-EuroHPC-2019-2), 2020-2022, 56,3 mil. EUR, and complementary project **EDIH Ostrava**, ID 101083551 (DEP), 2023-2025, 3 mil. EUR

The **EuroCC Czechia** is part of the **EuroCC initiative**, which aims to build a European network of **33 national HPC competence centres in 33 countries** to bridge the existing HPC skills gaps while promoting cooperation across Europe. Each participating country establishes a National Competence Centre (NCC) for HPC and Data Analysis to coordinate national HPC-related activities and serve as a contact point for industry, science, HPC experts, and the general public.

In the Czech Republic, NCC is represented by IT4Innovations, providing expertise, proof-of-concept service, training, and access to HPC resources. By leading NCC, IT4Innovations advances its mission. Each NCC maps available HPC competencies, identifies knowledge gaps, and delivers tailored solutions to a wide range of users.

The EuroCC Czechia applies an **interdisciplinary approach** showcasing HPC applications across various fields through success stories based on the offered proof-of-concept service. The **EuroCC sustainability** is insured by the next project EuroCC 2 ID 101101903 within the Digital Europe Programme (DEP).

A complementary project coordinated by IT4Innovations focused on industry support is the **EDIH Ostrava** which supports the adoption of advanced digital technologies among SMEs and public organizations to enhance their competitiveness. Established in 2022, it is a collaboration between IT4Innovations, the Faculty of Electrical Engineering and Computer Science at VSB-TUO, and the Moravian-Silesian Innovation Centre Ostrava. EDIH Ostrava provides access to HPC and digitized manufacturing environments, offers digital skills training, and assists in securing investments and partnerships. Its goal is to drive digital transformation and foster innovation in the region. An example of the test before invest service offered by EDIH was collaboration with MGL company based on the **ESPRESO** (see Chapter 3.4).

5. **E-INFRA CZ, 2020-2026, 119 mil. EUR, for OPEX and complementary project IT4I P2E, 2017-2022, 19 mil. EUR for CAPEX**

The **e-INFRA CZ** is a unique e-infrastructure for research and development in the Czech Republic, providing capacities and resources for the transmission, storage, and processing of scientific and research data. It offers a transparent environment with a comprehensive portfolio of ICT services essential for modern research.

By participating in e-INFRA CZ, **IT4Innovations contributes to the development and operation of this fully transparent IT environment**, providing services to users across various scientific disciplines. This involvement aligns with IT4Innovations' mission to advance supercomputing services and support research in HPC, data analysis, QC, and AI.

The e-INFRA CZ consortium comprises **three main partners**: CESNET, CERIT-SC, and IT4Innovations. These entities collaborate to build and modernize the national research e-infrastructure, ensuring that it meets the evolving needs of the research community.

IT4Innovations' role within e-INFRA CZ includes providing HPC resources, supporting data storage solutions, and ensuring secure and efficient data transmission. The center also contributes to the development of advanced computing technologies and methodologies, enhancing the overall capabilities of the e-infrastructure.

The **interdisciplinary nature** of e-INFRA CZ allows it to support a wide range of scientific fields, from natural sciences and engineering to humanities and social sciences. By offering a comprehensive suite of services, e-INFRA CZ facilitates collaboration across disciplines, promoting innovation and scientific discovery. **Sustainability** is guaranteed by the Czech government. E-INFRA CZ also supports development and maintenance of the most tools in Chapter 3.4.

The **IT4Innovations – Path to Exascale project** (2017-2022, 19 mil. EUR) significantly strengthened Czech HPC infrastructure, ensuring technological competitiveness in Europe. It delivered two state-of-the-art supercomputers—Barbora (2019) and Karolina (2021, 15.6 PFlop/s), the most powerful public system in the country.

6. **SPACE, ID 101093441 (HORIZON-EUROHPC-JU-2021-COE-01), 2023-2026, 8 mil. EUR**

The **SPACE (Scalable Parallel Astrophysical Codes for Exascale)** project is a newly funded EU Centre of Excellence focused on astrophysical and cosmological applications. Its primary goal is to re-engineer existing astrophysical codes to efficiently exploit forthcoming exascale computing

architectures, thereby enabling groundbreaking scientific discoveries in various astrophysical environments.

By participating in SPACE, **IT4Innovations contributes to the development of advanced computational solutions in astrophysics and cosmology**. This involvement aligns with IT4Innovations' mission to advance HPC, data analysis, and AI, and to support their applications across scientific fields.

The **SPACE consortium comprises several prominent institutions**, including the Università di Torino, INAF – Istituto Nazionale di Astrofisica, CINECA, Katholieke Universiteit Leuven, Ludwig-Maximilians-Universität München, CNRS, Johann Wolfgang Goethe-Universität Frankfurt am Main, Universitetet i Oslo, E4 Computer Engineering, EnginSoft, EVIDEN, and the Barcelona Supercomputing Center. These partners collaborate to evolve state-of-the-art codes into new products capable of efficiently utilizing upcoming computing architectures.

Within the project, **IT4Innovations plays a crucial role in optimizing and scaling astrophysical codes for exascale performance**. The center provides its expertise in HPC, performance and energy efficiency optimization, data analysis, and advanced visualisations, contributing to the development of innovative programming paradigms, software solutions, and libraries tailored for astrophysical simulations. Key tool used for advanced cosmological visualisations is the SW tool **CyclesPhi Renderer** and **MERIC** for energy efficiency optimization, both developed by IT4Innovations (see Chapter 3.4).

The **interdisciplinary nature** of SPACE brings together scientists, code developers, HPC experts, hardware manufacturers, and software developers. This collaboration fosters the reuse and sharing of algorithms and software components in the astrophysical and cosmological application domains, promoting the use of upcoming exascale and post-exascale computing capabilities. The **sustainability** should be insured by the specific EuroHPC JU calls.

7. **MAX3, ID 101093374 (HORIZON-EUROHPC-JU-2021-COE-01), 2023-2026, 8,5 mil. EUR**

The **MaX (Materials design at the eXascale)** project is a European Centre of Excellence dedicated to advancing materials modeling, simulations, discovery, and design by leveraging current and future HPC and High-Throughput Computing technologies. The project focuses on optimizing open-source quantum simulation codes to efficiently utilize exascale and post-exascale architectures, thereby facilitating significant scientific and industrial advancements.

By participating in MaX, IT4Innovations aligns with its mission to provide cutting-edge supercomputing services and promote research in HPC, data analysis, and AI. Within the project, **IT4Innovations leads Work Package 4, contributing by expertise in energy efficiency evaluation and tuning, and efficient work-flow processing through tools like MERIC and HYPERQUEUE** (see Chapter 3.4). The center also offers its proficiency in developing accelerated applications and porting codes to novel hardware architectures, enhancing the performance and scalability of materials science applications.

The **MaX consortium includes prominent institutions** such as CNR (Consiglio Nazionale delle Ricerche), CINECA, Barcelona Supercomputing Center, Forschungszentrum Jülich, or Atos. These partners collaborate to advance materials science codes, ensuring their adaptability to evolving HPC architectures and promoting their application in both academic and industrial contexts.

The **interdisciplinary nature** of MaX fosters collaboration among physicists, chemists, materials scientists, and computer scientists, facilitating the development of innovative computational tools and methodologies. This collaborative approach accelerates the discovery of new materials and enhances the understanding of complex material behaviors, contributing to advancements in

sectors such as energy, electronics, and manufacturing. The **sustainability** should be insured by the specific EuroHPC JU calls.

8. **LIGATE**, ID 956137 (H2020-JTI-EuroHPC-2019-1), 2021-2024, 5,9 mil. EUR

The **LIGATE (Ligand GAting at Exascale)** project aims to maintain Europe's global leadership in Computer-Aided Drug Design (CADD) by leveraging current state-of-the-art supercomputers and future exascale systems. Coordinated by Dompé Farmaceutici in Italy, the project builds on the achievements of Exscalate4COV, which conducted the largest supercomputing experiment on the SARS-CoV-2 virus to identify potential treatments for COVID-19.

By participating in LIGATE, IT4Innovations advances its mission to provide cutting-edge supercomputing services and drive research in HPC, data analysis, and AI. **The center led Work Package 4**, focusing on AI, Big Data, and Workflow Components, and played a key role in enhancing workflow management systems. IT4Innovations delivered new meta scheduler **HyperQueue** (see Chapter 3.4), enabling large-scale simulation tasks to run efficiently on supercomputers. This tool is released as open source, ensuring its applicability in other scientific projects. The project enabled the **EXSCALATE platform to evaluate more than 1 trillion molecules** in a single simulation by integrating artificial intelligence and machine learning and enhanced the accuracy of simulations, improving drug discovery outcomes. IT4Innovations tested the LIGATE solution with **LEXIS Platform** by multisite execution of the LiGen-based drug discovery workflow on Karolina, industrial E4, CINECA, and CSC-LUMI supercomputers.

The **consortium includes 11 institutions**, such as Dompé Farmaceutici, Politecnico di Milano, CINECA, KTH, and the University of Basel, working together to advance HPC-driven drug discovery.

The **interdisciplinary nature** of LIGATE brings together experts in pharmaceutical sciences, computer science, and artificial intelligence. This collaboration fosters the development of an integrated workflow that automates the drug design process, enabling rapid responses to public health crises, such as pandemics.

Awards: 1x by European Innovation Radar, see <https://innovation-radar.ec.europa.eu/innovator/999868144>

9. **EVEREST**, ID 957269 (H2020-ICT-2018-20), 2020-2024, 5 mil. EUR

The **EVEREST (dEsign enVironmEnt foR Extreme-Scale big data analyTics on heterogeneous platforms)** project developed a holistic design environment to simplify High-Performance Big Data analytics on heterogeneous, distributed, scalable, and secure systems. The project employed a data-driven design approach with domain-specific language extensions, hardware-accelerated AI, and efficient execution monitoring, ensuring seamless integration between hardware and software. The **EVEREST System Development Kit (SDK)** was introduced as an open-source framework to facilitate FPGA-based architectures and their deployment on high-performance cloud infrastructures.

The **EVEREST consortium comprised ten partners from six European countries**, including large companies, SMEs, research institutes, and universities. Key partners included IBM Research Europe GmbH (project coordinator), Politecnico di Milano, Fraunhofer Institute for Integrated Circuits IIS, ETH Zürich, Sygic, and IT4Innovations.

IT4Innovations played a crucial role in the project by **leading the real-time traffic modeling use case for intelligent transportation in smart cities**. The center contributed its expertise in HPC and big data analytics, focusing on developing a real-time traffic modeling framework (see **Smart City Traffic Computation Platform** in Chapter 3.4) that integrates complex data sources to optimize

urban traffic flow. Additionally, IT4Innovations was responsible for the technical development of programming models for orchestrating complex workflows and for the exploitation and dissemination of project results.

The project is addressing critical challenges in energy, environmental science, and smart city development. By participating in EVEREST, IT4Innovations advanced its mission to provide cutting-edge supercomputing services and foster research in HPC, data analysis, and AI. The project promoted **interdisciplinary collaboration** across computer science, data analytics, environmental science, and urban planning, driving innovation in diverse fields. **Sustainability** of the Smart City Traffic Computation Platform is covered by the collaboration of IT4Innovations and Sygic.

Awards: 2x by European Innovation Radar, see <https://innovation-radar.ec.europa.eu/innovator/999868144>.

10. **EUPEX, ID 101033975 (H2020-JTI-EuroHPC-2020-01), 2022-2026, 40,8 mil. EUR**

The **EUPEX (European Pilot for Exascale)** project aims to design, build, and validate the first EU platform for HPC, integrating European technologies across architecture, processors, system software, development tools, and applications. The EUPEX prototype is designed to be open, scalable, and flexible, featuring a modular platform compliant with OpenSequana and a corresponding HPC software ecosystem for Modular Supercomputing Architecture. Scientifically, EUPEX prepares HPC, AI, and Big Data processing communities for future European Exascale systems.

The **EUPEX consortium consists of 17 European organizations**, including established technology suppliers, research institutions, universities, computing centers, and application owners. Key partners include Eviden (coordinator), Forschungszentrum Jülich, CEA, GENCI, CINECA, FORTH, ECMWF, ParTec, Goethe University, IT4Innovations, and others.

A key IT4Innovations contribution to EUPEX is the ESPRESO FEM framework, an open-source, massively parallel solver for engineering, biomechanics, and energy applications based on the Finite Element Method (see Chapter 3.4). It efficiently utilizes GPU-accelerated supercomputers, solving hundreds of billions of unknowns with domain decomposition methods. Its parallel I/O module enables seamless integration with ANSYS, HyperMesh, ANSA, and ABAQUS. In EUPEX, ESPRESO FEM is being optimized for the future SiPearl Rhea chips, leveraging SVE vectorization and HBM memory to enhance performance on the EUPEX modular architecture.

Additionally, **IT4Innovations plays a crucial role in energy efficiency optimization** within EUPEX. The **MERIC** (see Chapter 3.4) runtime system is adapted to the EUPEX hardware platform, enabling parameter tuning and resource consumption monitoring to evaluate and enhance the energy efficiency of parallel applications running on the EUPEX pilot system.

By participating in EUPEX, IT4Innovations strengthens its role in European HPC leadership, fostering **interdisciplinary collaboration** in computer science, hardware engineering, and energy-efficient computing, and driving innovation in exascale computing capabilities. The **sustainability** should be insured by the specific EuroHPC JU calls.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ²⁴⁹	Project name	Support (in thousands CZK/EUR) ²⁵⁰				
		2019	2020	2021	2022	2023
Ministry of Education, Youth and Sports	Summary of projects	226 362,59/ 8 929 490,70	67 701,40/ 2 670 666,48	312 252,10/ 12 317 636,93	64 577,50/ 2 547 435,88	25 844,06/ 1 019 489,44
European Commission	Summary of projects	9 294,00/ 366 627,27	11 861,25/ 467 899,47	10 828,73/ 427 168,82	0,00/0,00	7 777,39/ 306 800,49
Czech Science Foundation (GAČR)	Summary of projects	1 920,42/ 75 756,04	2 474,50/ 97 613,57	3 264,35/ 128 771,03	3 146,23/ 124 111,57	2 775,02/ 109 468,21
Ministry of the Interior	Summary of projects	398,64/ 15 725,45	1 518,05/ 59 883,80	1 934,05/ 76 293,96	753,31/ 29 716,51	2 480,16/ 97 836,77
Technology Agency of the Czech Republic (TAČR)	Summary of projects	0,00/0,00	0,00/0,00	0,00/0,00	2 400,74/ 94 703,84	3 446,02/ 135 937,76
Moravian-Silesian Region	Summary of projects	335,88/ 13 249,70	714,99/ 28 204,59	317,06/ 12 507,48	115,20/ 4 544,38	1 069,46/ 42 187,87
Ministry of Industry and Trade	Summary of projects	0,00/0,00	0,00/0,00	0,00/0,00	0,00/0,00	2 256,12/ 88 998,63
Ministry of the Environment	Summary of projects	0,00/0,00	0,00/0,00	0,00/0,00	0,00/0,00	2 225,37/ 87 785,95
International Visegrad Fund	Summary of projects	548,39/ 21,63	108,95/ 4,30	0,00/0,00	0,00/0,00	19,14/ 754,92
Total		238 859,92/ 9 422 481,83	84 379,14/ 3 328 565,92	328 596,29/ 12 962 378,22	70 992,98/ 2 800 512,18	47 892,74/ 1 889 260,04
In the role of another participant						
Provider ²⁵¹	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Ministry of Education, Youth and Sports	Summary of projects	1 974,64/ 77 894,97	77 162,02/ 3 043 866,58	71 415,11/ 2 817 163,95	120 617,23/ 4 758 076,10	112 148,34/ 4 423 997,81
European Commission	Summary of projects	13 626,61/ 537 538,80	15 899,35/ 627 193,49	30 601,21/ 1 207 148,36	33 443,73/ 1 319 279,13	35 463,83/ 1 398 967,60

²⁴⁹ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

²⁵⁰ Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

²⁵¹ Ibid.

Technology Agency of the Czech Republic (TAČR)	Summary of projects	5 262,62/ 207 598,35	4 838,03/ 190 849,19	6 894,88/ 271 987,56	7 810,85/ 308 120,45	3 614,12/ 142 568,95
Ministry of Industry and Trade	Summary of projects	2 173,76/ 85 749,82	3 049,92/ 120 312,46	3 340,95/ 131 792,93	9 842,62/ 388 268,97	8 014,73/ 316 162,88
Czech Science Foundation (GAČR)	Summary of projects	0,00/0,00	0,00/0,00	0,00/0,00	709,26/ 27 978,84	1 842,63/ 72 687,46
Ministry of the Interior	Summary of projects	0,00/0,00	0,00/0,00	0,00/0,00	0,00/0,00	1 523,95/ 60 116,50
Ministry for National Economy (Hungary)	Summary of projects	634,11/ 25 014,18	0,00/0,00	0,00/0,00	0,00/0,00	0,00/0,00
Total		23 671,74/ 933 796,12	100 949,32/ 3 982 221,72	112 252,15/ 4 428 092,80	172 423,69/ 6 801 723,49	162 607,60/ 6 414 501,20

Table 3.3.2 - Contract research activities

Client ²⁵²	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
K2 atmitec s.r.o.	Testing the inventory optimization module of the K2 system.	100,00/ 3 944,77	0,00/0,00	0,00/0,00	0,00/0,00	0,00/0,00
Bayncore Labs Limited (Irsko)	IT4I provided consultancy and research support to Bayncore Labs Limited focusing on HPDA and HPC research.	710,46/ 28 026,13	1 564,87/ 61 730,65	0,00/0,00	0,00/0,00	0,00/0,00
GLASS SERVICE, a.s.	Design of production control optimization through parameters adjusted / monitored in zones 2-7 (input) based on temperature measurements in zones 1A/1B/... (output), using artificial neural networks (ANN).	75,00/ 2 958,58	0,00/0,00	0,00/0,00	0,00/0,00	0,00/0,00
Siemens s.r.o.	Optimization of the design of the asynchronous electric motor ventilation node with respect to air quantity, mechanical losses and noise. The first phase of the solution of the topic	710,00/ 28 007,89	0,00/0,00	0,00/0,00	0,00/0,00	0,00/0,00

²⁵² If the client is from abroad, indicate in brackets the country of origin of the client.

	Maximum operating speed of an asynchronous electric motor, consisting in performing computational simulations to determine the modal properties, i.e. natural frequencies and oscillation shapes.					
Continental Powertrain	Calculations of water diffusion into BPF and BPA as a function of temperature. Calculations of water diffusion into modified BPF and BPA with hydrophobic layer as a function of temperature. Diffusion of water into BPF, BPA and in particular modified BPF(BPA) with hydrophobic layer as a function of thickness.	541,20/ 21 349,11	0,00/0,00	0,00/0,00	0,00/0,00	0,00/0,00
Space Applications Services NV/SA (Belgie)	Development of specialized platforms for satellite image processing utilizing novel AI technologies.	0,00/0,00	1 847,47/ 72 878,58	1 151,48/ 45 423,26	0,00/0,00	722,40/ 28 497,04
NÚKIB	Modular Open Source secure communication.	0,00/0,00	3 244,63/ 127 993,22	350,41/ 13 823,01	0,00/0,00	0,00/0,00
BeePartner a.s.	The subject of the Contract is the provision of professional consultancy services in the field of artificial intelligence, in particular - Obtaining key information from the text of grant calls (in Czech language), - Finding words of similar meaning, synonyms, etc. , - Pairing of keywords.	0,00/0,00	0,00/0,00	190,00/ 7 495,07	0,00/0,00	0,00/0,00
FONDAZIONE LINKS-LEADING, ORkD	IT4I provided AI and HPC-as-a-Service research and technology support to provide AI HPC-based training datasets for a progressive capability in terms of functionality enrichment of the harm.	0,00/0,00	0,00/0,00	0,00/0,00	246,05/ 9 706,11	0,00/0,00
ITA spol.s.r.o.	3D finite element method calculations.	0,00/0,00	0,00/0,00	0,00/0,00	80,00/ 3 155,82	0,00/0,00
ELCOM a.s.	Implementation of an application demonstrating the function of a GPU accelerated node. Implementation of GPU acceleration APB image processing chain. Modification of image processing source code and DLLs.	0,00/0,00	0,00/0,00	0,00/0,00	287,40/ 11 337,28	35,00/ 1 380,67

Dolní oblast VÍTKOVICE, z.s.	Application to demonstrate style transfer AI.	0,00/0,00	0,00/0,00	0,00/0,00	88,00/ 3 471,40	0,00/0,00
NIOB, spol. s r.o.	Determination of the operating load of the variometer. Assessment of static and dynamic strength of spirals and shafts, assessment of fatigue strength of spirals and shafts.	0,00/0,00	0,00/0,00	0,00/0,00	0,00/0,00	200,00/ 7 889,55
MODEL OBALY a.s.	An application with a simple graphical interface.	0,00/0,00	0,00/0,00	0,00/0,00	0,00/0,00	25,00/ 986,19
Total		2 136,66/ 84 286,49	6 656,97/ 262 602,45	1 691,89/ 66 741,33	701,45/ 27 670,61	982,40/ 38 753,45

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the period of 2019–2023, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts²⁵³, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

²⁵³ See Terms definition.

1. LEXIS Portal v2 (part of the LEXIS platform, 2023)

The **LEXIS Portal** is a part of the **LEXIS Platform** which is a **service with web-based interface** that simplifies access to HPC and cloud resources for academia, industry, SMEs, and public organizations. It eliminates the need for users to interact with complex command-line environments, enabling seamless execution of computational workloads. The portal integrates HPC and cloud (Kubernetes) resources, automating large-scale computing tasks while efficiently managing data through the LEXIS Distributed Data Interface (see [documentation](#)). Users can monitor workflows in real time and execute computations across multiple HPC clusters simultaneously.

The LEXIS Platform has been **used in several European projects**. The [LIGATE project](#) uses it for large-scale molecular simulations in drug discovery, distributing computations across HPC centers such as IT4Innovations, LUMI, and CINECA. The [EVEREST project](#) employs it for weather simulation and renewable energy forecasting, improving climate resilience. The [BioDT project](#) leverages it for biodiversity research, integrating web-based user script definition. [OpenWebSearch.eu](#) uses it to process web data on HPC clusters, creating open web indexes for public access. These applications demonstrate the portal's role in democratizing supercomputing, fostering scientific collaboration, and supporting economic growth by making HPC more accessible for AI, climate modeling, and pharmaceutical research.

By lowering technical barriers, the LEXIS Platform **enhances inclusivity**, particularly for underrepresented groups such as non-IT specialists, by making computational resources accessible across research disciplines. Its **sustainability impact** is evident in optimized workload distribution, reducing energy consumption and the need for energy-intensive infrastructure. It also supports environmental sustainability by enabling projects like EVEREST to improve renewable energy predictions.

The innovation was recognised by [European Innovation Radar](#) and the **Federation Platform for the EuroHPC JU** which will federate the European (EuroHPC) supercomputers, quantum computers, and related data infrastructure will be based on the components of the LEXIS Platform.

2. HyperQueue (2021)

The **HyperQueue tool simplifies and optimizes the use of modern supercomputing clusters by efficiently managing job scheduling**. Traditional HPC clusters use job managers like PBS or Slurm, which can be inefficient when handling a large number of small jobs. [HyperQueue](#) automates job distribution across computing resources, ensuring better utilization, particularly on heterogeneous clusters. It is [open-source](#), with an active user community contributing to its development and adoption.

HyperQueue plays a **crucial role in several European projects**. In the [EVEREST project](#), it schedules tasks with complex resource requirements on heterogeneous clusters, particularly FPGA accelerators. In the [LIGATE project](#), it links and executes job sets for drug discovery simulations using tools like LiGEN and GROMACS. The [ACROSS project](#) is integrating HyperQueue for executing MPI jobs across multiple compute nodes, enabling large-scale parallel computations.

Internationally, HyperQueue has been **deployed on European supercomputers** like LUMI (Finland), Leonardo (Italy), and Karolina (Czech Republic), where it is recognized as a primary tool for job scheduling. It has also been integrated into widely used metaschedulers like [Aiida](#) and Nextflow, broadening its impact in scientific research. Additionally, it is used in the [ATLAS experiment at CERN](#), demonstrating its suitability for managing large-scale scientific workloads.

By reducing complexity, HyperQueue **makes HPC more accessible and inclusive**, benefiting researchers and industries that lack expertise in job scheduling. Its optimized and energy-efficient job execution contributes to sustainability by improving resource utilization and reducing idle computing power. Its development team actively promotes it through [training courses](#),

conferences, and collaborations, ensuring continued impact in the HPC community. The innovation was recognised by the [European Innovation Radar](#).

3. HEAppE Middleware v3 (2022)

The **HEAppE Middleware v3** is a HPC execution framework designed to provide secure and intuitive remote access to supercomputing infrastructure. Developed by IT4Innovations, it enables HPC-as-a-Service, allowing users, including SMEs and public organisations, to utilize HPC resources without needing to invest in hardware or possess advanced technical expertise. [HEAppE](#) functions as middleware, managing job submission, monitoring, reporting, and authentication, ensuring a seamless and secure connection between external applications and HPC infrastructure.

HEAppE has been **integrated into numerous international projects and research initiatives**. In H2020 [LEXIS](#), it serves as the job orchestrator for multiple HPC systems. In the [EVEREST project](#), it enables workflow execution at IBM's infrastructure for big data analytics on heterogeneous platforms. In [ExCaPE](#) and [LIGATE](#), it plays a key role in drug discovery, running scientific pipelines on HPC. Additionally, [ESA's BLENDED](#) and [Urban-TEP](#) projects leverage HEAppE for space data analysis and urban environment simulations.

By removing administrative barriers to HPC access, HEAppE **improves inclusivity** by allowing a broader range of users, including SMEs and researchers, to leverage supercomputing. Its open-source nature fosters global adoption and collaboration. The latest version introduces enhanced security features, support for partitioned clusters, and a local cluster environment for simulation without requiring direct HPC access. **Sustainability benefits** include efficient resource allocation, reducing energy consumption and redundant infrastructure investments. HEAppE has been hosted by/provided for major HPC centers, including IT4Innovations, LRZ, EPCC, IBM, CINECA, and LUMI, further strengthening its impact on global HPC accessibility and efficiency.

4. Smart City Traffic Computation Platform (2023)

The [Smart City Traffic Computation Platform](#), developed collaboratively by Sygic and IT4Innovations within the Horizon Europe [EVEREST project](#), **is an innovative solution designed to enhance urban traffic management**. Unveiled at the ITS Congress in Lisbon, this platform utilizes real-time and historical data from floating car data (FCD) to provide comprehensive traffic visualizations and predictions. By processing these data streams, municipalities can gain valuable insights into traffic patterns, enabling more efficient traffic control and urban planning.

The platform's application is particularly **relevant for municipalities and urban planners** seeking to optimize traffic flow and reduce congestion. By leveraging artificial intelligence and HPC, the system can analyze vast amounts of data to predict traffic conditions, allowing for proactive traffic management strategies. This capability is crucial for improving urban mobility, reducing travel times, and enhancing the overall quality of life for city residents.

In terms of economic impact, the platform **offers municipalities the potential to reduce costs associated with traffic congestion**, such as fuel consumption and lost productivity. Additionally, by improving traffic flow, cities can decrease emissions, contributing to environmental sustainability. The platform's ability to provide data-driven insights supports informed decision-making, leading to more effective infrastructure investments and urban development plans.

Regarding the gender dimension, the platform **promotes inclusivity** by providing tools that can be utilized by a diverse range of professionals in urban planning and traffic management.

The **sustainability impact** of the platform is significant. By enabling more efficient traffic management, it contributes to reduced vehicle emissions, supporting environmental sustainability goals. Furthermore, the platform's data-driven approach promotes the development of smart cities, where technology and data are harnessed to create more sustainable and livable urban environments.

The innovation was recognised by the [European Innovation Radar](#).

5. MERIC v2 (2022)

The **MERIC** runtime system is a pivotal component of the [MERIC energy-efficient tool suite](#), **designed to optimize power consumption in HPC data centers**. By measuring resource usage of parallel applications and adjusting hardware power settings, such as CPU core frequency, MERIC achieves significant energy savings without compromising performance. This is crucial for minimizing CO₂ emissions and reducing operational costs in large-scale supercomputing facilities, where energy demands can be substantial.

MERIC's impact is evident through its **integration into various industrial applications**. For instance, benchmarks like walBerla and proLB, utilized by major European companies such as Airbus and Renault, have reported up to 20% energy reduction (see [SCALABLE project](#)). As a recognized tool within the [EuroHPC JU](#), MERIC is one of the flagship codes of the [POP CoE](#) and is deployed in multiple EuroHPC centers, with plans for expansion to additional petascale and pre-exascale systems.

The MERIC **plays a key role** in the [EUPEX project](#), which focuses on developing the future European SiPearl Rhea processor ecosystem. The latest version of MERIC supports modern server CPUs and GPUs, and Fujitsu A64FX processors, enabling dynamic power management and enhanced user interface features. Its adoption spans projects like [SCALABLE](#), [MaX](#), [SPACE](#), and [READEX](#), further strengthening energy efficiency research in HPC.

By reducing power consumption and operational costs, MERIC significantly contributes to **sustainability in HPC**. As part of the [EuroHPC Energy Efficient Technologies initiative](#) and DARE consortium for RISC-V, MERIC collaborates with other European runtime systems, ensuring optimal resource utilization and promoting a low-carbon computing future.

6. CyclesPhi v2 renderer (2021)

The **CyclesPhi v2 renderer** is an **advanced path-tracing rendering software** that enables photorealistic image synthesis of virtual objects and environments. As an extended version of Blender's Cycles renderer, CyclesPhi v2 introduces a novel data distribution mechanism for efficient multi-GPU rendering on supercomputing clusters. This mechanism enables large-scale scene rendering across multiple GPUs, significantly reducing processing time while maintaining high visual quality. The scientific impact of this work is demonstrated by its publication in the [ACM Transactions on Graphics](#) (D1-ranked journal) and its presentation at SIGGRAPH, a leading international graphics conference.

A key application of CyclesPhi is within Rendering-as-a-Service (R-a-a-S), allowing [Blender](#) users to perform high-performance rendering remotely on IT4Innovations' supercomputing infrastructure. This service facilitates interactive rendering of large-scale scenes at ~10 fps, which was previously unattainable without significant local computing resources. The wide adoption of Blender, with over [15 million downloads](#) in 2020, highlights the strong global and national user base benefiting from this technology.

The social and economic impact of CyclesPhi extends beyond entertainment and visualization. It is actively **used in education, scientific simulations, and industrial design**, allowing users to visualize complex simulations in multiple scientific fields. In the [SPACE CoE project](#), CyclesPhi is used for the visualization of outputs from cosmological simulations, enabling researchers to analyze and interpret astrophysical phenomena with high-fidelity imagery. Blender's integration into secondary and tertiary education makes CyclesPhi a valuable tool for training future professionals. IT4Innovations offers free academic access to this service, providing a significant cost advantage over standard cloud rendering solutions. The renderer is available for testing through [IT4Innovations' service portfolio](#).

By accelerating rendering workflows, reducing computational costs, and enabling **sustainable access** to high-performance visualization tools, CyclesPhi supports both creative and scientific

communities and **improves inclusivity** by allowing its functionalities to a broader range of users.

7. Voxelization workflow (2022)

The **Voxelization workflow** developed by IT4Innovations **significantly enhances volume rendering for CFD simulations**, providing a more illustrative and efficient visualization technique compared to traditional methods like streamlines, cutting surfaces, or iso-surfaces. The key advantage of this method is its ability to visualize entire computed volumes in real time, making it a powerful tool for scientific post-processing. However, volume rendering is computationally demanding, especially for large datasets, and the necessary resampling of unstructured grid data has traditionally hindered its practical use.

To address this, IT4Innovations has developed an HPC-ready workflow that efficiently resamples CFD simulation results from established scientific software such as Ansys FLUENT and OpenFOAM into the OpenVDB format, the industry standard for volumetric data storage. This format is supported by major visualization tools including Houdini, Maya, and Blender, **allowing for photo-realistic rendering of scientific simulations with up to 1 billion cells in just a few minutes using thousands of CPU cores**.

The workflow is **integrated into the [MESIO library](#)**, an open-source tool for parallel loading and processing of unstructured mesh databases. It introduces asynchronous I/O and a new load-balancing algorithm, significantly improving performance by overlapping data conversion with storage operations. This innovation reduces the conversion process from hours to minutes, surpassing existing tools like ParaView and VisIt.

The scientific impact of this work is demonstrated by its recognition at the Supercomputing Conference (SC22), where it won the **Best Research Poster Award**. It is also being used in Horizon Europe projects [SPACE](#) and [FALCON](#) for the post-processing of simulation results, showcasing its value in international scientific collaborations and **potential for sustainability**.

By reducing computational bottlenecks, enabling large-scale visualization, and improving accessibility to HPC-powered rendering, this **workflow enhances inclusivity** and represents a major advancement in scientific visualization and post-processing.

8. ESPRESSO FEM Assembler (2023)

The **ESPRESSO FEM Assembler** is a **HPC tool designed to optimize Finite Element Method (FEM) simulations** by improving the efficiency of kernel execution on modern CPU architectures. FEM is widely used for simulating physical phenomena in engineering, requiring the transformation of physical parameters into large systems of linear equations. Since kernel computations can represent a significant portion of total simulation time, ESPRESSO introduces vectorization and dynamic optimization techniques to achieve substantial [performance improvements](#).

A **key innovation** of [ESPRESSO](#) is its cross-element vectorization, meta-programming, and run-time selection of computational operators, which dynamically adapt to hardware configurations and user-defined parameters. ESPRESSO's novel approach divides kernels into reusable sub-kernels, allowing real-time performance tuning without excessive computational overhead. This results in up to 3x faster kernel execution, significantly improving efficiency in large-scale FEM simulations. ESPRESSO is **an integral part of the [EUPEX project](#)**, where it is used for testing and co-designing the European modular exascale-ready pilot system. In particular, it has been applied to optimize performance for the Scalable Vector Extension (SVE) instruction set, which will be used in the future European processor. In the [FALCON project](#), it supports fluid-structure interaction simulations of airplane wings in collaboration with the Karlsruhe Institute of Technology. In this context, ESPRESSO's optimizations significantly reduce computational costs.

Regarding the **gender dimension**, ESPRESSO contributes to the accessibility of HPC tools by reducing the complexity of performance optimization, which can broaden participation in FEM-based research and engineering, including for underrepresented groups. From a **sustainability perspective**, ESPRESSO enhances computational efficiency, reducing energy consumption and

hardware usage, which is crucial for lowering the environmental footprint of large-scale numerical simulations. Its open-source availability ensures broad adoption and continuous improvement, making it a valuable asset in next-generation European HPC infrastructure.

9. AI-based Voicebot for Emergency Call Handling (2022)

The **AI-based Voicebot for Emergency Call Handling** is an artificial intelligence solution designed to assist emergency operators by automatically processing 112 and 150 emergency calls in the Czech Republic when operator capacity is exceeded. The system integrates speech recognition, dialogue management, and speech synthesis to ensure faster emergency response and reduced operator workload. Using real emergency call recordings from TCTV 112, a domain-specific language model was developed, improving speech transcription accuracy by 7% compared to commercial solutions. The system structures the extracted information into a data sentence format compatible with emergency dispatching systems, enabling seamless integration into crisis management workflows (see [Voicebot Demonstrator](#) in Czech).

The solution **aligns with the Security Strategy of the Czech Republic**, supporting public protection through AI. It was recognized as the [Most Innovative Solution](#) at the DT4REGIONS Final Conference in Brussels, highlighting its potential for AI-driven public administration. Additionally, it was presented at the [Jelinek Summer Workshop](#) on Speech and Language Technology (JSALT23) as a cutting-edge approach to AI in emergency services.

Regarding the **gender dimension**, the voicebot integrates both male and female synthesized voices, ensuring inclusivity in emergency communication. By automating emergency call handling, it helps alleviate operator stress and fatigue, fostering a more balanced and accessible work environment, particularly for women and underrepresented groups in emergency services.

From a **sustainability perspective**, the system optimizes human resources and response times, improving crisis management efficiency during natural or industrial disasters. By reducing manual workload, it enhances the resilience of critical infrastructure, ensuring faster, AI-driven emergency response that can scale effectively during crisis situations.

The solution was created in the **project VI20192022169** supported by the Ministry of Interior of the CR, 2021-2022, 0.9 mil. EUR. The follow-up project is VI20192022169, 2023-2025, 1.9 mil. EUR.

10. ESA Platforms (2019-2023)

The [AIOPEN platform](#) is an AI platform for processing Earth observation data developed within a collaboration between IT4Innovations and the European Space Agency (ESA). The platform provides a user-friendly interface with customizable AI workflows, enabling researchers, policymakers, and industry professionals to analyze remote sensing and satellite imagery without requiring advanced technical skills. AIOPEN integrates machine learning models to support applications such as land cover classification, disaster monitoring, environmental impact assessment, and urban growth analysis, helping to inform sustainable regional development.

AIOPEN **builds on IT4Innovations' previous ESA collaborations**, including the Urban Thematic Exploitation Platform ([Urban TEP](#)), which generated cloud-free satellite imagery for urbanization monitoring, and the [BLENDED project](#), which used Blockchain Enabled Deep Learning for space data. The key tool was HEAppE Middleware. The AIOPEN Platform combines and extends the existing platforms ASB (Automated Service Builder), EOPEN (Open Interoperable Platform for Unified Access & Analysis of EO Data) and EOEPKA (EO Exploitation Platform Common Architecture). The ASB and EOPEN technologies, developed by Space Applications Services, allow AIOPEN to import custom processes, creating workflows and executing them in a distributed environment to deliver services on user customizable dashboards. Components from EOEPKA project are included to bring interactive development, cataloguing, and sharing capabilities.

From a **gender dimension** perspective, AIOPEN fosters inclusivity in AI and remote sensing by

providing accessible tools for diverse users, including underrepresented groups in STEM fields. The platform's intuitive design lowers barriers to entry, ensuring broader participation in AI-driven Earth observation research.

The **sustainability impact** of AIOOPEN is significant. By automating satellite data analysis, the system optimizes resource efficiency and enables faster, data-driven decision-making in climate monitoring, land management, and disaster response. This AI-powered approach supports ESA's commitment to sustainable space technologies and aligns with European climate initiatives.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ²⁵⁴	Year of application	Name
LEXIS Portal v2	2023	Pylat N., Golasowski M., Swiatkowski J., Martinovič J.
HyperQueue	2021	Böhm S., Beránek J., Cima V., Martinovič J., Jansík B.
HEAppE Middleware v3	2022	Křenek J., Konvička J., Podhorányi M., Svatoň V.
Smart City Traffic Computation Platform	2023	Martinovič J., Slaninová K., Cmar R. et al.
MERIC v2	2022	Vysocký O., Říha L.
CyclesPhi v2 Renderer	2021	Jaroš M., Říha L., Strakoš P.
Voxelization workflow	2022	Hrabánková M., Meca O., Jaroš M., Brzobohatý T., Říha L., Strakoš P.
ESPRESO FEM Assembler	2023	Kadlubiak K., Meca O., Brzobohatý T., Říha L.
AI-based Voicebot for Emergency Call Handling	2022	Svatoň V., Šurkovský M., Drábek L. et al.
ESA Platforms	2019-2023	Svatoň V. et al.

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)²⁵⁵, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).²⁵⁶

Additionally, the evaluated unit shall briefly comment on the funds received during the period of 2019–2023 from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations,

²⁵⁴ Specify the specific type of result. Add rows as needed.

²⁵⁵ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

²⁵⁶ If the commercialisation of R&D&I results is carried out in this way.

etc.). A full summary shall be provided in annex table (Table 3.5.1).

IT4Innovations employs several key strategies for transferring research results into practice, focusing on collaboration with industry partners, startups, and public organisations. These strategies are designed to maximize the societal and economic impact of innovations while generating value for both IT4Innovations and its collaborators.

System for Transferring Results

1. **Contract Research** (tailored research services in HPC, data analytics, AI, and QC)
2. **Commercial Infrastructure Access** (renting HPC resources to external partners)
3. **Financial Instruments** (test new technologies and evaluate their potential benefits through EDIH Ostrava services)
4. **Subsidized Applied Research** (collaborative projects subsidized by public sources through the Technology Agency of the CR, Ministry of Industry and Trade, Digital Europe, Horizon Europe, etc.)
5. **Training and Education** (specialized training courses for industry professionals)

Intellectual Property Management: IT4Innovations collaborates with the university's Technology Transfer Centre to address intellectual property protection issues, ensuring innovations are safeguarded during commercialization efforts. At the same time, it employs an in-house lawyer for specific topics such as preparing NDAs related to the use of its supercomputing infrastructure or contract research projects.

Typical Users and Collaboration Examples

SMEs: Example SYGIC

In 2023, Sygic and IT4Innovations introduced the Smart City Traffic Computation Platform at the ITS Congress in Lisbon. This platform integrates real-time and historical traffic data to enhance urban mobility, optimize route guidance, and improve traffic management. By leveraging HPC and AI, it enables municipalities to analyse traffic patterns, predict congestion, and make data-driven infrastructure decisions. The platform benefits urban planners, public authorities, and transportation services, reducing travel times, fuel consumption, and emissions. Through this collaboration, IT4Innovations and Sygic contribute to the development of smarter, more sustainable cities and improved traffic efficiency.

Large Companies: Example Dompé Farmaceutici

Dompé Farmaceutici worked with IT4Innovations on the LIGATE project, which utilized European supercomputing systems to improve computer-aided drug design (CADD). The LIGATE project enabled the EXSCALATE platform to evaluate more than 1 trillion molecules in a single simulation by integrating AI and enhanced the accuracy of simulations, improving drug discovery outcomes. This partnership demonstrated how large companies could benefit from academic expertise in addressing critical healthcare challenges.

Public Organizations: Example University Hospital Ostrava

IT4Innovations collaborated with the University Hospital Ostrava to deploy and test a tool for remote automatic tissue segmentation from patient imaging data obtained through computed tomography (CT) or magnetic resonance imaging (MRI) on IT4Innovations' HPC infrastructure. The methods used for tissue segmentation were based on deep learning (DL).

Startups: Example Bonmedix

Bonmedix partnered with IT4Innovations to develop an expert system that used modeling and

neural network training to detect and segment images used in retinal examinations for diabetic retinopathy. IT4Innovations' supercomputers helped train and validate models more accurately, aiming to increase examination capacity and enable early detection of eye diseases.

European project partners: all types of stakeholders

Most of our results (see Chapter 3.4) are integrated into various industrial applications and play key roles in the European projects.

These examples highlight IT4Innovations' ability to collaborate across a wide range of sectors, ensuring that research outcomes are effectively translated into practical applications.

Finding new users through a combination of networking, outreach and dedicated business development efforts

1. **Proactive business development:** the dedicated IT4Innovations' Sales Manager identifies new business opportunities and fosters collaborations with industry and public organisations while actively seeking out potential users of IT4Innovations' research results. The acquisition list is regularly processed to identify potential clients.
2. **Projects and ecosystem networks:** IT4Innovations participates in European initiatives such as the network of National Competence centres in HPC (33 centres in 33 countries) or EDIHs network (more than 150 EDIHs across Europe) as well as in regional and national activities such as the Technology Incubation Programme implemented by the state agency CzechInvest. Through involvement in these initiatives, it brings contacts with new clients from start-ups, SMEs, large enterprises, and public organisations.
3. **Active participation in industry events:** The Centre also engages in the application sphere by participating and presenting at events such as engineering fairs, a booth at SC and ISC conferences, and ANSYS conference and introducing its capabilities to potential industrial partners.
4. **As part of VSB-TUO:** IT4Innovations uses university resources such as industry councils, university networks and thematic industrial events to connect with potential users from academia and industry.
5. **Website and social networks** to present its portfolio of services and maintains an active presence on social media platforms.

For other channels to attract different users, see also Chapter 3.6.

The effectiveness of the transfer of results and the commercialisation of R&D&I based on the results in Table 3.4.1.

1. **Components of LEXIS Platform and HEAppE Middleware** – key tools for delivery and operation of the Federation Platform for the **EuroHPC JU**, contract research aimed at the seamless federation of the EuroHPC supercomputing and quantum systems and the interconnected data infrastructure, **2 980 100 EUR for IT4Innovations**. The tools are also used within the collaborative projects with companies: EXA4MIND, LIGATE, BioDT, OpenWebSearch.eu, EVEREST, etc.
2. **ESA platforms and HEAppE Middleware** – contract research within the **European Space Agency** projects focused on creating ESA platforms with the HEAppE Middleware as the key

tool: AIOOPEN (2023-2024, AI platform for processing Earth observation data, partners: Space Applications Services, Telespazio, KP Labs, and SERCO), URBAN TEP (2017-2024, Urban Thematic Exploitation Platform, partners: the German Aerospace Center, GISAT and others), BLENDED (2020-2021, Blockchain Enabled Deep Learning), **180 747 EUR for IT4Innovations**. The tool is also used within the collaborative projects with companies: LEXIS, EXA4MIND, LIGATE, ACROSS etc.

3. **MERIC** – as energy-efficient tool suite designed to optimize power consumption in HPC data centres has been deployed on the Portuguese supercomputer DEUCALION, the contract including maintenance is concluded with **EXELIZ SOLUTIONS, S.L., 32 400 EUR** in collaboration with **EVIDEN** and **Fujitsu**. The tool is also used within the collaborative projects with companies: SCALABLE, EUPEX, MAX, SPACE, POP, and READEX.
4. **ESPRESO FEM Assembler** – a key tool to optimise characteristics of an asynchronous electric motor within the contract research for **Siemens, 28 008 EUR**. The tool is also used within the collaborative projects with companies: FALCON and MIT Digital twin of product within Siemens plants, ID: CZ.01.1.02/0.0/0.0/17_176/0015651.
5. **CyclesPhi Renderer** – a key tool used for the generation of image data using rendering-as-a-service for assessment of production errors of the variomixer's operational load protection, contract research with **ING corporation, 5 049 EUR**. The tool is also used within the collaborative projects with companies: SPACE and TA CR Research and development of a functional sample of a railway vehicle with data acquisition capability and a SW-simulator with data generation capability for training of obstacle detection in simulated conditions, ID: FW01010274.

Non-public non-grant revenue in 2019-2023 consisted mainly of (in relation with Table 3.5.1):

- Income from commercial rental of computing resources including related user support on average 0.2 mil. EUR/year (DHI, Varroc lighting, AIRMOBIS, LightOn, SOTIO Biotech, PO LIGHTING CZECH), donations for research activities (IXPERTA), sales of licences (International Patent: Axial and radial cooled brake disc with cover).

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
Rental of HPC resources	2 603,71/ 102 710,45	8 512,75/ 335 808,70	3 393,62/ 133 870,71	7 197,51/ 283 925,55	3 008,32/ 118 671,57
Gift from IXPERTA s.r.o. Research and development of a functional sample of a railway vehicle with data acquisition capability and a SW-simulator with data generation capability for training of obstacle detection in simulated conditions	0,00/0,00	243,00/ 9 585,80	368,00/ 14 516,77	400,00/ 15 779,09	0,00/ 0,00
Licensing revenue (International Patent: Axial and Radial Cooled Brake Disc with G-Cooling System)	0,00/0,00	259,37/ 10 231,72	191,08/ 7 537,48	0,00/0,00	0,00/0,00
Proportion of revenues from completed business cases that have benefited from the results of the MIT FV30104 project Intake and	0,00/0,00	0,00/0,00	0,00/0,00	0,00/0,00	9,00/ 355,03

discharge objects of pump and turbine stations					
Total	2 603,71/ 102 710,45	9 015,12/ 355 626,22	3 952,70/ 155 924,96	7 597,51/ 299 704,64	3 017,32/ 119 026,60

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF R&D&I

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the period of 2019–2023 and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

Between 2019 and 2023, IT4Innovations actively engaged in initiatives to popularise research, development, and innovation (R&D&I) while enhancing public communication. These efforts aimed to raise awareness of HPC, inspire future scientists and showcase the societal benefits of supercomputing.

A key activity was participation in **major international HPC events**, including the **ISC (International Supercomputing Conference, 150+ exhibitors from 20+ countries and 3,500+ attendees)** in Europe and **SC (Supercomputing Conference, 400+ exhibitors from 25+ countries and 14,000+ attendees)** in the USA. These conferences provided a platform to exhibit cutting-edge research, supercomputing infrastructure, and collaborative projects. With approximately **300 active visitors of the IT4Innovations booth per event discussing the research results and infrastructure**, IT4Innovations strengthened global partnerships and showcased contributions to AI, big data processing, and computational modelling.

IT4Innovations played a pivotal role in the **European Researchers' Night**, attracting around **800 visitors annually**. This event provided interactive exhibits, expert lectures, and hands-on experiences, demonstrating supercomputing applications in climate modelling, drug discovery, and advanced simulations. Public engagement fostered interest in HPC and inspired young talents.

Public relations efforts averaged **170 media mentions per year**, highlighting research breakthroughs, supercomputing advancements, and major projects. The supercomputers Barбора and Karolina gained public recognition through media features, including a popular **TV quiz show and commercial campaigns**. Articles in science magazines like **ABC** and **21st Century** helped make supercomputing more accessible to broader audiences.

Collaboration with VSB – Technical University of Ostrava included participation in events such as **Art & Science, Kariéra+**, and the **University Open Day**, offering interactive exhibits and career insights into HPC, AI, and data science. Engagement with the Czech Academy of Sciences through **Brain Week** and the **Science Fair** allowed approximately **1,000 visitors** to experience HPC demonstrations and expert lectures on AI and human intelligence.

Participation in **NATO Days in 2019** showcased the role of HPC in defence and security, with interactive demonstrations on cybersecurity, crisis management, and military technology. Educational initiatives included **QC Workshops for high school students**, introducing quantum computing principles through lectures, hands-on exercises, and simulations.

Guided excursions attracted **800 visitors annually**, combining lectures on

supercomputing with facility tours. Creative outreach materials, such as **Superheroes4Science comics**, introduced supercomputing concepts to young audiences, while **giveaways** sparked curiosity about HPC.

IT4Innovations leveraged its **website** and **social media platforms**, reaching over **4,700 followers** with more than **100 posts annually on each channel**. These diverse outreach efforts successfully promoted R&D&I, making supercomputing more accessible and inspiring future generations of scientists and engineers.

1. Exhibition Booths at International Conferences ISC in Europe and SC in the USA

IT4Innovations has actively participated in two major annual international HPC events: **ISC (International Supercomputing Conference, 150+ exhibitors from 20+ countries and 3,500+ attendees)** in Europe and **SC (Supercomputing Conference, 400+ exhibitors from 25+ countries and 14,000+ attendees)** in the USA. Between 2019 and 2023, IT4Innovations regularly exhibited at both conferences and co-organised **Birds of a Feather (BoF)** events such as: A Student BoF on Enjoying a Career and Community in HPC, Another Step Towards a Sustainable HPC Outreach Ecosystem, and Designing HPC Outreach Activities.

The IT4Innovations exhibition booth attracted approximately **300 visitors to discuss the research results and infrastructure per event each year**, including the public, researchers, industry representatives, and policymakers interested in HPC technologies.

Despite the challenges posed by the COVID-19 pandemic, which affected event formats in 2020 and 2021, IT4Innovations successfully adapted to hybrid and online participation while maintaining its presence in the HPC community.

By attending ISC and SC annually, IT4Innovations has reinforced its position as a leading European HPC centre, contributing to global scientific progress and fostering innovation in supercomputing. Its continued participation highlights its commitment to advancing HPC research.

2. European Researchers' Night

IT4Innovations has actively participated in the **European Researchers' Night** from 2019 to 2023, opening its doors to the public and showcasing the fascinating world of supercomputing. **Around 800 visitors** of all ages explore the IT4Innovations building each year, engaging with a diverse program of interactive exhibits, demonstrations, and expert lectures.

The event offers a unique opportunity to discover how supercomputers contribute to solving real-world challenges in science, industry, and society. Visitors can learn about artificial intelligence, climate modelling, drug discovery, and advanced simulations. A key attraction is the chance to see IT4Innovations' powerful supercomputers, including Karolina and Barbora, up close and understand their role in HPC.

Each edition of the Researchers' Night at IT4Innovations features around ten interactive stations where guests can try hands-on experiments, engage in discussions, and meet leading scientists. Expert lectures provide deeper insights into HPC applications, making complex topics accessible to all.

By participating in this popular science outreach event, IT4Innovations fosters public interest in supercomputing and inspires future generations of scientists, engineers, and innovators. The event strengthens the connection between research and the general public, demonstrating the impact of HPC on modern life.

3. Media Outreach

IT4Innovations actively engages in public relations activities to raise awareness of HPC and its impact on society. A key aspect of its PR strategy is media outreach, with an average of **170 media mentions annually in newspapers, magazines, TV, and online platforms**.

IT4Innovations ensures that its press releases are not only informative but also engaging for the general public. They highlight groundbreaking research, technological advancements, and the centre's involvement in major projects. Stories about supercomputers Barbora and Karolina have reached a broad audience, with Barbora featured in a popular knowledge-based TV quiz show and Karolina showcased in a commercial campaign.

IT4Innovations is frequently mentioned in well-known magazines for youngsters and the public, such as *ABC* and *21st century*, bringing supercomputing closer to younger readers. These articles explain complex topics in an accessible way, demonstrating how supercomputers contribute to fields like climate research, artificial intelligence, and healthcare.

IT4Innovations strengthens its public presence through these PR activities, making supercomputing more understandable and inspiring future scientists and engineers. By effectively communicating its work, the centre fosters interest in cutting-edge technologies and reinforces its role as a leading European HPC institution.

4. Key Events Organised by VSB – Technical University of Ostrava

Between 2019 and 2023, IT4Innovations has been actively involved in key events organised by VSB – Technical University of Ostrava, including **Art & Science**, **Kariéra+**, and **the University Open Day**. These events provide valuable opportunities for public engagement, education, and student outreach.

At **Art & Science**, IT4Innovations presents interactive activities that showcase the intersection of technology and creativity. At the booth of IT4Innovations, visitors of all ages can explore the world of supercomputing through engaging demonstrations, visual simulations, and hands-on experiments that illustrate the power of HPC in science and innovation.

IT4Innovations opens its doors to prospective students and the general public during the **University's Open Day** through the booth at the Faculty of Electrical Engineering and Computer Science.

At **Kariéra+**, IT4Innovations actively promotes student career opportunities, offering internships, research collaborations, and full-time positions in HPC, artificial intelligence, and data science. Experts from the centre provide insights into the industry, discuss career paths, and inspire students to explore the potential of supercomputing.

Through its participation in these events, IT4Innovations strengthens its connection with students, researchers, and the public, fostering interest in cutting-edge technologies and career development.

5. Events Organised by the Czech Academy of Sciences

Between 2019 and 2023, IT4Innovations actively participated in key events organised by the Czech Academy of Sciences, including **Brain Week** (Týden mozku) and the **Science Fair** (Veletrh vědy). These events provided a unique opportunity to showcase HPC and AI to the general public.

IT4Innovations took part in the **Science Fair** twice, attracting **around 1,000 visitors** to its booth at each event. Through engaging exhibits, demonstrations, and discussions, attendees could explore the power of supercomputers and their applications in science and industry. Visitors learned how HPC contributes to fields such as AI, climate modelling, and medical research. Experts from IT4Innovations explained complex topics easily, making supercomputing more understandable and exciting for all age groups.

During **Brain Week**, IT4Innovations contributed expert lectures, including *“Does Artificial Intelligence Have a Brain?”* by Ada Böhm. This talk explored the similarities and differences between human intelligence and AI, providing insights into machine learning, neural networks, and the future of AI.

By participating in these events, IT4Innovations strengthens its connection with the public, inspires future scientists, and highlights the impact of supercomputing on modern research and

everyday life.

6. NATO Days

In 2019, IT4Innovations participated in NATO Days, **Central Europe's largest security show** with more than **100,000 visitors**. This event provided an excellent opportunity to showcase the role of HPC in defence, security, and advanced technology applications.

At the **IT4Innovations booth**, visitors learned how supercomputers contribute to various fields, including cybersecurity, crisis management, and military technology development. Experts from the centre explained how HPC is used for real-time simulations, data analysis, and AI, helping to enhance national and international security.

The exhibition featured interactive demonstrations, allowing attendees to explore how supercomputers process vast amounts of data to model complex scenarios, such as predicting natural disasters or optimising logistics for military operations. Visitors of all ages engaged with visual presentations, gaining insights into the power of supercomputing and its impact on modern security strategies.

IT4Innovations' participation in NATO Days helped raise public awareness about the importance of HPC in defence and beyond. By demonstrating real-world supercomputing applications, the centre highlighted its role in supporting scientific and technological advancements that contribute to global security and innovation.

7. Workshops for High School Students: Introduction to Quantum Computing

As part of our efforts to popularise research, development, and innovation (R&D&I), we have organised the **Introduction to Quantum Computing** workshop for high school students. This initiative aims to introduce young learners to fundamental quantum computing concepts and inspire their interest in cutting-edge technologies.

The first workshop, held in October 2022, attracted **33 participants**. Based on its success and positive feedback, we expanded the program in 2023, offering four additional workshops, totalling **99 students** for the year.

During these workshops, students were introduced to key quantum computing principles, including qubits, superposition, and entanglement, through interactive lectures and hands-on exercises. They also had the opportunity to experiment with quantum algorithms using cloud-based quantum simulators. The workshops were designed to be accessible to high school students with no prior experience in quantum computing, making complex scientific topics engaging and understandable.

By sparking curiosity and fostering early engagement with quantum technologies, this initiative supports the development of future scientists and innovators, contributing to a broader public understanding of emerging research fields.

8. Excursions

Between 2019 and 2023, IT4Innovations organised around **50 guided tours annually**, hosting approximately **800 visitors annually**. These tours primarily welcomed high school students but also included elementary school pupils, university students, and members of extracurricular science clubs.

Each tour began with a **45-minute lecture introducing supercomputers, their role, and their use** at IT4Innovations. Visitors learned about the centre's cutting-edge research in AI, big data analysis, and complex simulations applied in fields such as medicine, engineering, and environmental science. The lecture was tailored to different age groups, ensuring an engaging and educational experience for all participants.

After the lecture, visitors explored IT4Innovations' facilities. Most students visited the showroom, where they could see supercomputers up close and interact with visual demonstrations. For those

with a more profound technical interest, a smaller group had the opportunity to tour the supporting infrastructure. This specialised 45-minute tour provided insights into the essential systems that keep the supercomputers running, including cooling systems, water circuits, and electrical networks.

These tours inspired young minds, fostering enthusiasm for supercomputing and technology.

9. Promotional materials

IT4Innovations actively uses promotional materials to popularise science and make HPC more accessible to the public. As a key initiative in our science communication efforts, we coordinated the **Superheroes 4 Science project** (2018–2020), funded by the Visegrad Fund. This international project, involving partners from the Czech Republic, Slovakia, Hungary, and Poland, aimed to popularise HPC and its critical role in scientific and technological advancements. By developing engaging educational materials including **comics, a short cartoon, and a series of showcases** highlighting real scientific breakthroughs enabled by HPC, we made complex concepts accessible to young students and the general public. The project had a strong regional impact, with outreach activities conducted at major science fairs and public events across Central Europe, **reaching thousands of students, educators, and science enthusiasts**. Additionally, we leveraged digital platforms to extend the project's influence beyond physical events, ensuring its long-term impact. All project materials remain freely accessible on the project [website](#). Even after the project's conclusion, partners continue to widely use these materials in various science popularisation events, further strengthening public awareness of HPC's role in innovation and society. Through this initiative, we fostered interest in STEM careers and enhanced the visibility.

10. Web, social media

IT4Innovations actively promotes science popularisation through its website, www.it4i.eu, and social media platforms. The website provides year-round updates on supercomputing projects, scientific breakthroughs, and HPC applications for the public.

On social media, IT4Innovations engages a broad audience. By the end of 2023, the centre's platforms had over **4,700 followers**, with more than **100 posts annually on each channel**. The centre uses different platforms to target specific audiences.

Facebook (mainly in Czech) shares research updates, events, and educational content, aiming to raise awareness within the Czech Republic. **Instagram** (mainly in Czech) offers visually engaging news and insights. **LinkedIn** (in English) focuses on professional networking, highlighting research achievements and collaborations to foster connections and recruitment. **X** (in English) provides real-time updates on research news, also targeting an international audience.

Through its website and social media platforms, IT4Innovations makes supercomputing research accessible, engages with a wide range of the public, and sparks interest in the real-world applications of HPC, expanding its global reach and impact.

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

During the previous evaluation period, we were assessed in Module 3 with **an overall assessment of 5 – Excellent**. Minor recommendations and responses to them are provided below.

Recommendation 3.2, 3.3 a 3.4:

The achievements in chapters 3.2 - 3.4 deserve excellent scores. However, the IEB agrees that contractual research should be developed in the future as well.

The volume of contract research has slightly decreased compared to the previous evaluation period from EUR 583,000 to EUR 480,054, as a number of collaborations with companies have been transformed into the services covered by the Digital Europe Programme projects **National Centre of Competence in HPC** and **EDIH Ostrava**, see Chapter 3.3, item 4. Moreover, in 2024, IT4Innovations succeeded as a member of the consortium led by the Finnish center CSC-IT with the tender to build the Federation Platform for the EuroHPC JU (**2 980 100 EUR for IT4Innovations**). IT4Innovations will continue to enhance its engagement in contractual projects while ensuring that the long-term research goals remain aligned with its mission.

Recommendation 3.5 a 3.6:

IT4I might also focus on applied research results in the non-economic sphere and could increase research with a non-economic impact on society. The IEB also agrees that IT4I might have greater opportunity to collaborate, and gain commercialisation in more diverse research fields.

IT4Innovations recognizes the need to broaden applied research beyond economic applications, increasing its societal impact. Our current research already contributes to **climate modeling, healthcare, and public administration**. However, securing funding for non-economic research remains a challenge, as many grants emphasize commercial potential. For this reason, we have created two platforms for collaboration with industry and public organisations: **National Centre of Competence in HPC** and **EDIH Ostrava**, see Chapter 3.3, item 4. Examples of cooperation with the non-economic sphere such as the University Hospital Ostrava, the Police of the Czech Republic, Politecnico di Milano, etc. can be found here: <https://www.eurocc-czechia.cz/en/successes-stories>.

Other non-economic contributions: to maintain Europe's global leadership in Computer-Aided Drug Design by leveraging current state-of-the-art supercomputers and future exascale systems within the LIGATE project and development the real-time traffic modeling for intelligent transportation in smart cities within the EVEREST project. For all projects see <https://www.it4i.cz/en/research/research-projects>.

Recommendation 3.7, 3.8 a 3.9:

Another main recommendation from the IEB is to participate in the set-up and support of spin-offs.

IT4Innovations continuously develops its technology transfer strategies and explores new avenues for commercialization. While we benefit from VSB-TUO's strong intellectual property and technology transfer support, participating in the establishment and support of spin-offs presents both an opportunity and a challenge. While spin-offs can drive innovation and economic impact, they require significant resources, risk management, and market-driven expertise. We aim to identify high-potential research outputs that can lead to successful spin-offs, while ensuring a sustainable support structure for their development. Instead of spin-offs, we have created two platforms for collaboration with industry and public organisations: **National Centre of Competence in HPC** and **EDIH Ostrava**, see Chapter 3.3, item 4 for more details.

Recommendation 3.10 a 3.11:

In terms of recognition by the scientific community, IT4I's achievements deserve the highest score. To obtain the same excellent score in the next evaluation cycle, the activities mentioned in 3.10 and 3.11 should also be continued.

IT4Innovations extended its membership in the European infrastructures and initiatives **PRACE**, **ETP4HPC**, **I4MS**, **BDVA**, **EUDAT CDI**, **HiPEAC** by the following ones: **EOSC**, **VI-HPS**, **iRODS**, and **Women in HPC** and employees of IT4Innovations were again awarded by many awards, see Table 3.2.1.

Recommendation 3.12:

The main recommendation is to continue doing this type of popularisation of their research activities and use their knowledge to provide service learning for society.

IT4Innovations' PR activities are constantly evolving. The PR team has been strengthened and currently consists of **5 FTEs**. The most important activities in the field of R&D&I popularisation and public communication are listed in Chapter 3.6.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
LEXIS Platform documentation	3.4 - 1.	https://docs.lexis.tech
LIGATE project - website	3.4 - 1., 3.4 - 2., 3.4 - 3.	https://www.ligateproject.eu
EVEREST project - website	3.4 - 1., 3.4 - 3., 3.4 - 4.	https://everest-h2020.eu
BioDT project - website	3.4 - 1.	https://biodt.eu
OpenWebSearch - website	3.4 - 1.	https://openwebsearch.eu
European Innovation Radar (LEXIS Platform)	3.4 - 1.	https://innovation-radar.ec.europa.eu/innovation/45671
HyperQueue documentation	3.4 - 2.	https://it4innovations.github.io/hyperqueue/stable/
HyperQueue GitHub Repository	3.4 - 2.	https://github.com/it4innovations/hyperqueue
EVEREST project – IT4I part	3.4 - 2.	https://everest-h2020.eu/it4i/
ACCROSS project - website	3.4 - 2.	https://www.acrossproject.eu/
Aiida-HyperQueue Integration	3.4 - 2.	https://github.com/aiidateam/aiida-hyperqueue
CERN ATLAS Experiment	3.4 - 2.	https://cds.cern.ch/record/2837871
IT4I training course	3.4 - 2.	https://events.it4i.cz/event/124/
Describing of innovation by European Innovation radar	3.4 - 2.	https://innovation-radar.ec.europa.eu/innovation/45671
HEAppE Middleware Documentation	3.4 - 3.	https://heappe.eu
LEXIS project - website	3.4 - 3.	https://lexis-project.eu
ExCaPE project H20 - website	3.4 - 3.	https://cordis.europa.eu/project/id/671555
Sygic & IT4Innovations collaboration: <i>Smart City Traffic Computation Platform at ITS Congress in Lisbon</i>	3.4 - 4.	https://www.sygic.com/press/sygic-and-it4innovations-unveil-smart-city-traffic-computation-platform-at-its-congress-in-lisbon

European Commission Innovation Radar (2024). <i>Smart City Traffic Computation Platform</i> .	3.4 - 4.	https://innovation-radar.ec.europa.eu/innovation/55952
MERIC	3.4 - 5.	https://code.it4i.cz/vys0053/meric/
SCALABLE project - website	3.4 - 5.	https://scalable-hpc.eu/
European Performance Optimization and Productivity Center of Excellence (POP)	3.4 - 5.	https://pop-coe.eu
EuroHPC Joint Undertaking	3.4 - 5.	https://eurohpc-ju.europa.eu/
EUPEX project - website	3.4 - 5., 3.4 - 8.	https://eupex.eu/
MaX project – website	3.4 - 5.	https://www.max-centre.eu/
SPACE CoE project - website	3.4 - 5., 3.4 - 6.	https://www.space-coe.eu/
READEX project	3.4 - 5.	https://www.readex.eu/
EU Funding & Tenders Portal (new project SEANERGYs)	3.4 - 5.	https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-eurohpc-ju-2023-energy-04-01
ACM Transactions on Graphics (2024). <i>CyclesPhi v2: High-Performance Distributed Rendering</i> .	3.4 - 6.	https://dl.acm.org/doi/abs/10.1145/3447807
Blender Foundation - <i>Blender Usage Statistics</i> .	3.4 - 6.	https://www.blender.org/news/blender-by-the-numbers-2020/
IT4Innovations Rendering Services	3.4 - 6.	https://blender.it4i.cz
MESIO Library Documentation	3.4 - 7.	https://github.com/It4innovations/mesio
FALCON Project - website	3.4 - 7., 3.4 - 8.	https://falconproject.eu/
<i>An approach for dynamically adaptable SIMD vectorization of FEM kernels</i>	3.4 - 8.	https://doi.org/10.1016/j.cpc.2024.109319
ESPRESO GitHub Repository	3.4 - 8.	https://github.com/It4innovations/espresso
EUPEX Project - ESPRESO	3.4 - 8.	https://eupex.eu/applications/#engineering
AI-based Emergency Call Handling	3.4 - 9.	http://aivtiv.vsb.cz/
DT4REGIONS AI-based Emergency Call Handling	3.4 - 9.	https://dt4regions.eu/index.php/dt-book/dt-stories/involvement-artificial-intelligence-receiving-emergency-calls
JSALT23 Workshop	3.4 - 9.	https://jsalt2023.univ-lemans.fr/en
AIOPEN Platform	3.4 - 10.	https://aiopen-platform.com
ESA Urban TEP	3.4 - 3., 3.4 - 10.	https://eo4society.esa.int/projects/urban-tep
ESA BLENDED Project	3.4 - 3., 3.4 - 10.	https://earth.esa.int/eogateway/news/heritage-data-trains-neural-networks-to-detect-urban-sprawl

SELF-EVALUATION REPORT FOR MODULE 3

THE NAME OF THE UNIT BEING EVALUATED:

Centre for Energy and Environmental Technologies (CEET)

FORD: 2 - Engineering and technology

SOCIAL CONTRIBUTION OF THE EVALUATED UNIT

3.1 Introductory information about the unit under evaluation

The evaluated unit will describe its mission and vision and provide a general self-reflection of the societal contribution of R&D&I, along with its long-term goals in the fields it develops. The distribution of research activities by type of research will also be commented on.²⁵⁷ The evaluated unit will describe its organisational structure and size (staffing, number of students, number of study programmes implemented, etc.) based on the data provided in annex tables 3.1.1 to 3.1.6.

Maximum 1000 words.

This is a non-rated indicator that serves as an introduction to the evaluated unit, providing context for data in indicators 3.2-3.7.

Centre for Energy and Environmental Technologies (CEET) is a university institute at VSB-TUO, established on January 1, 2021, through the merger of the university institutes **Nanotechnology Centre, Energy Research Centre, ENET Centre, and Institute of Environmental Technology**, as per the decision of the Academic Senate of VSB-TUO on November 24, 2020.

In its first year of operation in 2021, CEET succeeded in gaining a strong position within the university structure. With a significant share of more than **25% of the total scientific output of the university** in 2023 (expressed as a financial share from DKRVO, i.e., MEYS contribution to the Long-term conceptual development of a research organization), CEET has become the university leader in research and development.

Between 2019 and 2023, there were implemented **170 national and 6 international research projects of basic and mainly applied research with a total funding of €36.868 million**. A great success can be considered the repeated acquisition of the **National Centre for Energy** projects under leadership of CEET, as well as project **Institute of Environmental Technology – Excellent Research in the prestigious Excellent Research call of the Operational Program Research, Development, and Education**. Furthermore, since 2019, the **Large Research Infrastructure ENREGAT – Energy Waste Recovery and Gas Treatment** has also been in operation here.

CEET was also the **initiator of the main idea of the REFRESH – Research Excellence For REgion Sustainability and High-tech Industries** project, which is the **flagship initiative of VSB-TUO**.

Additionally, CEET is highly active and successful in commercialization, contributing approximately €4.63 million in 2023, which accounts for **50% of the total volume of contracts within the university**.

Moreover, CEET strongly supports the involvement of women in science. This commitment is reflected in the fact **that women make up 40% of the total number of academic and research staff**

²⁵⁷ Basic, applied, contract, artistic research (see Definition of Terms in Methodology HEI2025+).

at CEET, exceeding the European average in the field of sustainable energy.

CEET Vision is to become a recognized university institute focused on developing new technologies and materials for low-carbon and sustainable energy and environmental technologies in line with the principles of circular economy, which is open to cooperation on current and strategic projects at the national and international level.

CEET Mission: CEET is a university institute focused on research and development in the field of low-carbon and sustainable energy and environmental technologies in line with the principles of circular economy. We offer sharing of our unique laboratory base with knowledgeable experts for research, development and education of students at all levels of study. We are open to cooperation with partners from the public sector, application sphere, universities and research organizations at the national and international level.

SOCIETAL IMPACT AND LONG-TERM GOALS

CEET plays a vital role in supporting the Czech Republic's transition to low-carbon technologies. Focusing on development of hydrogen technologies, waste-to-energy solutions, and environmental technologies, CEET addresses challenges in emission reduction and resource efficiency. Its research supports both industrial and public sectors in creating more sustainable practices, contributing to the circular economy.

CEET aims to expand its influence through strategic international partnerships in energy storage, smart grids, and nanomaterials. Long-term goals include enhancing energy independence, reducing environmental impact, and fostering industrial sustainability while balancing technological, economic, and regulatory factors. These efforts ensure CEET's ongoing contribution to societal, industrial, and academic advancement.

RESEARCH AREAS

CEET is an interdisciplinary research and educational scientific workplace focused on the following areas:

- Research in Materials for Energy and Environmental Technologies
- Research in the Utilization of Secondary Raw Materials and Alternative Energy Sources
- Research in Energy Storage, Transformation, and Management
- Research in Environmental Aspects and Technologies

RESEARCH GROUPS

CEET research activities are thematically divided into 20 research groups that work closely together:

- Thermochemical and Hydrogen Conversion
- Energy By-products
- Bulk Materials
- Smart Grids
- Advanced Nanomaterials Lab
- Materials-Envilab
- Nanotechnology and Materials Structure Lab
- Servis and Contractual Research Lab
- Biochemical Processes
- Heterogeneous Photocatalysis
- Preparation of Materials and Waste Recovery
- Heterogeneous Catalysis
- Industrial Chemistry
- Waste to Energy
- Water Treatment and Analysis

EBEAM
 Innovation and Safety
 Applications for Industry and Municipalities
 Technologies for Environmental Protection
 Modern Heating Systems

ORGANIZATIONAL STRUCTURE

The organization structure consists of four research centres:

1. ENET Centre (CENET) focused on:
 - Transformation of fuels, raw materials, and energy, and the impacts of anthropogenic activities in the field of thermal conversions on the environment
 - Treatment and transport of bulk materials
 - Diagnostics of energy devices
 - Conversion, storage, distribution, and management of energy balance
2. Nanotechnology Centre (CNT) focused on:
 - Design and development of nanotechnologies, advanced materials, nanomaterials and nanocomposites
 - Characterization and testing of products under development in the nanotechnology field, advanced materials, nanomaterials and nanocomposites
 - Application testing for energy and environmental applications
 - Molecular modelling
 - Materials analysis and characterization
3. Institute of Environmental Technology (IET) focused on:
 - Creating conditions for a wider use of waste
 - Waste-to-energy technologies
 - Technologies for the treatment of waste gases
 - Technologies for the treatment of waste- and saline water
 - Environmental technologies
4. Energy Research Centre (ERC) focused on:
 - Energy and rational use of energy
 - Environmental protection and safety of technologies
 - Measurement and testing of combustion equipment
 - Measurement methods and instruments

PERSONNEL STRUCTURE

The CEET research teams comprise **244 staff members (207.92 FTE)**, including **130 researchers, 15 academic staff** (5 professors, 6 associate professors, 4 assistant professors), as well as **99 administrative staff members and technical support specialists**.

The team consists of both experienced senior researchers and young professionals, ensuring a balanced mix of expertise. The age composition is diverse, with employees in their late 20s (37), mid-career professionals (189), and senior experts over 60 years old (18). A number of PhD students were employed to work on projects (**21 FTE early career researchers**).

CNT guarantee **Nanotechnology study program**, other research centres participate in educational activities by supervising students' final theses and involving them in research projects.

Based on the recommendation of the MEYS, we present in this Self-evaluation report the results achieved at the higher education institutes CENET, ERC, CNT, and IET for the years 2019-2020, and

from then onwards, the results of the university institute CEET.

Table 3.1.1 - Staffing per FTE²⁵⁸

Academic/ Professional position	Total/Of which women					
	2019	2020	2021	2022	2023	Total
Professor	3,89/2,44	3,65/2	4,59/2,59	3,86/2,65	4,4/2,75	4/2
Associate Professor	4,71/1,37	4,86/1,17	4,98/1	5/1,32	4,48/1,28	4/1
Assistant Professor	4/1	4/1	5,48/1	5,13/0,66	4,37/0	5/1
Assistant						
R&D Personnel ²⁵⁹	11,63/2,98	9,73/1,51	11,05/1,52	9,12/1,69	4,84/0,39	11/2
Researchers in other categories ²⁶⁰	103,16/37,45	102,49/38,60	93,94/36,78	84,72/32,81	91,76/32,15	103/38
Technical and economic staff ²⁶¹	77,47/35,16	86,32/36,17	81,51/35,37	90,46/38,55	98,14/42,74	90/42
Scientific, research and development staff involved in teaching activities	20,63/10,58	19,97/9,15	22,46/9,59	21,24/9,22	19,75/8,03	22/10
Early career researchers ²⁶²	21,31/9,06	19,93/9,41	20,06/9,21	19,25/7,56	14,11/5,6	21/9
Total ²⁶³	204,86/80,4	211,05/80,45	201,55/78,26	198,27/77,68	207,92/79,31	207/80

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

²⁵⁸ The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

²⁵⁹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

²⁶⁰ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

²⁶¹ Who participates in the management and support of R&D&I in the institution.

²⁶² See Definition of Terms in Methodology HEI2025+.

²⁶³ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

3.1.2 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2019 (numbers of physical employees and personnel)²⁶⁴

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor							2	2	1		1	
Associate Professor			1		1	1	3	1			1	
Assistant Professor			1		2		1	1				
Assistant												
R&D Personnel ²⁶⁵	4		4	1	1	1			1	1		
Researchers in other categories ²⁶⁶	32	15	52	22	20	6	9	1	3	2	8	1
Technical and economic staff ²⁶⁷	13	1	22	13	22	12	12	5	3	2	4	1
Scientific, research and development staff involved in teaching activities			5	2	8	5	7	4	1		2	
Early career researcher ²⁶⁸			27	10	6	4						
Total ²⁶⁹	49	16	85	38	54	26	34	14	9	5	16	2

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D Personnel, Researchers in other categories and Technical and economic staff are mutually exclusive, i.e. one staff member is reported in only one category. The categories of scientific, research and development staff involved in teaching activities and early career researchers are reported collectively for all the above-mentioned categories.

²⁶⁴ The total number of employees/workers as of 31st December of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

²⁶⁵ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

²⁶⁶ The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

²⁶⁷ Who participates in the management and support of R&D&I in the institution.

²⁶⁸ See Definition of Terms in Methodology HEI2025+.

²⁶⁹ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I Personnel, Researchers in other categories and technical and economic staff.

3.1.3 Age structure of R&D&I personnel of the evaluated unit and their structure by job title and gender in the year 2023 (numbers of physical employees and personnel)²⁷⁰

Academic/ professional position	Under 29 years		30-39 years old		40-49 years old		50-59 years old		60-69 years old		70 years and older	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor							4	3	1			
Associate Professor					3	2			2		1	
Assistant Professor			2				2					
Assistant												
R&D Personnel ²⁷¹					1				1			
Researchers in other categories ²⁷²	24	10	47	16	43	15	7	0	1	1	6	1
Technical and economic staff ²⁷³	13	4	33	18	30	12	17	8	4	2	2	1
Scientific, research and development staff involved in teaching activities			3		8	6	36	3	4		1	
Early career researcher ²⁷⁴	1		10	4	4	2						
Total ²⁷⁵	37	14	82	34	77	29	30	11	9	3	9	2

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, R&D personnel, researchers in other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Table 3.1.4 – Students

Type of study	2019		2020		2021		2022		2023		Total	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Undergraduate	17	5	4	2								

²⁷⁰ The total number of employees/workers as at 31.12. of the calendar year in question is to be entered, irrespective of the level of time worked, but only in an employment relationship (including agreement on work activity, excluding agreement on work performance). Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

²⁷¹ The category "R&D Personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

²⁷² The category "Researchers in other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

²⁷³ Who participates in the management and support of R&D&I in the institution.

²⁷⁴ See Definition of Terms in Methodology HEI2025+.

²⁷⁵ Total is the sum of the categories: professor, associate professor, assistant professor, assistant, R&I personnel, researchers in other categories and technical and economic staff.

Master's ²⁷⁶	12	7										
Doctoral	14	8	6	4	5	3	4	3	5	5	34	23
Lifelong Learning Courses												
Total	43	20	10	6	5	3	4	3	5	5	34	23

Table 3.1.5 - Study programmes in Czech/English

Type of study programme	Total ²⁷⁷ /Of which professional study programmes											
	2019		2020		2021		2022		2023		Total	
Undergraduate	1/1		1/1								1/1	
Master's	1/1										1/1	
Doctoral	1/1		1/1		1/1		1/1		1/1		1/1	
Lifelong Learning courses												
Total	3/3		2/2		1/1		1/1		1/1		1/1	

Note: For each SP type, enter the number of SPs in Czech language in the first cell and insert the number of SPs in English language after the slash in the same cell (e.g. 15/3), enter the number of professional SPs in Czech language in the second cell and insert the number of professional SPs in English language after the slash. Follow a similar procedure in the last column of the table (Total).

3.1.6 – R&D&I capacities

R&D&I field	FORD	FORD share [%]	Predominant type of research	Total share of industry group [%]
1. Natural Sciences	1.1 Mathematics	1	Applied Research	33
	1.2 Computer and information sciences	1	Applied Research	
	1.3 Physical sciences	13	Basic Research	
	1.4 Chemical sciences	12	Basic Research	
	1.5 Earth and related environmental sciences	5	Balanced basic and applied research	
	1.6 Biological sciences	1	Basic Research	
	1.7 Other natural sciences	0		
2. Engineering and Technology	2.1 Civil engineering	0		67
	2.2 Electrical engineering, Electronic engineering, Information engineering	2	Applied Research	
	2.3 Mechanical engineering	9	Applied Research	
	2.4 Chemical engineering	12	Balanced basic and applied research	
	2.5 Materials engineering	8	Basic Research	

²⁷⁶ All master's degree students are listed, regardless of the length of their programme of study.

²⁷⁷ The total number of study programmes for which admissions have been announced in a given academic year.

	2.6 Medical engineering	0		Balanced basic and applied research
	2.7 Environmental engineering	30		
	2.8 Environmental biotechnology	0		
	2.9 Industrial biotechnology	0		Basic Research
	2.10 Nanotechnology	6		
	2.11 Other engineering and technologies	0		
3. Medical and Health Sciences	3.1 Basic medicine	0		0
	3.2 Clinical medicine	0		
	3.3 Health sciences	0		
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries	0		0
	4.2 Animal and Dairy science	0		
	4.3 Veterinary science	0		
	4.4 Other agricultural sciences	0		
5. Social Sciences	5.1 Psychology and cognitive sciences	0		0
	5.2 Economics and Business	0		
	5.3 Education	0		
	5.4 Sociology	0		
	5.5 Law	0		
	5.6 Political science	0		
	5.7 Social and economic geography	0		
	5.8 Media and communications	0		
	5.9 Other social sciences	0		
6. Humanities and the Arts	6.1 History and Archaeology	0		0
	6.2 Languages and Literature	0		
	6.3 Philosophy, Ethics and Religion	0		
	6.4 Arts (arts, history of arts, performing arts, music)	0		
	6.5 Other Humanities and the Arts	0		
Total		100 %	-	100 %

RECOGNITION BY THE RESEARCH COMMUNITY

3.2 Recognition by the research community

The evaluated unit will briefly comment on its position in the research community. It shall consider individual and other prestigious R&D&I awards, participation of its academic staff in the editorial boards of international scientific journals, elected membership in professional societies, major invited lectures given by the evaluated unit's academic staff abroad or by foreign scientists and other relevant guests at the evaluated unit. Additionally, it will address the involvement of staff in the evaluation of national or European project/programme calls over the period of 2019–2023 based on the data provided in annex tables 3.2.1 to 3.2.5 (max. 10 most relevant items). If necessary, the evaluated unit shall list any additional services to the scientific community that it considers relevant. *Maximum 1000 words.*

Over the past five years, the research centres that make up the CEET assessment unit have established a strong position in the research community at both national and international level:

PRESTIGIOUS AWARDS

During the evaluation period, 15 prestigious awards were granted to CEET employees, the 10 most important ones are selected in Table 3.2.1. One of the most important awards is **the gold medal awarded at the INTARG® international innovation exhibition in Katowice (2022)** for nitrogen oxide reduction technology. This award underlines the excellence in the field of applied research and technology transfer into practice, as well as **the Award of the Technology Agency of the Czech Republic** for the best project in the Governance category (2019) and the award for **the best applied research result of 2020 at VSB-TUO**, which was received by Prof. Mišák and Assoc. prof. Prokop.

In individual awards, Prof. Zbořil stands out, having received a number of awards, including the **Highly Cited Researcher 2021, Materials Science in Czech Republic Leader Award (2023, 2022) and the Chemistry in Czech Republic Leader Award (2023)** from Research.com. In addition, he was awarded **the Miloš Hudlický Award (Czech Chemical Society, 2023)** for outstanding contribution in the field of chemistry. Prof. Obalová was also awarded **the Prof. Ferdinand Schulz Medal for her long-term cooperation in the field of energy and environmental technologies**.

Another success is the **gold medal for the best dissertation** for Dr. Vysocký and supervisor Prof. Mišák (2022) and 3rd place for the best diploma thesis for Ing. Bardoňová and supervisor Assoc. Prof. Mamulová - Kutlákova (2020) in **the Werner von Siemens Prize competition**. An important award at the institutional level is **the Rector's award** for obtaining of significant national and international projects for Prof. Obalová for successfully obtaining a project in the OP VVV call Excellent Research (2019) and Prof. Mišák for successfully obtaining the National Centre for Energy Project. These awards reflect CEET's ability to effectively obtain financial support.

PARTICIPATION IN EDITORIAL BOARDS OF INTERNATIONAL SCIENTIFIC JOURNALS

In the period under review, R&D staff actively participated in the editorial boards of 16 major international scientific journals within the fields of Natural Sciences and Engineering and Technology, the most prestigious journals were **View (AIS 1.527), Applied Materials Today (1.384), Scientific Reports (AIS 1.06), PLOS ONE (AIS 0.886) and Frontiers in Chemistry (0.834)**, the 10 selected most important cases are shown in Table 3.2.2.

INVITED LECTURES BY ACADEMICS

Academic staff were regularly invited to give lectures at foreign institutions. Out of a total of 27 lectures, the 10 most important ones were selected (Table 3.2.3), whose excellence is evidenced by certificates and invitations from prestigious foreign institutions (e.g. **Technical University of Munich; Polish Academy of Science; Wuhan University of Technology, China; Universidad Nacional de Ingenieria, Peru**). In addition to our senior scientists Prof. Kočí, Prof. Zbořil, Prof. Simha Martynková, Prof. Plachá and Prof. Obalová, also our junior researchers Dr. Matějová, Dr. Jezerská and Assoc. Prof. Pacultová gave invited lectures.

LECTURES BY FOREIGN SCIENTISTS AND GUESTS

During the five-year period we hosted 27 distinguished foreign experts, e.g. **Prof. Hill (Canada), Prof. Fornasiero (Italy), Prof. Cetinkava (Turkey), Assoc. Prof. Zimowska (Poland), Dr. Buton (France), Dr. Hrbek (Austria)**, from which the 10 most relevant were selected (Table 3.2.4). These lectures covered a wide range of scientific disciplines and contributed to the development of collaboration and professional discussions within CEET.

INVOLVEMENT IN THE EVALUATION OF NATIONAL/EUROPEAN RESEARCH PROJECTS

CEET staff participated in the evaluation of a large number of national and European scientific

projects including the prestigious international programmes **ERC Advanced**, **ERC Consolidator** (Prof. Zbořil) and **REA-European Research Executive Agency** (Dr. Najser, Dr. Frantík). Prof. Kočí, Prof. Plachá and Prof. Praus were members of the Technical Chemistry and Material Science panels at the **Czech Science Foundation**, Prof. Kočí was even **Chairman of the Technical Chemistry panel at the Czech Science Foundation** (2021-2022). Scientific projects with the application sphere of MIT OP PIK, MIT OP TAK, MIT DNSH and TACR were evaluated by Assoc. Prof. Dombek. In addition to professors, a number of junior scientists were involved in the evaluation processes (Dr. Mikeska, Dr. Matějová, Dr. Leštinský, Dr. Frantík, Dr. Najser), which contributed to their professional growth and integration into the research community.

ELECTED MEMBERSHIP OF PROFESSIONAL SOCIETIES

CEET staff were elected members of several professional societies during the period under review: EFCATS - European Federation of Catalysis Societies (Prof. Obalová-representative of the Czech Republic).

Board and Main committee members of Czech Society of Chemical Engineering (Prof. Kočí, Prof. Obalová).

ATD CR, Reg. Assoc. - Association of Technical Diagnosticians of the Czech Republic (Assoc. Prof. Prokop - head of the expert group Diagnostics of electrical equipment).

OTHER ACTIVITIES

In addition we were involved in other services to the scientific community, we organised **regular international scientific conferences** and workshops:

- NanoOstrava 2019, 2021, 2023 (Prof. Simha Martynková, Dr. Čech Barabaszová, Prof. Plachá, 150 participants),
- Energy and Environment 2022, 2023 (Dr. Borovec, Assoc. Prof. Ochodek, 90 participants)
- CzePoCat 2019, 2020, 2022, 2023 (Prof. Kočí, 50-67 participants),
- Doctoral Catalytic Seminar 2019 (Prof. Kočí, 45 participants).

In addition to these larger events, all Centres organised a number of smaller workshops and seminars with a narrow thematic focus, e.g. Kick-off meeting on OP RDE projects IET-Excellent Research, COOPERATION (11-12 November 2019, Ostravice, 45 participants), conference on the end of the OP RDE project COOPERATION (15-16 March 2023, Čeladná, 40 participants).

Researchers were involved in **the scientific councils of Czech universities**, e.g. UCT Prague -Faculty of Chemical Technology, Faculty of Chemical Engineering and Faculty of Environmental Protection Technology; University Institute CXI Technical University of Liberec (Prof. Obalová) and also in the organizing committees of international conferences, e.g. EuropaCat 2023 (Prof. Obalová, Prof. Kočí, Dr. Bílková).

The researchers are also involved in a number of **national and international scientific organizations**: Czech Chemical Society, Czech Society of Chemical Engineering, EFCATS, Czechoslovak Microscopical Society, Czech Society for Research and Utilization of Clays, Czech and Slovak Crystallographic Association, Jan Marek Marci Spectroscopic Society and Association of Authorized and Accredited Persons.

Table 3.2.1 - Prestigious R&D&I awards granted during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the award	Awarding institution
Jozef Vlček, prof. Ing. Ph.D.; Jiří Burda, Ing.; Kateřina Pacultová, doc. Ing. Ph.D.; Marek Velička, doc. Ing. Ph.D.	Gold medal for the invention „Technology for the reduction of nitrogen oxides by ammonia in the	INTARG®, Katowice, Poland, 2022

	presence of an iron oxide additive“	
Jiří Horák, Ing. Ph.D.	Award of the Technology Agency of the Czech Republic for the best project in the Governance category year 2019	Technology Agency of the Czech Republic, 2019
Stanislav Mišák, prof. Ing. Ph.D.; Lukáš Prokop, doc. Ing. Ph.D.	Award for the best applied research result of 2020	VSB-TUO, 2020
Radek Zbořil, prof. RNDr. Ph.D.	Chemistry in Czech Republic Leader Award	Research.com, 2023
Radek Zbořil, prof. RNDr. Ph.D.	Miloš Hudlický Award	Czech Chemical Society, 2023
Lucie Obalová, prof. Ing. Ph.D.	Medal of Professor Ferdinand Schulz for long-term cooperation in the field of energy and environmental technologies	Faculty of Environmental Protection Technology, UCT Prague, 2023
Jan Vysocký, Ing.; Stanislav Mišák, prof. Ing. Ph.D.	Gold medal in Category Smart Infrastructure – dissertation thesis “The System for optimizing the operation of the electrical distribution network”	Werner von Siemens Award 2022
Lenka Bardoňová, Ing.; Kateřina Mamulová – Kutlákova, Mgr. Ph.D.	3rd place in Category Best diploma thesis - "Preparation of nanofibrous layers containing clay minerals by electrostatic softening"	Werner von Siemens Award 2020
Lucie Obalová, prof. Ing. Ph.D.	Rector's award for obtaining of significant national and international projects	VSB-TUO, 2019
Stanislav Mišák, prof. Ing. Ph.D.	Rector's award for obtaining of significant national and international projects	VSB-TUO, 2019

Note: Provide up to 10 examples.

Table 3.2.2 Participation of academic staff of the evaluated unit in editorial boards of international scientific journals during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of scientific journal, ISSN
Lucie Obalová, prof. Ing. Ph.D.	Chemical Engineering & Technology, Online ISSN: 1521-4125, Wiley-VCH GmbH, Weinheim.
Petr Praus, prof. Ing. Ph.D.	Catalysts, ISSN: 2073-4344, MDPI.
Panagiotis Basinas, Dr.	Detritus, ISSN: 2611-4135, CISA PUBLISHER.
Kamila Kočí, prof. Ing. Ph.D.	Frontiers in Chemistry, section: Catalysis and Photocatalysis, Electronic ISSN 2296-2646, FRONTIERS MEDIA SA.
Radek Zbořil, prof. RNDr, Ph.D.	Applied Materials Today, ISSN: 2352947, Elsevier BV, (since 2018).
Radek Zbořil, prof. RNDr, Ph.D.	View, Online ISSN: 2688-268X, Wiley, (since 2020).
Grażyna Simha Martynková, prof. Ing. Ph.D.	Polish Journal of Chemical Technology, ISSN 1509-8117, De Gruyter, Inc.
Mohit Bajaj, Dr.	Scientific Reports - Nature; ISSN: 2045-2322, NATURE PORTFOLIO.
Flah Aymen, assoc. prof. Dr.	PLOS ONE; eISSN: 1932-6203, PUBLIC LIBRARY SCIENCE.
Mark H. Rummeli, prof., FRSC, FIoP, FIMMM, Ph.D., hc D.Sc., CPhys, CSci	Nano Express, ISSN: 2632-959X, IOP Publishing Ltd.

Note: Please provide up to 10 examples of academic staff participation in editorial boards of international scientific journals (e.g. editor, editorial board member, etc.).

Table 3.2.3 The most important invited lectures delivered by the academic staff of the evaluated unit at foreign institutions during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Invited lecture title	Name of host institution, or name of conference or event	Year
Kamila Kočí, prof. Ing. Ph.D.	Photocatalytic reduction of CO ₂ using Pt doped C ₃ N ₄ photocatalysts	3 rd International Workshop on Graphene and C ₃ N ₄ -based Photocatalysts, Wuhan, China	2019
Lucie Obalová, prof. Ing. Ph.D.	Catalytic decomposition of nitrous oxide - evaluation of pilot plant results	52 nd Polish Annual Conference on Catalysis, November, organised by Polish Academy of Sciences, Krakow, Poland	2020
Lenka Matějová, Ing. Ph.D.	Design of TiO ₂ -based photocatalysts in various macroscopic forms for environmental pollution reduction	PERUVIAN WORKSHOP ON SOLAR ENERGY - JOPEs 2021, Lima, Peru	2021
Kamila Kočí, prof. Ing. Ph.D.	Constructed p-n heterojunction of NiO/TiO ₂ nanorods structure photocatalysts for enhancing H ₂ production	The 4 th International Symposium on Energy and Environmental Photocatalytic Materials held in Xi'an and Yan'an, China	2021
Kamila Kočí, prof. Ing. Ph.D.	Hydrogen production from methanol-water mixture over NiO/TiO ₂ nanorods structure photocatalysts	New Photocatalytic Materials for Environment, Energy and Sustainability (NPM-6), Ljubljana, Slovinsko	2022
Kateřina Pacultová, doc. Ing. Ph.D.	NO direct catalytic decomposition over cobalt based mixed oxides modified by potassium	15 th Pannonian International Symposium on Catalysis, Jastrzębia Góra, Poland	2022
Kamila Kočí, prof. Ing. Ph.D.	Photocatalytic CO ₂ reduction	Polish Chemical Society, Štětín, Polsko.	2023
Grażyna Simha Martynková, prof. Ing. Ph.D.	Recent trends in hydroxyapatite bioceramics for bone regeneration	Scientific Conference Medical and Sport Technologies, Wisla Poland	2022
Lucie Jezerská, Ing. Ph.D.	Biofuels from spent tea leaves and tea bags	18th SDEWES Conference on Sustainable Development of Energy, Water and Environment Systems, September 24.-29.9. 2023, Dubrovnik, Croatia	2023
Daniela Plachá, prof. Ing. Ph.D.	Clay in Natural and Modified Forms for Nanotechnology	Northumbria University, Mechanical and Construction Engineering Faculty of Engineering and Environment	2019

Note: Provide up to 10 examples.

Table 3.2.4 - The most important lectures by foreign scientists and other guests relevant to R&D&I at the evaluated unit during the evaluation period

Name, surname and title(s) of the lecturer	Lecturer's employer at the time of the lecture	Invited lecture title	Year
Benoita Louis, Dr.	University of Strasbourg, France	Zeolites: (still) the key players	2021

		in Heterogeneous Catalysis (on-line)	
María de los Milagros Ballari, Dr.	Universidad Nacional del Litoral, Santa Fe, Argentina	Chemical and biological air remediation by photocatalytic building materials	2022
Josephine M. Hill, Prof.	University of Calgary, Canada	Catalysis from and for waste	2023
Prof. Vitold Kwapinsky	The University of Limerick, Ireland	Pyrolysis and hydrothermal carbonisation as a bio-waste treatment processes: products properties	2021
DI. Dr.techn. Jitka Hrbek	University of Natural Resources and Life Sciences, Austria	Thermal gasification of waste	2021
Paolo Fornasiero, Prof.	University of Trieste	Preparing a scientific manuscript: the process, the correct behaviors and the unethical shortcuts	2023
Anca Mazare, Dr.	Friedrich-Alexander-Universität Erlangen-Nürnberg	X-ray photoelectron spectroscopy (XPS) – extracting surface analysis data from basics to single-atom evaluation	2023
Tugrul Cetinkaya, Prof.	Sakarya University, Turkey	SET of 3 lectures: Introduction to Energy Storage and Lithium Ion Batteries, Nanocomposite Electrodes for Lithium-Air battery and Supercapacitors, Nanocomposite Electrodes for Lithium-Ion and Li-S Batteries	2021
Beata Zimowska, Assoc. Prof. Ph.D.	University of Life Sciences in Lublin, Poland	Biotechnological potential of endophytic fungi in nanotechnology	2023
Bakht Ramin Shah, Ph.D.	Ziauddin University, Pakistan	Production and characterization of nanoparticles stabilized emulsions based on chitosan; the story so far	2023

Note: Provide up to 10 examples.

Table 3.2.5 - Involvement in the evaluation of national/European research project/programme calls relevant to the R&D&I area at the unit during the evaluation period

Name, surname and title(s) of the evaluated unit's staff member	Name of the project/programme call	Name of the authority/guarantor project/programme call	Year
Jan Najser, Ing. Ph.D.	RFCS-2022	European Research Executive Agency REA	2023
Kamila Kočí, prof. Ing. Ph.D.	Standard projects in Panel 106 International projects in Panel 106 Junior projects in Panel 106 SASPRO 2/ Slovak Academic and	Czech Science Foundation (GAČR) Member of the Technical Chemistry panel (P106) at the Czech Science Foundation (4/2019 - 3/2023). Chairman of the Technical Chemistry panel (P106) at the Czech Science Foundation (4/2021 - 3/2022).	2019 - 2023

	Scientific Programme	Slovak Academy of Sciences	2022
	OP EIC Application	Ministry of Industry and Trade	2023
Martin Reli, Ing. Ph.D.	OPUS-20 (LAP), PRELUDIUM BIS-1, PRELUDIUM-20, SONATA-18	Poland, National Science Center	2020- 2023
Petr Praus, prof. Ing. Ph.D.	Standard projects in Panel 108 International projects in Panel 108 Junior projects in Panel 108	Czech Science Foundation (GAČR) Member of the Materials Science and Engineering panel (P108)	2019 - 2023
Pavel Leštinský, Ing. Ph.D.	SASPRO 2/ Slovak Academic and Scientific Programme TA CR Environment for Life programme TA CR THÉTA 2	Slovak Academy of Sciences Technology Agency of the Czech Republic (TA CR)	2019 2023
Radek Zbořil, prof. RNDr. Ph.D.	External Evaluator of ERC Advanced Grants External Evaluator of ERC Grants - Consolidator	European Research Council	2023
Marcel Mikeska, Ing. Ph.D.	Visegrad grants	International Visegrad Fund	2021
Václav Dombek, doc. RNDr. CSc.	OP EIC (51 projects) OP TAC (33 projects) DNSH (26 projects) TA CR (23 projects) Ministry of Education, Research, Development and Youth of the Slovak Republic (4 projects)	Ministry of Industry and Trade Ministry of Industry and Trade Ministry of Industry and Trade Technology Agency of the Czech Republic (TA CR) OP VaV Slovak Republic	2019 - 2023
Daniela Plachá, prof. Ing. Ph.D.	Standard projects in Panel 108	Czech Science Foundation (GAČR) Member of the Materials Science panel (P108)	2023
	OP TAC, OP EIC Aplikace, Proof of Concept, Technological Platforms	Ministry of Industry and Trade	2020 - 2023
	TA CR Environment for Life programme	Technology Agency of the Czech Republic (TA CR)	2020 - 2023
	NRP	Technology Agency of the Czech Republic (TA CR)	2020 - 2023
Gražyna Simha Martynková, prof. Ing. PhD.	TA CR Environment for Life programme TREND 6 TREND 1 (11 projects)	Technology Agency of the Czech Republic (TA CR)	2019 - 2023

Note: Provide up to 10 examples.

RESEARCH PROJECTS

3.3 Research projects

The evaluated unit shall list at most 10 (considered most significant by the evaluated unit) research projects/activities (regardless of whether they are supported by public funds or based on contract research²⁷⁸) that it has implemented or participated in during the period of 2019–2023²⁷⁹. This should be done from the full list in annex tables (Table 3.3.1-3.3.2)²⁸⁰, regarding particularly the results achieved or the application potential of the projects. The unit should also describe how the research projects contributed to the mission and purpose of the evaluated unit. If the evaluated unit has been a participant in listed project, it shall indicate which other entities were involved and describe its contribution to the project. The interdisciplinary aspects of the projects will also be commented on, along with any collaboration with other units of the evaluated HEI.

Maximum 300 words per project.

1) San4Fuel - Single atom based photo(electro)catalysts for green fuel (2022-2025), HORIZON-WIDERA-2021-ACCESS-03-01, No. 101079384, H2020

The project is solved in cooperation of VSB-TUO with partners from UPOL, University of Trieste, and Friedrich-Alexander-Universität Erlangen-Nürnberg. This partnership provides a robust framework for collaborative multidisciplinary research and application.

The research is focused on exploration of novel catalytic systems capable of converting renewable energy into clean fuel sources through innovative single-atom approaches. These catalysts will be engineered to optimize energy conversion efficiency and reduce the environmental footprint of green fuel production. By harnessing the unique properties of single-atom catalysis, the project seeks to deliver breakthroughs in the performance, stability, and scalability of sustainable energy technologies.

Notably, by the end of 2023, the project generated four publications in high-impact journals such as ACS Catalysis (Impact Factor 13.7) and Advanced Science (Impact Factor 17.5). The project also served as the foundation for numerous workshops and the organization of one summer school, which collectively facilitated knowledge sharing, capacity building, and collaboration among international experts and emerging researchers.

2) Real-LIFE Emissions - Harmonizing reliable test procedures representing real-LIFE air pollution from solid fuel heating appliances (2021-2024) LIFE Programme (EU), LIFE20PRE/FI/000006

Project brings together leading European research institutions to tackle the pressing issue of air pollution from solid fuel heating appliances. Coordinated by the University of Eastern Finland, the project consortium included the VSB-TUO, the French National Institute for Industrial Environment and Risks, and the Technology and Support Centre in the Centre of Excellence for Renewable Resources (Germany).

The project's core objective was to develop and implement standardized testing procedures that more accurately reflect real-life emissions from solid fuel heating appliances. By considering not only the quantity but also the quality of emissions and their adverse effects on human health and the environment, Real-LIFE Emissions aims to bridge the gap between laboratory testing and

²⁷⁸ For the definition of contract research for the purposes of evaluation in the HE segments, see Article 2.2.1 of the Community Framework for State Aid for Research, Development and Innovation 2014/C 198/01.

²⁷⁹ Regardless of whether the projects are completed or still ongoing, provided that at least part of the project was implemented during the evaluation period.

²⁸⁰ The evaluated unit shall only fill tables that are relevant to it.

actual operational conditions.

The achieved results have been processed into five technical reports focused on sampling methods, overview of emission components, test protocols, intercomparison campaign, emission factors, emission limits and round robin with Real-LIFE test protocol.

The outcomes of this project supported ongoing European efforts in air quality regulation, contributing to the work of European Committee for Standardization, United Nations Economic Commission for Europe, the European Commission, and national authorities. With a consortium boasting extensive expertise in combustion technologies, emissions measurement, and policy collaboration, the project exemplifies a truly interdisciplinary approach and was set to play a pivotal role in shaping future testing protocols.

The results were presented to potential users through three workshops by representatives from various organizations across Europe. The implementation of these improved testing methods can lead to more effective regulation, helping manufacturers develop cleaner and more efficient heating appliances that comply with stricter emission limits. The project holds significant social relevance, as reducing real-life emissions will improve air quality, public health, and overall living conditions, particularly in regions heavily reliant on solid fuel heating.

3) NCE - National Centre for Energy (2019-2022) TN01000007, NCE II (2023-2028) TN02000025, Technology Agency of the Czech Republic (TA CR)

The National Centre for Energy (NCE) is focused on research and development in the field of sustainable energy, emphasising applicable on results at TRL level 5 and above. Its aim is to foster long-term cooperation with industrial partners through sharing infrastructure, know-how and joint applied research projects.

Its first phase NCE I (2019-2022), was implemented with the support of TA CR within the National Centres of Competence (NCC) programme with a budget of €14,6 million. NCE I brought together 24 entities with the dominant involvement of CEET scientists. Research focused on improving efficiency, safety and reliability of power units and networks, decentralised energy sources and alternative fuels.

The follow-up project NCE II (2023-2028), with a budget of €34,4 million brings together 34 institutions under leadership of CEET. Its aim is to develop a strategy for low-carbon and sustainable energy strengthening energy and raw material independence of our country. Research includes socio-economic impact analysis and recommendations for legislative measures.

Within the NCE I 33 sub-projects with high commercial potential were implemented, followed by 11 new projects in NCE II. Thanks to interdisciplinary collaboration across research organisations and the application domain, 575 results are expected to be achieved during the 2019-2028 period, with potential for rapid implementation in practice and further commercial exploitation. Focus on R&D outputs with high level of IP protection and high level of TRL was placed, specifically 45 utility models, 9 national and international patents, 54 proven technologies, 13 certified methodologies, 45 software solutions, 8 semi-operational units, 22 prototype solutions, 2 industrial designs and other applied outputs.

4) CEET - Centre for Energy and Environmental Technologies (2020-2024), TK03020027, Technology Agency of the Czech Republic

The CEET project focused on the development of innovative technologies for the conversion of alternative fuels and wastes into chemicals and energy, using circular economy, digital twins and

advanced control methods. The aim was to create modular and mobile technologies that support the decarbonisation of the energy sector and the efficient use of renewable resources.

The project was implemented in synergy with the investment project "CEET", supported by the Ministry of Industry and Trade of the Czech Republic and the Moravian-Silesian Region.

The project produced 5 utility models, a prototype, a working software sample and a certified methodology. The developed autonomous system enables waste disposal and energy production in remote areas and in crisis situations. The device processes sorted and mixed waste as alternative fuels and converts them into electrical and thermal energy.

A control system (SCS) with a digital twin optimises operation and increases resource efficiency. Thanks to its mobile and modular design, the technology finds application in municipalities, industrial plants and developing countries. At the same time, it serves as a platform for research, development and education, thus promoting innovation and technological development.

The project is interdisciplinary in nature and links energy, chemical engineering, materials science and digital technologies. Technologies for gasification, pyrolysis processes and hydrogen separation enable the efficient use of waste. BIM modelling facilitates planning and optimisation of operations.

The ENET Centre, the Energy Research Centre, the National Supercomputing Centre IT4I and the Faculty of Electrical Engineering and Computer Science participated in the project.

The project has significant potential for application in the Czech Republic, Europe and in the global market.

5) Research on the identification of combustion of unsuitable fuels and systems of self-diagnostics of boilers combusting solid fuels for domestic heating (2019-2022), CZ.02.1.01/0.0/0.0/18_069/0010049, OP RDE call Pre-application research for ITI, Ministry of Education, Youth and Sport

The project was focused on research of technical and organizational measures to reduce dust emissions through mechanisms that allow effective control of combustion of unsuitable/banned fuels and implementation of a boiler self-diagnostic system for monitoring and control of the correct combustion process. Emphasis was placed on the combustion of solid fuels in small boilers primarily used in households. This project contributes to achieving sustainability from an environmental and economic point of view. The control of particulate matter emissions and the identification of other pollutants is essential for the development of effective air protection strategies that promote long-term environmental protection and public health. In addition to the ecological benefits, there is also an inherent economic aspect - reducing healthcare costs and improving environmental quality contribute to the overall sustainability of regions and the national economy.

Three specialized departments of VSB-TUO participated in the project implementation, with close interconnection of combustion technology, environmental chemistry and diagnostic technologies. The Energy Research Centre in cooperation with the ENET Centre dealt with the identification of markers in solid combustion products, while the ERC in cooperation with the IET dealt with the development of instrumentation for a self-diagnostics system enabling the monitoring of operational and emission parameters of hot water boilers for domestic heating.

The interdisciplinary approach was also reflected in the research results. Four working samples and 30 scientific articles were produced, 22 of them in journals with an impact factor. 6 of these impact factor articles were co-authored by foreign authors, underlining the international collaboration and

interdisciplinary nature of the research.

6) Sustainable Development of the ENET Centre (2015-2019), LO1404, Ministry of Education, Youth and Sport

The Sustainable Development Project of the ENET Centre focused on interdisciplinary research in the field of energy extraction and use from non-traditional sources with an emphasis on sustainability and modern technologies. The main objectives included the development of advanced methods for the transformation of waste and alternative fuels into energy, optimisation of gasification processes, energy storage and smart grid management. The project included testing of innovative technologies, including digital twins and advanced energy flow management methods. The results support the decarbonisation of the energy sector, reduce environmental burdens and contribute to the development of regions affected by industrial decline.

The project has produced 124 publications with an impact factor, 4 technical books, 7 book chapters, 178 conference papers, 17 patents, 4 semi-innovations, 40 utility models and 3 software solutions. The application potential lies in innovative technologies for the efficient use of energy from unconventional sources, with applications in the energy, chemical and materials engineering industries.

The project contributed to research and development of renewable energy sources, technologies for microgrids with storage and optimised methods for waste-to-energy conversion. The technologies developed enable the efficient use of industrial, municipal and agricultural waste, contribute to decentralised energy and reduce operating costs through artificial intelligence and digital twins. Hydrogen storage systems support the transition to emission-free sources.

The ENET Centre participated in the solution in cooperation with the Faculty of Electrical Engineering and Computer Science, the Faculty of Mechanical Engineering, the Faculty of Mining and Geology and the Faculty of Materials Science and Technology. The project not only brought economic and environmental benefits but also strengthened innovation and competitiveness of the Czech industry.

7) Intelligent Hybrid Heat Source up to 100 kW (2019-2022) FV40307, Ministry of Industry and Trade TRIO programme

Within the project "Intelligent hybrid heat source with power up to 100 kW" solved by BENEKOVterm s.r.o, HOTJET, s.r.o and VSB-TUO CEET a series of heat source was developed, which combines the advantages of wood pellets fired boiler and heat pump operation. The units are available with rated outputs of 10, 25 and 90 kW. The 10 kW and 25 kW power versions are primarily designed to provide heat for single family homes, while the 90 kW unit is designed for heating medium sized amenity buildings or business premises. Hybrid heat sources are designed to operate at the lowest possible cost per kWh produced. All sources contain the following basic elements: combustion section (pellet boiler); heat pump and intelligent control unit.

The hybrid source combines a pellet boiler equipped with rotary burners and an air-to-water or ground-to-water heat pump, while the intelligent SIEMENS Climatix control unit optimises operation to achieve the lowest heat production costs. The high-efficiency wood pellet boiler meets the requirements of EN 303-5:2022 Class 5 and Ecodesign, while its storage tank allows operation for up to 24 hours at rated output. The heat pump is designed with a glycol anti-freeze circuit and an anuloid system for hydraulic connection. Automatic control selects between pellet

boiler and heat pump operation according to fuel and electricity costs, optimising COP and reducing wear and tear.

The project represents an example of effective collaboration between commercial entities and the university, which resulted in a number of application outputs: 4 utility models, 2 industrial designs and 3 functional samples. The results of the project have supported the competitiveness of industrial partners on the Czech and European markets.

8) Doctoral Grant Competition of VSB-TUO (2020-2023) CZ.02.2.69/0.0/0.0/19_073/0016945, OP RDE Ministry of Education, Youth and Sport

The main objective of the project was to improve the conditions for the preparation of new scientific and pedagogical staff and, in connection with this, to subsequently increase the quality and strengthen human resources for research and development to a level comparable to leading European universities and to achieve international competitiveness within the European and global research area. This project improved the student grant competition's quality and impact by establishing a unified expert panel with international evaluators, increasing transparency and fairness. Mandatory international and interdisciplinary collaboration enhanced project quality, student preparation, and efficient use of research infrastructure. The program also extended grant durations, hosted outreach events, and introduced public defenses and improved evaluation methods, making the competition more competitive, transparent, and effective.

During the project the following results were created: 53 Peer-reviewed scientific article, 23 Article in proceedings, 9 Technically realized results, 8 softwares, 2 Chapter in a specialist book, 1 Specialist book, 1 Workshop organization, 1 Proven technology.

9) Institute of Environmental Technology - Excellent Research (2018-2022) CZ.02.1.01/0.0/0.0/16_019/0000853, OP RDE call Excellent research, Ministry of Education, Youth and Sport

The project focused on research in material and energy recovery of waste. Research was done in the field of material recovery of technogenic pozzolans, thermal treatment of waste polymeric materials and anaerobic digestion. The second key research area was the reduction of pollutants in the environment, namely new surfactant materials for environmental applications, waste gas treatment by catalytic and sorption processes, photocatalytic removal of pollutants in the gas phase and research on methods for the detection and removal of pollutants from surface and waste waters.

Results of the project: participation in 3 international projects, creation of 144 publications with impact factor, 70% of which were created in collaboration with foreign co-authors and filing of 2 international patent applications. The final outcome: obtaining of a European patent "Method of preparation of a catalyst for the removal of nitrous oxide from waste industrial gases and the catalyst prepared by this method" (EP3737498) and a utility model registered in Germany "Membrane permeability measurement device" (212020000628.8). An important part of the project was also the partial reconstruction of the existing IET science and research facility, which allowed to expand the capacity of laboratory and office space of the building.

The project also significantly contributed to the efficient use of existing infrastructure, and to the solution of waste and polluted environment issues not only in the Moravian-Silesian Region and the Czech Republic, but also internationally in accordance with the mission and purpose of the

CEET-IET Research Centre. Due to its interdisciplinary nature (energy, materials, chemical and environmental engineering), the project was carried out in collaboration with researchers from the Faculty of Materials Science and Technology and the CEET-Nanotechnology Centre research staff.

10) Large research infrastructure ENREGAT – Energy Waste Recovery and Gas Treatment (2019-2022) LM2018098 a (2023-2026) LM2023056, Ministry of Education, Youth and Sport

Large research infrastructure ENREGAT was included to the Czech Roadmap of Large Infrastructures for Research, Development and Innovation from January 2019. Thanks to the targeted support from the Ministry of Education, Youth and Sports (projects LM2018098, LM2023056), ENREGAT infrastructure is available in open access free of charge for scientific community. Enterprises and commercial customers can use ENREGAT in collaborative or contractual research mode.

ENREGAT offers access to the facilities and technological units focused on energy recovery of waste and off-gases treatment in accordance with the mission of the CEET-IET, where ENREGAT infrastructure is located. ENREGAT represents a unique base for the comprehensive research of combustion, thermochemical processes and anaerobic digestion of waste, as well as the catalytic, sorption and photocatalytic cleaning and membrane separation of the resulting gases. The uniqueness of ENREGAT lies in the ability to perform research focused on several waste-to-energy technologies from the laboratory up to pilot plant scale.

In 2019-2023, 101 publications with impact factor, 5 patents, 13 applied results were created by ENREGAT infrastructure users from VSB-TUO (CEET, Faculty of Materials Science and Technology, Faculty of Mining and Geology) and other Czech and foreign research institution. Operator results focused on improvements of infrastructure services were published in 40 publications in impact factor journals.

Table 3.3.1 Projects supported by public funds

In the role of beneficiary						
Provider ²⁸¹	Project name	Support (in thousands CZK/EUR) ²⁸²				
		2019	2020	2021	2022	2023
Horizon Europe (EU)	San4Fuel - Single Atom-Based Nanohybrid Photocatalysts for Green Fuels, 101079384	0/0	0/0	0/0	132/5	1858/73
Erasmus+ Programme (EU)	Virtual open Course of Automotive Life Cycle Assessment, 2021-CZ01-KA220-HED-000032222	0/0	0/0	0/0	5446/215	0/0
European Regional Development Fund - Interreg	AIR TRITIA / Uniform approach to the air pollution management system for functional	5981/236	3908/154	6962/275	0/0	0/0

²⁸¹ If the provider is from abroad, please indicate the provider's country of origin in brackets. For the determination of the country of origin of the provider, the place of residence of the provider is decisive.

²⁸² Indicate the total amount expressed in thousands of CZK and the conversion of the total amount into Euro.

Central Europe (EU)	areas in TRITIA region, CE1101					
Czech National Agency for International Education and Research	Mobility of joint doctoral studies in the field of ellipsometry of advanced nanostructures, EHP-CZ-MOP-2-013	0/0	484/19	4/0,16	306/12	28/1
Czech National Agency for International Education and Research	Joint supervision of doctoral studies by VSB-TUO and the Norwegian University, EHP-CZ-ICP-1-013	367/ 14	511/20	261/10	13/327	219/9
Czech Science Foundation	Tailored oxidic catalysts for NO decomposition without reducing agent, 18-19519S	1303/51	1303/51	0/0	0/0	0/0
Czech Science Foundation	Non-metal doped nanostructures of graphitic carbon nitride for photocatalytic reactions, 19-15199S	0/0	1635/64	1635/64	1635/64	0/0
Czech Science Foundation	Heterojunction photocatalysts and simultaneously metal and non-metal doped TiO ₂ photocatalysts for environmental photocatalytic reactions, 20-09914S	0/0	1475/58	1475/58	1475/58	0/0
Czech Science Foundation	Instrumentation and theory for measurement of terahertz optical activity of biomolecules, 22-33060S	0/0	0/0	0/0	1501/59	1501/59
Czech Science Foundation	Advanced spin-phonic and quantum nonlinear sources of light, 18-22102S	1231/ 49	1231/49	0/0	0/0	0/0
Ministry of Education, Youth and Sport	Support of cross-sectoral cooperation in the field of environmental pollutants reduction and waste recovery (COOPERATION), CZ.02.1.01/0.0/0.0/17_049/0008419	9106/359	11130/439	12647/499	10118/ 399	2530/100
Ministry of Education, Youth	Institute of Environmental	1058/42	20084/792	29947/1181	21079/831	25617/1011

and Sport	Technology – Excellent Research (IET-ER), CZ.02.1.01/0.0/0.0/16_019/0000853					
Ministry of Education, Youth and Sport	Large research infrastructure: ENREGAT - Energy Waste Recovery and Gas Treatment, LM2018098	10380/409	10554/416	9874/390	9842/388	0/0
Ministry of Education, Youth and Sport	Large research infrastructure: ENREGAT - Energy Waste Recovery and Gas Treatment, LM2023056	0/0	0/0	0/0	0/0	11013/434
Ministry of Education, Youth and Sport	Innovation for efficiency and the environment – Growth, CZ.1.05/2.1.00/01.003 6	10500/414	0/0	0/0	0/0	0/0
Ministry of Education, Youth and Sport	Research into the identification of combustion of undesirable substances and self-diagnosis systems of solid fuel boilers for household heating, EF18_069/0010049	5979/236	3174/125	3904/154	1056/42	0/0
Ministry of Education, Youth and Sport	Innovation of educational programs in the field of energy, NFP304010U698	0/0	0/0	858/34	878/35	0/0
Ministry of Education, Youth and Sport	Innovation for energy sources, NFP304010Y352	0/0	0/0	232/9	1934/76	0/0
Ministry of Education, Youth and Sports	Correlated single-atom catalysts for green hydrogen production, CZ.02.01.01/00/22_01 0/0006136	0/0	0/0	0/0	0/0	711/28
Ministry of Education, Youth and Sports	Development of smart materials with the additive manufacturing for high-performance systems, 8J20FR03	0/0	75/3	150/6	106/4	0/0
Ministry of Education, Youth and Sports	Infrastructure support of scientific education of doctoral students at CNT VSB-TUO, CZ.02.1.01/0.0/0.0/16	353/14	353/14	164/6	0/0	0/0

	_017/0002664					
Ministry of Education, Youth and Sports	Doctoral grant competition VSB – TUO, CZ.02.2.69/0.0/0.0/19_073/0016945	0/0	478/19	2195/87	2110/83	2320/92
Ministry of Education, Youth and Sports	Nanotechnology – PhD study in the frame of Double International Guidance, CZ.02.2.69/0.0/0.0/16_018/00027808	2174/86	1392/52	820/32	581/23	638/25
Ministry of Education, Youth and Sports	Infrastructure support of strategic studying programme at CNT VSB-TUO, CZ.02.2.67/0.0/0.0/16_016/0002468	524/21	211/8	196/8	0/0	0/0
Ministry of Education, Youth and Sports	Sustainable development of the ENET Centre, LO1404	13665/539	0/0	0/0	0/0	0/0
Ministry of Education, Youth and Sports	Energy Research and Development Information Centre of the Czech Republic, LTI17023	976/39	0/0	0/0	0/0	0/0
Ministry of Education, Youth and Sports	Use of catalysts to reduce pollutant emissions from biomass waste combustion, 8JPL19020	42/2	41/2	0/0	0/0	0/0
Ministry of Education, Youth and Sports	Low Carbon Energy Technologies Research Centre, CZ.02.1.01/0.0/0.0/16_019/0000753	21620/853	9442/372	7919/312	7340/290	0/0
Ministry of Industry and Trade	Electromobility at ERC, CZ.01.3.14/0.0/0.0/19_252/0019748	0/0	0/0	469/18	0/0	0/0
Ministry of Industry and Trade	Practical training programme for staff developing a low-carbon economy in the border region, CZ.11.3.119/0.0/0.0/15_005/0000048	797/31	16/0,63	0/0	0/0	0/0
Ministry of Industry and Trade	Optimizing the energy flow between high-capacity energy storage powered by solar cells and the distribution grid, CZ.01.1.02/0.0/0.0/17	0/0	1065/42	2663/105	0/0	0/0

	_107/0012463					
Ministry of Industry and Trade	Research and development of an application for SMART business management, CZ.01.1.02/0.0/0.0/17_176/0015702	0/0	0/0	392/15	665/26	1112/44
Ministry of Industry and Trade	Research on the identification of combustion of undesirable substances and self-diagnostic systems of solid fuel boilers for domestic heating, CZ.01.1.02/0.0/0.0/17_107/0012463	1620/64	0/0	5035/199	0/0	0/0
Ministry of Industry and Trade	Environmental Research and Development Information Centre, LTI19	0/0	327/13	755/30	742/29	667/26
Ministry of Industry and Trade	Research and development of innovative equipment for DEM simulations calibration and validation of particulate matter in the field of mechanical comminution processes and abrasion, CZ.02.2.69/0.0/0.0/19_073/0016945	0/0	0/0	0/0	868/34	234/9
Ministry of Industry and Trade	Low-potential waste heat recovery, CZ.02.2.69/0.0/0.0/19_073/0016945	0/0	0/0	0/0	744/29	428/17
Ministry of Industry and Trade	Study of the Additives Impact on Emissions from the Combustion of Alternative Fuels, CZ.02.2.69/0.0/0.0/19_073/0016945	0/0	0/0	0/0	951/38	24710
Ministry of Industry and Trade	Optimization of decomposition, CZ.02.2.69/0.0/0.0/19_073/0016945	0/0	0/0	0/0	788/31	392/15
Ministry of Industry and Trade	Partial Discharge Detection in Insulation systems, CZ.02.2.69/0.0/0.0/19_073/0016945	0/0	0/0	0/0	1110/44	230/9

Ministry of Industry and Trade	Smart Control System for Energy Flow Optimization and Management in a Microgrid with V2H/V2G Technology, CZ.02.2.69/0.0/0.0/19_073/0016945	0/0	0/0	0/0	933/37	1005/40
Ministry of Industry and Trade	TORIFICATION, CZ.01.1.02/0.0/0.0/15_019/0004771	1925/76	2214/87	0/0	0/0	0/0
Ministry of Industry and Trade	Pyrolysis unit with induction heating, CZ.01.1.02/0.0/0.0/15_019/0004681	0/0	2612/103	0/0	0/0	0/0
Ministry of Industry and Trade	Gasification of agromaterial AXIOM TECH, s.r.o., CZ.01.1.02/0.0/0.0/15_019/0004885	851/34	169/7	0/0	0/0	0/0
Ministry of Industry and Trade	Treatment, processing and use of agglomeration waste, CZ.01.1.02/0.0/0.0/16_084/0010306	904/36	1276/50	0/0	0/0	0/0
Ministry of Industry and Trade	Research and development of new solid alternative fuel from mixed municipal waste by wet separation method and combustion test, CZ.01.1.02/0.0/0.0/16_084/0010340	315/12	0/0	0/0	0/0	0/0
Ministry of Industry and Trade	Process intelligence optimization of the parking system for Smart City, FV40411	1584/62	2164/85	2070/82	868/34	0/0
Ministry of Industry and Trade	Power flow control system between electric vehicle and power unit - critical infrastructure support, CZ.01.1.02/0.0/0.0/20_321/0024901	0/0	0/0	0/0	656/26	2036/80
Ministry of Industry and Trade	System for efficient control of public transport traction system, CZ.01.1.02/0.0/0.0/20_321/0024902	0/0	0/0	0/0	210/8	0/0
Ministry of Industry and Trade	Research and development of a firefighting and	0/0	0/0	0/0	452/18	1862/73

	quarantine container designed to deal with electric vehicle fires, including the development of a dry extinguishing method, CZ.01.1.02/0.0/0.0/21_374/0027319					
Ministry of Industry and Trade	Research and development of technology for the production of solid alternative fuel from waste components of car wrecks and electrical equipment, or other waste for ecological combustion in external energy installations, CZ.01.1.02/0.0/0.0/20_321/0024899	0/0	0/0	0/0	1193/47	6217/245
Ministry of Industry and Trade	Development of a test unit for the disposal of sewage sludge, CZ.01.1.02/0.0/0.0/20_321/0025056	0/0	0/0	0/0	0/0	7474/295
Ministry of Industry and Trade	Scalable Control System for Actuators, CZ.01.1.02/0.0/0.0/20_321/0024308	0/0	0/0	0/0	967/38	4307/170
Ministry of Industry and Trade	Research and development of a low-emission boiler without electrical connection working on the principle of biomass gasification, CZ.01.1.02/0.0/0.0/20_321/0024298	0/0	0/0	0/0	2189/86	0/0
Ministry of Industry and Trade	R-mat separation - ecological application, CZ.01.1.02/0.0/0.0/19_262/0020077	0/0	0/0	2791/110	2524/100	3564/141
Ministry of Industry and Trade	Centre for Energy and Environmental Technologies - explorer (CEETe), CZ.01.1.02/0.0/0.0/19_311/0024013	0/0	0/0	0/0	0/0	43650/1722
Ministry of the Environment of the Czech Republic	Intelligent Air Pollution Source Identification System (IIS), 07149/2020/ŽPZ	36882/1455	0/0	0/0	0/0	0/0
Ministry of the	Modern ecological	0/0	0/0	750/30	0/0	0/0

Environment of the Czech Republic	transport at ERC, 1191100073					
Ministry of Interior of the Czech Republic	Comprehensive risk reduction of disasters of epidemiological, natural and technical character by building resilience at the local level, VI04000064	0/0	0/0	4266/168	4535/179	0/0
Ministry of Regional Development CZ (Interreg CZ-PL)	DRONE EXPERT - specialized training for students, CZ.11.3.119/0.0/0.0/18_031/0002209	0,00	280/11	1123/44	2226/88	383/15
Ministry of Regional Development CZ (Interreg CZ-PL)	SUWAT: Cross-border cooperation in the monitoring of chemical and radiation contamination of surface waters by mine waters, CZ.11.4.120/0.0/0.0/17_028/0001633	913/36	370/15	1481/58	876/35	0/0
Ministry of Regional Development CZ (Interreg CZ-PL)	Professional competences of graduates as an opportunity to work in the construction sector on the cross-border labour market, CZ.11.3.119/0.0/0.0/17_027/0001668	400/16	146/6	557/22	861/34	151/6
Ministry of Regional Development CZ	Electromobility in the Czech-Polish border area, CZ.11.4.120/0.0/0.0/16_013/0001585	0/0	0/0	257/10	0/0	0/0
Ministry of Regional Development CZ	Scientific and research cooperation for the development of ecotransport in the Czech-Polish border area, CZ.11.4.120/0.0/0.0/16_013/0002137	0/0	0/0	0/0	0/0	185/7
Ministry of Agriculture	Optimization of sludge treatment technology from municipal wastewater treatment plants with regard to their chemical and microbial composition and ability to retain water with the aim of	0/0	0/0	1366/54	1441/57	1545/61

	their safe use on agricultural and forest land, QK21010300					
Moravian-Silesian Region	Feasibility study of the Energy and Environmental Technologies Centre, 02680/2019	750/30	0/0	0/0	0/0	0/0
Moravian-Silesian Region	Establishment of research infrastructure - Energy and Environmental Technology Centre-Explorer, 07116_2020_DSH	0/0	0/0	1400/55	4200/166	1400/55
Moravian-Silesian Region	Operation of the IIS - Intelligent Identification System for Air Pollution Sources, 04414_2021_ŽPZ	0/0	700/28	0/0	0/0	0/0
Moravian-Silesian Region	Intelligent identification system of air pollution sources - identification of the influence of the Hrabová zone on the odour load, 02308/2022/ŽPZ	0/0	0/0	0/0	700/28	0/0
Moravian-Silesian Region	Implementation of pilot control measurement of pollutant emissions on incinerators purchased as part of MSK boiler subsidies	200/8	0/0	0/0	0/0	0/0
State Environmental Fund of the Czech Republic (Norway grants)	The impact of traffic on air pollution within the TEN-T route Ústí nad Labem - Mělník – Zdíby, 3202100004	0/0	0/0	1701/67	1520/60	1110/44
State Environmental Fund of the Czech Republic (Norway grants)	SENZAIR - Sensor networks for monitoring, 3212400002	0/0	0/0	0/0	0/0	833/33
State Environmental Fund of the Czech Republic (Norway grants)	Local sensor network in Velká Bystřice, 3212400006	0/0	0/0	0/0	0/0	1250/49
State Environmental Fund of the Czech Republic	i-AIRP's Identification of causes of air pollution on the	0/0	0/0	2358/93	0/0	2134/84

Republic	Czech-Polish border, SFZP 016204/2021					
Technology Agency of the Czech Republic	National Centre for Energy, TN01000007	15276/603	29034/1145	14857/586	8849/349	0/0
Technology Agency of the Czech Republic	National Centre for Energy II, TN02000025	0/0	0/0	0/0	0/0	45724/1803
Technology Agency of the Czech Republic	Research and development processes of coke oven gas conversion to hydrogen and alternative fuel, TK03030198	0/0	2083/82	5893/232	5284/208	4836/191
Technology Agency of the Czech Republic	The research of Hg distribution in absobrem wet method desulphurization, TK04020181	0/0	0/0	0/0	1618/64	1776/70
Technology Agency of the Czech Republic	Complex hydrogen safety and security in the Moravian-Silesian Region, TK05010075	0/0	0/0	0/0	0/0	1980/78
Technology Agency of the Czech Republic	The methodology of H2 sampling at high pressures and subsequent analysis of its contamination from the perspective of further effective use in the transport and energy sector, TK05010184	0/0	0/0	0/0	0/0	2472/98
Technology Agency of the Czech Republic	Problems and impacts of the use of solid alternative fuels, TK02010156	1207/48	3437/136	3648/144	3476/137	1523/60
Technology Agency of the Czech Republic	Research and development of a device for separating ammonia from coking wastewater, TH02030535	1325/52	0/0	0/0	0/0	0/0
Technology Agency of the Czech Republic	Aerobic - anaerobic mobile contained rotary bioreactor, TH03020064	1339/53	1300/51	0/0	0/0	0/0
Technology Agency of the Czech Republic	Elimination of trichlorethylene from production of ammonium sulphate (ELTRIS), TH04030008	1285/51	1285/51	1285/51	643/25	0/0
Technology	SAFER - Self-healing	0,00	0,00	0,00	0,00	479/19

Agency of the Czech Republic	fiber ceramic matrix composite, TH82020004					
Technology Agency of the Czech Republic	Use of markers for identification of fuel origin in local heating systems, TH02030922	702/28	702/28	0/0	0/0	0/0
Technology Agency of the Czech Republic	Effect of biochar addition on the change of compost properties, TH02030925	799/32	799/32	0/0	0/0	0/0
Technology Agency of the Czech Republic	Publish and Flourish: support for publishing activities of PhD students and supervisors, TL01000274	697/27	697/27	0/0	0/0	0/0
Technology Agency of the Czech Republic	Increase savings and efficiency of parking systems for transport vehicles, TH04020180	1770/70	2052/81	2009/79	0/0	0/0
Technology Agency of the Czech Republic	Identification of the origin of dust particles in road dust and technological options for their reduction, TH04010239	1466/58	1687/67	581/23	0/0	0/0
Technology Agency of the Czech Republic	Non-contact partial discharge detector for HV distribution lines, 08181/2018/RRC	1321/52	1546/61	236/9	0/0	0/0
Technology Agency of the Czech Republic	Optimization of the operating parameters of the power distribution system using artificial intelligence, TJ02000327	1458/58	1724/68	277/11	0/0	0/0
Technology Agency of the Czech Republic	Research and optimization of the production process and mechanical properties of raw materials for the production of hard ferrite magnets, TJ02000333	497/20	1673/66	305/12	0/0	0/0
Technology Agency of the Czech Republic	Research on the potential of using hydrogen technologies for transformation of the energy mix of the Moravian-Silesian	559/22	1590/63	1651/65	0/0	0/0

	Region, low-carbon energy and development of low-emission transport, TK02010187					
Technology Agency of the Czech Republic	Smart energy management system for power grids, TK02030039	2384/94	5336/211	6168/243	5428/214	5365/212
Technology Agency of the Czech Republic	Development of a reactor for algae cultivation by GROW LED spectral light illumination using carbon dioxide from biogas, TH04020180	127/5	905/36	778/31	725/29	0/0
Technology Agency of the Czech Republic	Environmental Impact Assessment of Coal Landfills, SS01020432	0/0	1791/71	3499/138	4152/164	0/0
Technology Agency of the Czech Republic	CEET- Centre for Energy and Environmental Technologies, TK03020027	0/0	4750/187	10345/408	9120/360	11884/469
Technology Agency of the Czech Republic	Reducing the energy intensity and environmental burden of rail transport through the preparation of infrastructure for trains with alternative propulsion, TK04010081	0/0	0/0	0/0	1090/43	1135/45
Technology Agency of the Czech Republic	Optimization of the properties and use of reclamation substrates based on sewage sludge and other suitable waste materials in accordance with the principles of circular economy, SS03010311	0/0	0/0	757/30	1253/49	2216/87
Technology Agency of the Czech Republic	Developing analytical tools for an effective transition to electromobility, CK04000060	0/0	0/0	0/0	0/0	2438/96
Technology Agency of the Czech Republic	Development of a plasma torch for thermochemical conversion of feed materials to high hydrogen gas,	0/0	0/0	0/0	2305/91	0/0

	TK05020042					
Visegrad fund	Low carbon technologies, 22030137	0/0	0/0	200/8	10/0,39	0/0
Total		126793 / 5002	141475 / 5581	144570 / 5703	135755 / 5355	143409 / 5657
In the role of another participant						
Provider ²⁸³	Project name	Support (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
Urban Innovative Actions Initiative (EU)	CLAIRO (Clear AIR and Climate Adaptation in Ostrava and other cities), UIA03-123	2172/86	2257/89	2321/92	1059/42	0/0
Polish National Agency for Academic Exchange (Poland)	Environmental Safety of Biosolids in the Circular Economy- EnviSafeBio, PDI/APM/2018/1/0002 9/U/001	393/16	174/7	0/0	0/0	0/0
LIFE Programme (EU)	Harmonizing reliable test procedures representing real-LIFE air pollution from solid fuel heating appliances, LIFE20PRE/FI/000006	0/0	0/0	575/23	0/0	739/29
LIFE Programme (EU)	Improving the implementation of programs to improve air quality in Slovakia by strengthening the capacities and competences of regional and local authorities and supporting measures in the area of air quality, LIFE18 IPE/SK/000010	0/0	3588/142	0/0	5177/204	0/0
Czech Science Foundation	Advanced analysis of the relationship between optical/electron/textural/structural properties of TiO ₂ doped materials and its photocatalytic activity, 17-20737S	992/39	0/0	0/0	0/0	0/0
Czech Science Foundation	CO ₂ transformation to valuable chemicals by catalytic and photocatalytic ways	0/0	0/0	1530/60	1836/72	1836/72

²⁸³ Ibid.

	over highly active materials, 21-24268K					
Czech Science Foundation	Study of key factors influencing hydrogenation / deoxygenation of oxygen mixtures, 22-12925S	0/0	0/0	0/0	1167/46	1191/47
Czech Science Foundation	New advanced mobile units for thermal degradation of waste, TH02010268	650/26	0/0	0/0	0/0	0/0
Czech Science Foundation	Dispersion strengthened high entropy alloys for extreme conditions, 17-23964S	592/23	0/0	0/0	0/0	0/0
Czech Science Foundation	Control of electronic properties of metal-containing molecules through their noncovalent interactions with solvents, ligands and 2D nanosystems, 19-27454X	0/0	1672/66	5181/204	5227/206	5360/211
Ministry of Education, Youth and Sports	Development of photocatalysts based on nanostructured layered double hydroxides for photocatalytic reduction of carbon dioxide under (UVC and UVA) light, 8J19UA041	121/5	0/0	73/3	0/0	0/0
Ministry of Industry and Trade	Torrefaction technology for small and mobile units, CZ.01.1.02/0.0/0.0/16_084/0010290	778/31	328/13	0/0	0/0	0/0
Ministry of Industry and Trade	New technology refining flue gases and elimination of persistent organic pollutants using waste sorbent, CZ.01.1.02/0.0/0.0/15_019/0004523	487/19	0/0	0/0	0/0	0/0
Ministry of Industry and Trade	The new low-cost technology for catalytic reduction of nitrogen oxides in the flue gas intended for small emission	489/19	0/0	0/0	0/0	0/0

	sources, CZ.01.1.02/0.0/0.0/15 _019/0004522					
Ministry of Industry and Trade	The elimination of the waste air emissions by photochemical oxidation, FV10674	512/20	0/0	0/0	0/0	0/0
Ministry of Industry and Trade	Synthesis of ionic liquids in microwawe reactor, FV10089	1800/71	1050/41	0/0	0/0	0/0
Ministry of Industry and Trade	Continual purification of Caprolactam, FV40040	1474/58	1324/52	1203/47	1980/78	0/0
Ministry of Industry and Trade	Technology for optimal thermal treatment of automotive waste, CZ.01.1.02/0.0/0.0/19 _262/0019993	0/0	293/12	1168/46	2013/79	0/0
Ministry of Industry and Trade	Hot-water fireplace insert with integrated accumulation, EG15_019/0004928	1635/65	0/0	0/0	0/0	0/0
Ministry of Industry and Trade	Low emission off-grid heat source for solid fuels up to 500kW, FV20623	2520/100	2340/92	0/0	0/0	0/0
Ministry of Industry and Trade	Micro ORC unit with utilisation of 3D printing, EG16_084/0010314	550/21	2127/84	0/0	0/0	0/0
Ministry of Industry and Trade	Combined decontamination of waters polluted by engines fuel additives using nanotechnologies, CZ.01.1.02/0.0/0.0/16 _084/0010305	1225/48	2486/987	0/0	0/0	0/0
Ministry of Industry and Trade	Waste heat using technology generated by the waste disposal of water treatment, EG16_084/0010332	1479/58	2731/108	1314/52	0/0	0/0
Ministry of Industry and Trade	Small-scale ORC unit with special expanders, EG17_107/0012424	0/0	212/8	2383/94	0/0	0/0
Ministry of Industry and Trade	Methodology and system solutions in applying to ISO 50001	0/0	336/13	0/0	1828/72	0/0
Ministry of Industry and Trade	Intelligent hybrid heat source with an output of up to 100 kW, FV40307	1126/44	2629/104	2592/102	1133/45	0/0

Ministry of Industry and Trade	Development of a new type of interior stove in low energy and passive houses, CZ.01.1.02/0.0/0.0/17_176/0015493	0/0	200/8	1512/60	1013/40	0/0
Ministry of Industry and Trade	Pellet combustion plant with healthy radiant heat storage function and automatic combustion control, CZ.01.1.02/0.0/0.0/19_262/0019973	0/0	0/0	325/13	1487/59	1255/50
Ministry of Industry and Trade	Fireplace with new construction platform with pyrolytic combustion, CZ.01.1.02/0.0/0.0/19_262/0020128	0/0	0/0	653/26	1116/44	0/0
Ministry of Industry and Trade	Development of a solid fuel stove with ceramic tiles and temperature control for Smart Heat baking, CZ.01.1.02/0.0/0.0/20_321/0023803	0/0	0/0	596/24	1620/64	0/0
Ministry of Industry and Trade	Photonic structures in safety holograms (Modelling and design of photonic structures for safety holograms), FV20020	1483/58	1483/58	667/26	0,00	0,00
Ministry of Industry and Trade	Water desalination and boron elimination technology, CZ.01.1.02/0.0/0.0/21_374/0027350	0/0	0/0	0/0	316/12	0/0
Ministry of Regional Development CZ, (Interreg CZ-PL)	i-AIR REGION, CZ.11.4.120/0.0/0.0/16_026/0001075	20/0,79	195/8	213/8	0/0	0/0
Ministry of Interior of the Czech Republic	Safety Concept of Hydrogen Technologies for Smart Cities and Regions, VK01030175	0/0	0/0	0/0	0/0	405/16
State Environmental Fund of CZ, (Norway grants)	KRNOV SmartON networks for air polutions, 3212400003	0/0	0/0	0/0	0/0	617/24
State Environmental Fund of CZ,	TOP_AIR Nizni Lhoty, 3212400007	0/0	0/0	0/0	0/0	1029/41

(Norway grants)						
State Environmental Fund of CZ, (Norway grants)	TOP AIR Ostrava Hrabova, 3212400009	0/0	0/0	0/0	0/0	1034/41
State Environmental Fund of CZ, (Norway grants)	Corridor D8, local air quality measurements with emphasis on domestic heating issues, Ústí region, 3212400019	0/0	0/0	0/0	0/0	193/8
State Environmental Fund of CZ, (Norway grants)	Corridor D8, local air quality measurements with emphasis on domestic heating issues, Central Bohemia region, 3212400018	0/0	0/0	0/0	0/0	173/7
State Environmental Fund of CZ, (Norway grants)	AIR PAU benzo(a)pyrene at the border, 3212400001	0/0	0/0	0/0	0/0	780/31
State Environmental Fund of CZ, (Norway grants)	CLEAN AIR, Sensors pro Mělník, 3212400017	0/0	0/0	0/0	0/0	189/7
Technology Agency of the Czech Republic	Long-term heat energy storage in a supercooled substance, TM04000021	0/0	0/0	0/0	0/0	3521/139
Technology Agency of the Czech Republic	National Competence Centre of Polymer Materials and Technologies for 21. century, TN02000051	0/0	0/0	0/0	0/0	1000/39
Technology Agency of the Czech Republic	Micro combined heat and power with biomass combustion and ORC technology, TK04020140	0/0	0/0	0/0	1359/54	1493/5
Technology Agency of the Czech Republic	Air quality Research, Assessment and Monitoring Integrated System, SS02030031	0/0	642/25	4275/169	4410/174	4/0,17
Technology Agency of the Czech Republic	Technology of low-emission local heater burning biomass for houses with almost zero energy consumption, FW03010351	0/0	0/0	300/12	272/11	0/0
Technology Agency of the	Battery storage with a guaranteed service life	0/0	0/0	2665/105	2649/105	0/0

Czech Republic	of at least 25,000 cycles and a discharge / charge rate of up to 3C for households, industry, electromobility and community energy applications, FW03010612					
Technology Agency of the Czech Republic	Analysis of the real operation of solid-fuel household heating systems, SS01010121	0/0	1530/60	3098/122	3242/128	1331/53
Technology Agency of the Czech Republic	Long-term heat energy storage in a supercooled substance, TM04000021	0/0	0/0	0/0	0/0	3522/139
Technology Agency of the Czech Republic	Research of PAH and heavy metals atmospheric deposition health effect in connection with the transport induced particles resuspension, SS01010156	0/0	500/20	1769/70	1360/54	0/0
Technology Agency of the Czech Republic	Advanced technologies for heat and electricity production, TE01020036	3650/144	0/0	0/0	0/0	0/0
Technology Agency of the Czech Republic	High power density modular power converters for automotive and aerospace systems, TH02020191	3083/122	2370/93	0/0	0/0	0/0
Technology Agency of the Czech Republic	Thermal treatment of dry fermentation residues, TH02030120	780/31	65/3	0/0	0/0	0/0
Technology Agency of the Czech Republic	Development of technology for purification and treatment of synthesis gases, TH02020032	980/39	0/0	0/0	0/0	0/0
Technology Agency of the Czech Republic	Increasing the efficiency of compressed air production in compressor stations using ORC compressor, TH02020183	1092/43	648/26	0/0	0/0	0/0
Technology	Development of an	950/37	979/39	0/0	0/0	0/0

Agency of the Czech Republic	innovative pneumatic transport system, TH03010453					
Technology Agency of the Czech Republic	Reduction of Hg, HCl and HF concentrations from large industrial sources, TK01020101	1442/57	1413/56	0/0	0/0	0/0
Technology Agency of the Czech Republic	Innovative development of a divider for efficient analysis of bulk materials, TH02010028	1200/47	0/0	0/0	0/0	0/0
Technology Agency of the Czech Republic	Research and implementation of a prototype of a multifunctional mobile autonomous hybrid air/water-water heat pump energy container with progressive autonomous energy management, TK02020099	559/22	1590/63	1651/65	0/0	0/0
Technology Agency of the Czech Republic	Development of tools to minimise the risks of air contamination by respirable asbestos fibres released by human activities from the rock environment, SS01010257	0/0	573/23	1105/44	956/38	304/12
Technology Agency of the Czech Republic	Centre for Environmental Research: Waste and Circulation Management and Environmental Safety (CEVOOH), SS02030008	0/0	598/24	592/23	724/29	507/20
Technology Agency of the Czech Republic	Multifunctional monoblock high-temperature industrial heat pump in mobile and stationary design, TK05020091	0/0	0/0	0/0	0/0	1413/56
Technology Agency of the Czech Republic	ESO - N1 hydrogen fuel cell vehicle, CK04000248	0/0	0/0	0/0	0/0	1022/40
Technology Agency of the Czech Republic	National Hydrogen Mobility Centre, TN02000007	0/0	0/0	0/0	0/0	2051/81

State Agency of the Higher Council for Scientific Research, Madrid, Spain*	Design of novel antimicrobial biobased materials using supercritical fluids processes, iLINK A20364	0/0	0/0	0/0	0/0	0/0
State Agency of the Higher Council for Scientific Research, Madrid (Spain)*	Graphene-based hybrid materials as antimicrobial systems effective against antibiotic resistant bacteria, iLINK 1191	0/0	0/0	0/0	0/0	0/0
COST, European Cooperation in Science and Technology (EU) *	Advanced Engineering and Research of aeroGels for Environment and Life Sciences, CA18125	0/0	0/0	0/0	0/0	0/0
COST, European Cooperation in Science and Technology (EU)*	Ammonia and Greenhouse Gases Emissions from Production Building, CA16106	0/0	0/0	0/0	0/0	0/0
FONDECYT (Peru)*	Synthesis of carbon quantum dots from agro-industrial residual biomass using hydrothermal carbonization and/or microwaves, with technical properties suitable for use in biomolecule transport, 398-2019-FONDECYT	0/0	0/0	0/0	0/0	0/0
Total		47078 / 1857	42004 / 1657	49087 / 1936	58553 / 2310	45895 / 1810

* VSB-TUO was not the grant recipient, but the costs were reimbursed to it by the project holder.

Table 3.3.2 - Contract research activities

Client ²⁸⁴	Activity name	Revenue (in thousands CZK/EUR)				
		2019	2020	2021	2022	2023
ALU - COLOR s. r. o.	Analysis of hexafluoroisocyanuric acid-based reagent	0/0	0/0	0/0	0/0	7/0,28
Bekaert Bohumín s.r.o.	Analysis of sorbents for tar content	5/0,20	0/0	0/0	0/0	0/0
BEST, a.s.	Determination of the mineralogical and chemical composition of	0/0	0/0	0/0	47/1,85	0/0

²⁸⁴ If the client is from abroad, indicate in brackets the country of origin of the client.

	geological samples					
CARTHAMUS a.s.	Combustion test of solid alternative fuel	0/0	0/0	0/0	0/0	279/11,01
Confal a.s.	Determination of the chemical and phase composition of an aluminium production sample	13/0,49	0/0	0/0	0/0	0/0
Confal a.s.	Determination of the chemical and phase composition of the sample	0/0	0/0	42/1,66	0/0	0/0
CONFORMITY s.r.o.	Determination of biogas and methane production of unstabilised and stabilised cellulose treatment sludge without and with the influence of the enzyme MetZyme FORCI 024	79/3,14	0/0	0/0	0/0	0/0
CONFORMITY s.r.o.	Tests: verification of the effect of LIGNO 001 on anaerobic decomposition of organic matter of raw sludge	0/0	0/0	133/5,25	0/0	0/0
CONFORMITY s.r.o.	Tests: verification of the effect of LIGNO 001 on the anaerobic decomposition of organic matter of raw sludge	0/0	94/3,71	0/0	0/0	0/0
Crop Intellect Ltd. (United Kingdom)	Laboratory tests on supplied samples	0/0	0/0	0/0	0/0	30/1,2
Crop Intellect Ltd. (United Kingdom)	Evaluation of the photocatalytic activity of the supplied sample (TiO ₂ treated) for the photocatalytic degradation of NO ₂ (100 ppm in helium) for 24 hours	0/0	0/0	0/0	0/0	33/1,31
ČEZ ESCO, a.s.	Analysis of TAP sample - fuel analysis, X-ray fluorescence of ash	3/0,12	0/0	0/0	0/0	0/0
Dekonta a.s.	Pyrolysis tests of the FVP section	0/0	0/0	0/0	69/2,72	0/0
Dekonta a.s.	Pyrolysis of plastic films from battery recycling	0/0	0/0	0/0	47/1,83	0/0

Dekonta a.s.	Pyrolysis of sewage sludge including initial analysis of the produced biochar	0/0	0/0	0/0	0/0	96/3,79
DEZA, a.s.	TGA analysis, Determination of the TGA curve	6/0,24	0/0	6/0,24	26/1,03	0/0
ECOCOAL, s.r.o.	Phase analysis and chemical composition by XRF technique	0/0	3/0,13	0/0	0/0	0/0
EDEN TRADE CZ, s. r. o.	Determination of specific biogas and methane production of highly organically polluted wastewater	13/0,51	0/0	0/0	0/0	0/0
EFG Rapotín BPS s.r.o.	Analysis of VOCs in biogas from BPS Rapotín	0/0	0/0	0/0	19/0,77	0/0
EGGBEDDED SOLUTIONS, s.r.o.	Original product development LoRaWAN compatible dust particle, temperature and humidity meter	0/0	0/0	0/0	0/0	490/19,33
EKOLTES Hranice, a.s.	Determination of calorific value of mixed municipal waste	0/0	0/0	0/0	0/0	11/0,42
Elkem Carbon Slovakia, a.s. (Slovakia)	Carbon material analysis	0/0	0/0	0/0	0/0	15/0,61
ENERGETIKA TŘINEC, a.s.	Determination of chlorides, fluorides, carbonates, sulphites and sulphates by ion chromatography on condensate samples	0/0	3/0,11	0/0	0/0	0/0
ENVIRTA CZ s.r.o.	Gravimetric analysis of filters	35/1,4	17/0,65	17/0,65	0/0	0/0
ENVitech Bohemia s.r.o.	Validation of a special immission measuring unit	36/1,42	0/0	0/0	0/0	0/0
ENVitech Bohemia s.r.o.	Accredited analysis of sorbed tubes from Radiello passive dosimeters collected at 151 sites	1640/64,69	0/0	0/0	0/0	0/0
ENVitech Bohemia s.r.o.	Determination of the concentration of benzo(a)pyrene in samples of suspended particles	103/4,07	131/5,16	267/10,52	325/12,81	0/0

	Pm10, determination of the concentration of benzene in samples taken on sorption tubes from the station in Nošovice					
ENVitech Bohemia s.r.o.	Determination of benzo(a)pyrene concentration in suspended PM10 samples collected from the Loštice station	62/2,43	90/3,55	155/6,11	105/4,14	0/0
ENVitech Bohemia s.r.o.	Sensor PID module after PAH	396/15,62	0/0	0/0	0/0	0/0
ENVitech Bohemia s.r.o.	Analyses - dust fallout, sulphate and fluoride ions	0/0	50/1,97	0/0	0/0	0/0
ENVitech Bohemia s.r.o.	Gravimetric determination of particles on Eurogas a.s. filter	0/0	0/0	7/0,28	0/0	0/0
ENVitech Bohemia s.r.o.	Determination of benzo(a)pyrene concentration in samples of suspended PM10 - Rožnov pod Radhoštěm	0/0	0/0	0/0	43/1,71	138/5,42
ENVitech Bohemia s.r.o.	Analysis of dust fallout from samples collected in Světlá nad Sázavou and analysis of sulphate and fluoride ions	0/0	0/0	0/0	58/2,27	0/0
ENVitech Bohemia s.r.o.	Analysis of dust fallout from samples collected in Světlá nad Sázavou and analysis of sulphate and fluoride ions-24 samples.	0/0	0/0	0/0	0/0	21/0,83
ENVitech Bohemia s.r.o.	Determination of benzo(a)pyrene concentration in PM10 suspended particulate matter samples collected from the Loštice station	0/0	0/0	0/0	0/0	158/6,21
ENVitech Bohemia s.r.o.	Determination of benzo(a)pyrene concentrations in	0/0	0/0	0/0	0/0	22/0,87

	samples taken from the station in Jánské Lázně					
Erwin Quarder CZ s.r.o.	Tempering of plastic parts	0/0	0/0	2/0,06	0/0	0/0
EUROGAS a.s.	Gas monitoring of the storage sites of the Hedvika and Ema tailings ponds	195/7,69	233/9,17	225/8,88	225/8,88	225/8,88
EUROGAS a.s.	Air pollution monitoring of the remediated site	0/0	0/0	30/1,18	0/0	0/0
Fortemix produkce s.r.o.	Quantitative phase analysis	0/0	0/0	0/0	0/0	5/0,19
GENEPHARM S.A.	Analyses	0/0	0/0	12/0,47	144/5,69	
GENEPHARM S.A.	Analyses in accordance with submitted sub-orders	0/0	0/0	0/0	0/0	106/4,16
H2 WORLD HEALTH	Development and optimization of the method for determination of hydrogen concentration in solution, determination of the volume of hydrogen released from the dental tablet	0/0	0/0	46/1,82	0/0	0/0
IMPEX TRADE CZ, s.r.o.	Determination of anaerobic biogas production from porcine blood	0/0	17/0,67	0/0	0/0	0/0
Lenzing Biocel Paskov a.s.	Determination of chemical composition by XRF	0/0	0/0	8/0,30	0/0	0/0
Lovochemie, a.s.	Determination of chlorate content	0/0	0/0	0/0	18/0,71	12/0,47
Lovochemie, a.s.	Determination of chlorate content in solid and liquid fertiliser samples	0/0	0/0	0/0	17/0,69	12/0,46
Macco Organiques, s.r.o.	XRD, DSC, DTA and elemental analysis on supplied samples	49/1,95	0/0	0/0	0/0	0/0
Macco Organiques, s.r.o.	XRD, DSC, DTA and elemental analysis on supplied samples	0/0	0/0	27/1,05	0/0	0/0
Maxion Wheels Czech s.r.o.	Paint Test - FLW - Volvo - Phosphate	0/0	0/0	14/0,54	0/0	0/0
MAXXI - THERM s.r.o.	Determination of quality parameters of	0/0	0/0	0/0	0/0	10/0,38

	biomass extrusions					
Město Krnov	Implementation of immission monitoring by sensors in the city of Krnov	0/0	0/0	0/0	0/0	366/14,44
Mevra EcoWaste s.r.o.	Consultancy services for chemical recycling of waste plastics according to partial orders	0/0	0/0	0/0	0/0	68/2,68
Nejdecká česárna vlny, a.s.	Anaestheses on supplied samples	0/0	0/0	0/0	0/0	12/0,45
Noroo Bee Chemical Czech	Determination of volatile organic compounds	0/0	0/0	4/0,16	0/0	0/0
Noroo Bee Chemical Czech	Solvent composition analysis by gas chromatography	0/0	0/0	0/0	4/0,16	0/0
Organic technology s.r.o.	Testing of biogas and methane production by in-situ mesophilic anaerobic digestion	0/0	0/0	0/0	92/3,63	0/0
Organic technology s.r.o.	Determination of residual biogas production	0/0	0/0	0/0	0/0	9/0,36
Organic technology s.r.o.	Analysis of raw materials for BPS Energy Centre Horní Suchá	0/0	0/0	0/0	0/0	50/1,97
Organic technology s.r.o.	Analyses of digestate from BPS Energy Centre Horní Suchá	0/0	0/0	0/0	0/0	17/0,65
ORGREZ, a.s.	Determination of sulphites in delivered samples	0/0	0/0	2/0,09	0/0	0/0
Ostravská LTS, a.s.	Analysis of pyrolysis gas	0/0	1/0,04	0/0	0/0	0/0
PERSEFONA, s.r.o.	Mineralogical and chemical composition of niobium-tantalum ore samples	0/0	0/0	5/0,2	0/0	0/0
PFI Eco Waste s.r.o.	Sample analyses	0/0	0/0	0/0	17/0,67	7/0,28
PFI Eco Waste s.r.o.	Sample analyses	0/0	0/0	0/0	0/0	3/0,1
PLASTOIL Europe, a.s.	Preparation of the opposing opinion on the project	0/0	0/0	0/0	0/0	5/0,2
Plzeňská teplárenská, a.s.	ZEVO catalyst analysis - determination of activity	0/0	0/0	0/0	86/3,4	0/0
Plzeňská teplárenská,	Verification of the	0/0	0/0	0/0	0/0	88/3,45

a.s.	activity of the catalyst from the selective NOx reduction reactor, determination of the chemical composition of the catalyst					
PRECHEZA a.s.	Analysis of the causes of sediments in the neutralization tank	0/0	0/0	0/0	0/0	200/7,89
PRECHEZA a.s.	Work based on partial orders (Nox measurement, photocatalytic H generation, photocatalytic CO2 reduction, advanced characterization)	0/0	0/0	0/0	0/0	90/3,55
PROJEKT MORAVSKÁ, s.r.o.	Determination of specific biogas and methane production of substrates corn mix, sorghum silage and wafers	29/1,16	0/0	0/0	0/0	0/0
PROJEKT MORAVSKÁ, s.r.o.	Determination of residual energy of digestate	0/0	0/0	0/0	0/0	10/0,39
Průmyslová keramika, spol. s.r.o.	Density measurement of samples	0/0	13/0,51	0/0	0/0	
RANIDO, s.r.o.	Reduction of 10 g of material in oxodic form	0/0	45/1,78	0/0	0/0	3/0,12
RANIDO, s.r.o.	Carrying out laboratory tests of catalytic decomposition of NH3 on the provided catalyst samples and their characterization	0/0	0/0	0/0	0/0	481/18,97
Recovera Využití zdrojů a.s.	BAT report	0/0	0/0	0/0	49/1,93	0/0
Recycling - kovové odpady a.s.	Laboratory analyses as per order 2023/005	0/0	0/0	0/0	0/0	19/0,74
REMEI POLSKA SPÓŁKA Z OGR (Poland)	Photocatalytic tests	0/0	0/0	0/0	24/0,96	0/0
GS Geotechnika a.s.	Determination of ion concentrations from aqueous solution	3/0,14	0/0	0/0	0/0	0/0
GS Geotechnika a.s.	Determination of	8/0,3	0/0	0/0	0/0	0/0

	chloride, sodium sulphate and potassium ion concentrations					
SINEKO Engineering s.r.o.	Testing and optimisation of domestic wastewater treatment plants	43/1,68	0/0	0/0	0/0	0/0
SITAP, s.r.o.	Determination of calorific value of delivered pellets	0/0	0/0	2/0,07	0/0	0/0
SMS CZ, s.r.o.	Substrate analysis - elemental analysis, pycnometric analysis, semi-quantitative ED-XRF analysis	0/0	0/0	0/0	0/0	3/0,12
SMS CZ, s.r.o.	Substrate analysis - elemental analysis, pycnometric analysis, semi-quantitative ED-XRF analysis	0/0	0/0	0/0	0/0	50/1,97
SMS CZ, s.r.o.	Sample analyses (elemental analysis, pycnometric density determination, ED-SRF analysis)	0/0	0/0	0/0	0/0	3/0,12
SMS CZ, s.r.o.	Monthly test of semi-continuous anaerobic digestion of one substrate in a 60l reactor	0/0	0/0	0/0	0/0	50/1,97
Smurfit Kappa Czech s.r.o.	Qualitative determination of sludge phase and chemical composition	0/0	0/0	0/0	5/0,18	0/0
SQZ, s.r.o.	Chemical composition of leachates from concrete samples	0/0	8/0,3	0/0	0/0	0/0
Statutární město Přerov	Operation and regular monthly maintenance of dust fallout measurement stations and processing and expression of results	0/0	0/0	0/0	65/2,56	74/2,93
StavRe-Envi s.r.o.	Determination of specific biogas and methane production of the OP-EB1 substrate	13/0,5	0/0	0/0	0/0	0/0
SUEZ CZ a.s.	BAT report	0/0	45/1,76	0/0	0/0	0/0

Technické služby města Olomouc	Measurement of calorific value of fuels from 6 municipal waste samples	0/0	0/0	0/0	34/1,33	0/0
Technické služby města Přerov	Determination of calorific value of 4 mixed municipal waste samples	0/0	0/0	0/0	0/0	11/0,44
Technické služby ochrany ovzduší Ostrava	Analytical analyses	0/0	7/0,27	0/0	0/0	0/0
Technické služby ochrany ovzduší Ostrava	Analytical analyses	0/0	10/0,39	0/0	0/0	0/0
Technické služby ochrany ovzduší Ostrava	Analytical analyses	0/0	0/0	9/0,34	0/0	0/0
Technické služby ochrany ovzduší Ostrava	Technical cooperation on the action "Measurement of mercury balance and solving the problem of ammonia slippage in ZEVA Chotíkov"	0/0	0/0	190/7,51	0/0	0/0
Technické služby ochrany ovzduší Ostrava s.r.o.	Analytical analyses	0/0	0/0	0/0	6/0,22	
Technické služby ochrany ovzduší Ostrava s.r.o.	Hg balance analysis	0/0	0/0	0/0	0/0	93/3,67
Technické služby ochrany ovzduší Ostrava s.r.o.	Development of a methodology to assess the deactivation of catalysts for selective catalytic reduction of NOx (SCR NOx)	0/0	0/0	0/0	0/0	490/19,33
Technické služby ochrany ovzduší Ostrava s.r.o.	Analyses according to partial orders	0/0	0/0	0/0	0/0	3/0,11
Teplárna Otrokovice a.s.	Preparation of the energy balance of the K4 boiler heat exchanger	50/1,97	0/0	0/0	0/0	0/0
Teplárna Otrokovice a.s.	Recalculation of the enthalpy balance of the K3 flue gas heat exchanger	0/0	12/0,47	0/0	0/0	0/0
Teva Czech Industries s.r.o.	Analytical analyses	0/0	53/2,07	275/10,86	0/0	0/0
Teva Czech Industries s.r.o.	Analytical analyses	0/0	0/0	0/0	287/11,31	0/0
Teva Czech Industries	Analytical analyses	0/0	0/0	0/0	0/0	69/2,71

s.r.o.						
TRAFIN OIL, a.s.	Test of biogas and methane production by in-situ mesophilic anaerobic digestion of 4 substrate samples	0/0	0/0	0/0	0/0	17/0,67
UNIKASSET, spol. s r.o.	Laboratory verification of ammonia desorption technology from aqueous solution for later design of a wet steam waste energy recovery unit	0/0	0/0	0/0	0/0	495/19,53
Ústav geoniky AV ČR, v.v.i.	Determination of pH, chloride and sulphate content on the sample supplied	0/0	0/0	0/0	3/0,13	0/0
UTP Czech s.r.o.	Determination of volatile organic compounds	0/0	0/0	3/0,15	0/0	0/0
UTP Czech s.r.o.	Chromatographic analysis and determination of the composition of the sample mixture	0/0	0/0	2/0,08	0/0	0/0
UTP Czech s.r.o.	Determination of impurities in IPA solvents by GC-MS	0/0	0/0	2/0,08	0/0	0/0
UTP Czech s.r.o.	Determination of volatile organic compounds (VOCs) in mixed solvents by GF-MS	0/0	0/0	0/0	8/0,3	0/0
Vítkovská zemědělská s.r.o.	Test: effect of Fat Cracker on anaerobic biogas production at BPS Klokočov	0/0	15/0,59	0/0	0/0	0/0
Vítkovská zemědělská s.r.o.	Determination of anaerobic biogas and methane production of wastewater from the Olšany Paper Mill	0/0	0/0	21/0,83	0/0	0/0
Vodní zdroje Chrudim, spol. s r.o.	Degradation of methyl tert-butyl ether by photocatalytic processes	0/0	0/0	350/13,81	0/0	0/0
WASTen, z.s.	Value chain of miscanthus fiber utilization from sustainable production in	0/0	0/0	1857/73,25	964/38,03	0/0

	marginal and post-mining locations					
Z + M servis, spol. s r.o.	Analysis of Electrical Conductivity in Printing Ink Samples	1/0,02	0/0	0/0	0/0	0/0
14 15 Bařův institut	Energy assessment	0/0	80/3,16	0/0	0/0	0/0
3E AUTOMOTIVE a.s.	Energy assessment	55/2,17	0/0	0/0	0/0	0/0
4EVER, s.r.o.	Analysis of the PV installation assessment	0/0	0/0	0/0	58/2,29	0/0
A C E R - C.S., spol. s r. o.	Energy assessment	0/0	0/0	125/4,93	0/0	0/0
A S P E C, spol. s r.o.	Energy assessment	112/4,43	0/0	0/0	0/0	0/0
ADOR CZ s.r.o.	Project documentation for the PV system	0/0	235/9,27	0/0	0/0	0/0
Advance Energo a.s.	Emission measurement	0/0	0/0	0/0	60/2,37	110/4,33
Aeras, s.r.o.	Measurement of flue gases including accompanying variables on flue pipes K1 and K3, Execution and evaluation of flue gas quantity measurement	0/0	476/18,76	596/23,5	92/3,61	169/6,65
AEROXON s.r.o.	Energy assessment	0/0	0/0	125/4,93	0/0	0/0
AGROSERVIS Hlučín, s.r.o.	Energy assessment	0/0	105/4,14	0/0	0/0	0/0
AGROSTROJ Pelhřimov, a.s.	Energy assessment	0/0	173/6,82	0/0	0/0	0/0
AHP 3T s.r.o.	Energy assessment	105/4,14	0/0	0/0	0/0	0/0
Aircraft Industries, a.s.	Energy audit	490/19,33	0/0	0/0	0/0	0/0
Alignum CZ s.r.o.	Grant consultancy	0/0	0/0	0/0	24/0,95	106/4,17
ALMEVA EAST EUROPE s.r.o.	Conducting experimental research	0/0	300/11,83	0/0	31/1,23	518/20,43
AlphaLighting CZ s.r.o.	Project documentation for the DPS	190/7,5	0/0	0/0	0/0	0/0
ALS Czech Republic, s.r.o.	Determination of PTCH of dust samples	0/0	0/0	0/0	0/0	8,3/0,33
ALW INDUSTRY, s.r.o.	Processing of an energy assessment	0/0	0/0	95/3,75	0/0	0/0
Amper Savings, a.s.	Processing of project documentation, Assessment of the possibility of installing KGJ	0/0	0/0	110/4,34	3291/129,8	360/14,19

AmpluServis, a.s.	Strength calculation of drainage material, modification of project documentation	0/0	0/0	0/0	29/1,14	0/0
Aoyama Automotive Fastene	Technical-economic study	160/6,31	160/6,31	0/0	0/0	0/0
AQUA SERVIS, a.s.	Feasibility study, project documentation	0/0	0/0	0/0	256/10,1	0/0
Arch.Design, s.r.o.	Project documentation for the PV system	0/0	49,9/1,97	0/0	0/0	0/0
Armádní Servisní, p.o.	Technical-economic studies, Processing of project documentation STP, DUR, DSP, DPS, engineering activities	390/15,38	7777/306,8	398/15,7	3365/132,8	3454/136,26
ARPEX MORAVA s.r.o.	Calculation of short-circuit currents in LDS	0/0	180,6/7,12	0/0	0/0	0/0
Asental Land, s.r.o.	Grant consultancy	0/0	0/0	0/0	315/12,43	0/0
Asociace autorizovaných laboratoří pro měření emisí - ALME	Determination of the concentration of particulate matter and determination of the concentration of water vapour in the gas, Provision of measurements for the ALME PZZ	329/12,96	294/11,58	376/14,82	440/17,37	510/20,1
ATAS elektromotory Náchod	Energy assessment	0/0	0/0	0/0	0/0	180/7,1
Ateliér POD VĚŽÍ s.r.o.	Project documentation for connection of pool technology	0/0	55/2,17	0/0	0/0	0/0
ATEX WOLFF I WSPÓLNICY SP.J. (Poland)	Carrying out tests to determine the explosion characteristics of dust dispersions	403/15,88	349/0	0/0	0/0	0/0
B:TECH, a.s.	Project documentation - power output	0/0	0/0	75/2,97	81/3,2	0/0
BENEKOVterm, s.r.o.	Inspection activities in the form of measurements, tests and product assessment	0/0	0/0	0/0	0/0	322/12,7
BEST - Bioenergy 2020+ (Austria)	Effective analysis and assessment of real-	0/0	21/0,84	208/8,2	0/0	0/0

	world conditions on emission factors and efficiency of biomass burning plants					
BIO FLAME, s.r.o. (Slovakia)	Power measurement, burner input	50/1,97	0/0	0/0	0/0	0/0
BIOENERGO - KOMPLEX, s.r.	Technical-economic study	120/4,73	0/0	0/0	0/0	0/0
BLAŽEK PROJEKT s.r.o.	Project documentation for the PV system	0/0	0/0	125/4,93	0/0	0/0
BMB, spol. s r.o.	Energy assessment, Processing of project documentation	335/13,21	0/0	0/0	0/0	0/0
BMS SERVIS, s.r.o.	Processing of project documentation for the PV system	0/0	86/3,39	0/0	0/0	0/0
BONATRANS GROUP a.s.	Energy assessment	0/0	0/0	0/0	159/6,27	99/3,9
BorsodChem MCHZ, s.r.o.	Combustion tests of alternative fuel with subsequent analysis of samples	0/0	0/0	150/5,92	0/0	0/0
BOSCH DIESEL s.r.o.	OP EIC 2 consultancy service, Processing of technical-economic study, Processing of project documentation, provision of engineering, coordination and consulting activities	2226/87,81	8466/334	5661/223,3	4889/192,87	475/18,75
Bosch Powertrain s.r.o.	Technical and economic studies, Processing of project documentation, provision of engineering, coordination and consulting activities	0/0	0/0	0/0	0/0	12061/475,79
Bosch Rexroth, s.r.o.	Technical and economic studies, Processing of project documentation, provision of engineering, coordination and consulting activities	148/5,84	17/0,68	0/0	0/0	0/0
Bosch Termotechnika s.r.o.	Technical and economic studies, Processing of project documentation, provision of	0/0	331/13,04	1035/40,82	470/18,53	0/0

	engineering, coordination and consulting activities					
BRABENEC spol. s r.o.	Inspection activity in the form of assessment and verification of the stability of product properties - solid fuel stove insert.	0/0	70/2,76	0/0	0/0	0/0
BREBECK Composite s.r.o.	Grant consultancy, processing of project documentation	0/0	0/0	0/0	25/0,99	237/9,35
BRIZANT Trade s.r.o.	Sample analysis	74/2,91	32/1,26	44/1,73	11/0,42	0/0
BTH Slavičín, spol. s r.o.	Project documentation for the PV system	0/0	0/0	0/0	198/7,81	0/0
BURNING TECHNOLOGY a.s.	Assessment and verification of the stability of product characteristics	615/24,26	225/8,88	145/5,71	255/10,06	0/0
C.E.I.S. CZ s.r.o.	Screening of selected buildings to identify the potential for implementing energy savings using the EPC method	0/0	210/8,28	400/15,78	200/7,89	0/0
CDS - VIROPLASTIC CZ s.r.o.	Energy assessment	95/3,75	0/0	0/0	0/0	0/0
CELPAP Machinery s.r.o.	Project documentation for DSP	0/0	457/18,01	0/0	0/0	0/0
Cement Hranice, a.s.	Processing of Technical-Economic Study, Energy Assessment, Emission Report, and Project Study	0/0	295/11,64	0/0	464/18,3	2159/85,17
CEMENTO DESIGN s.r.o.	Project documentation	0/0	59/2,33	0/0	66/2,6	0/0
C-Energy Planá s.r.o.	Continuous measurement of Hg concentration in flue gases from grate boilers with fluidised bed elements	201/7,91	0/0	0/0	0/0	0/0
Centrin CZ s.r.o.	Energy assessment	0/0	0/0	0/0	0/0	223/8,8
Centrum sociálních služeb Hrabyně	Project documentation	0/0	0/0	190/7,48	35/1,38	0/0
CIDEM Hranice, a.s.	Sample analysis	0/0	0/0	0/0	8/0,3	31/1,22
ČÍSAŘ, ČEŠKA, SMUTNÝ s.r.o.	Expert opinion	0/0	0/0	0/0	0/0	5600/220,91

Clairon Ltd. Clean Air Te	Continuous measurement	0/0	0/0	151/5,94	0/0	0/0
COLORprofi, spol. s r.o.	Project Documentation for PV Systems, Structural Assessment of Roof Load Capacity	0/0	0/0	0/0	56/2,21	1159/45,72
COUP OSTRAVA s.r.o.	PTCH determination of dust samples - organic dyes and pigments	260/10,24	267/10,54	258/10,16	309/12,2	366/14,42
CZESCO s.r.o.	Methodology for comparing theoretical and real values of heat consumption in the residential sector	0/0	0/0	0/0	0/0	419/16,53
Česká pošta, s.p.	Energy audit	0/0	0/0	138/5,44	0/0	0/0
Česká spořitelna, a.s.	Energy saving measures advisory service	0/0	0/0	0/0	200/7,89	124/4,89
České dráhy, a.s.	Energy saving measures advisory service	0/0	0/0	1088/42,9	0/0	363/14,3
České vysoké učení technické	Technological measurement of Hg concentration and other gaseous components using FTIR analyzer in flue gas from Golem fluidized bed boiler, Fuel sample analysis	26/1,04	5/0,18	475/18,74	470/18,52	110/4,34
Českomoravský cement, a.s.	Opinion on the technical proposal for an alternative investment	0/0	0/0	130/5,13	0/0	0/0
Český hydrometeorologický ústav	Methane measurements to correct TOC emission factors	165/6,52	0/0	0/0	0/0	0/0
ČEZ Distribuce, a. s.	Project documentation	228/9	0/0	96/3,78	0/0	0/0
ČEZ Energetické produkty	Research on the reduction of Hg concentration in flue gases of various types of brown coal mined in the Czech Republic carrying out one-off measurements of PCDD/F, TK and	0/0	0/0	0/0	0/0	2251/88,81

	accompanying. Flue gas components, during TAP combustion					
ČEZ Energetické služby	Project documentation, author's supervision	4662/183,9	2308/91,04	2543/100,3	1567/61,8	1026/40,47
ČEZ Energo, s.r.o.	Technical-economic study, Elaboration of project documentation for KGJ	0/0	650/25,64	0/0	32/1,26	0/0
ČEZ ESCO, a.s.	Energy audit, PD, performance of engineering activities, Technical-economic study	4182/165	3121/123	359/14,16	584/23,04	0/0
ČEZ Korporátní služby	Project documentation for the PV system	400/15,78	0/0	0/0	0/0	0/0
ČEZ Solární, s.r.o.	Project documentation, provision of engineering activities	75/2,96	215/8,48	0/0	0/0	0/0
ČEZ Teplárenská, a.s.	Update of the dispersion study	115/4,54	92/3,63	0/0	0/0	0/0
ČEZ, a.s.	Expert assessment of the accuracy of reported Hg concentration measurements, Project work and analysis	1172/46,22	2226/87,8	844/33,29	1093/43,12	828/32,66
DEHAS s.r.o.	DSP project documentation	240/9,47	0/0	0/0	0/0	0/0
Dejkron invest s.r.o.	Sample analysis	0/0	0/0	0/0	11/0,42	0/0
DEZA, a.s.	Technical-economic study	0/0	0/0	0/0	2780/109,7	1380/54,44
DIAMO, státní podnik	Sample analysis, Implementation of experimental and research activities	0/0	329/12,98	639/25,2	0/0	0/0
DISTEP a.s.	Project documentation, Processing of technical and economic study	0/0	0/0	364/14,37	158/6,23	0/0
Domažlická nemocnice, a.s.	EPC suitability analysis	0/0	0/0	0/0	850/33,53	0/0
Dopravní podnik hl. m. Prahy	Preparing an energy-saving project	1705/67,24	0/0	365/14,4	180/7,1	0/0
Dopravní podnik	Project	0/0	0/0	273/10,77	1253/49,43	75/2,96

Ostrava a.s.	documentation					
DPU REVIT s.r.o.	Project documentation for the PV system	0/0	0/0	97/3,83	0/0	355/14
DRUMEL a Co. s.r.o.	Energy assessment	0/0	0/0	0/0	0/0	130/5,13
DT EnergieTech, spol. s r. o.	Preparation of the boiler guarantee measurement project	0/0	0/0	0/0	0/0	971/38,3
E&H services, a.s.	Energy assessment	65/2,56	0/0	0/0	0/0	0/0
EA-Partneři s.r.o.	Project documentation for the PV system	0/0	0/0	0/0	168/6,63	0/0
ECOCOAL, s.r.o.	Sample analysis	0/0	0/0	0/0	5/0,18	0/0
EHB s.r.o.	Energy assessment	0/0	0/0	0/0	180/7,1	0/0
Eko Bi s.r.o.	Public procurement administration	0/0	0/0	145/5,72	0/0	0/0
EKOL Energo s.r.o.	Analysis - Determination of physicochemical characteristics of the fuel	0/0	0/0	0/0	120/4,71	0/0
Elektrárna Chvaletice a.s.	Hg measurements before and after DeSox	0/0	0/0	0/0	0/0	121/4,79
Elektrárny Opatovice, a.s.	Authorised measurements	607/23,94	599/23,62	330/13,01	478/18,86	1086/42,83
ELEKTRO - MESSERSCHMIDT	Project documentation for the PV system	0/0	0/0	0/0	0/0	438/17,27
Elektroprim - Koutník, a.s.	Project documentation including implementation status	0/0	0/0	154/6,06	0/0	0/0
Eligo a.s.	Analysis for the Possibility of Installing PV (Photovoltaic) Systems	0/0	0/0	0/0	65/2,56	0/0
Elprocon 21, s.r.o.	KGJ project study	0/0	0/0	130/5,13	0/0	0/0
EM Polar k.s.	Processing of an energy assessment	0/0	0/0	95/3,75	0/0	0/0
enact s.r.o.	Study on the Energy Recovery of Wastewater Treatment Sludge	0/0	0/0	0/0	0/0	416/16,41
ENE20 a.s.	Technical-economic study	0/0	0/0	0/0	474/18,7	0/0
Energetický regulační úřad	Opposing opinion.	0/0	0/0	90/3,53	0/0	0/0
ENERGETIKA TŘINEC,	Opinion on the	0/0	0/0	150/5,92	0/0	90/3,55

a.s.	technical proposal for an alternative investment					
Energo Příbram, s.r.o.	Emission measurement	0/0	0/0	160/6,29	95/3,75	0/0
EnergoFuture, a.s.	Measurement of NH ₃ concentration in flue gas from boiler K4	0/0	129/5,1	0/0	0/0	0/0
Energotrans, a.s.	Conducting tests to reduce Hg emissions at Energotrans, technical assistance in research on Hg distribution in wet flue gas desulphurisation	0/0	0/0	0/0	142/5,58	3248/128,15
ENERGY Ústí nad Labem, a.s.	Verification of continuous emission measurements for DeSOx, in the range of QAL2, single measurement of Hg.	83/3,27	134/5,29	0/0	0/0	0/0
ENERGYia, s.r.o.	Project documentation	0/0	0/0	0/0	1992/78,58	0/0
Energylink s.r.o.	Project documentation	0/0	0/0	0/0	0/0	137/5,4
ENESA a.s.	Author's supervision, Preparation of documents for preliminary report, Preparation of project documentation	100/3,94	225/8,88	1575/62,13	0/0	0/0
ENEX GROUP s.r.o.	Technical-economic analysis of the financial assessment of the return on investment	0/0	0/0	0/0	660/26,04	0/0
enteria a.s.	Assessment of the possibility of installing a PV system	0/0	0/0	0/0	256/10,1	0/0
EP Rožnov, a.s.	Project documentation, Processing of feasibility study	176/6,94	0/0	0/0	540/21,3	0/0
Erdrich Umformtechnik s.r.o.	Energy audit	0/0	0/0	150/5,92	0/0	0/0
Erich Hrubý	Energy assessment	0/0	0/0	0/0	64/2,52	0/0
Ernst & Young, s.r.o.	Opinion on the technical proposal for an alternative investment	0/0	0/0	120/4,73	0/0	0/0
ESCO Slovensko, a.s.,	Assessing the	0/0	0/0	110/4,33	0/0	0/0

(Slovakia)	potential for immediate savings					
EUFC CZ s.r.o.	Opinion on the technical proposal for an alternative investment	0/0	0/0	450/17,75	100/3,94	1130/44,58
EUFC ENERGY s.r.o.	Opinion on the technical proposal for an alternative investment	0/0	0/0	0/0	0/0	280/11,05
Europasta SE	Energy analysis	0/0	0/0	0/0	0/0	160/6,31
European Clean Air Centre Foundation (Poland)	Measurement of emission factors of selected pollutants	0/0	0/0	0/0	0/0	481/18,98
EVECO Brno, s.r.o.	Provision of operational emissions data	0/0	75/2,96	0/0	0/0	0/0
Fakultní nemocnice Královské Vinohrady	Consulting and technical service related to the submission and processing of subsidy titles for subsidies, Processing of project documentation for DPS	1035/40,83	0/0	1490/58,78	0/0	0/0
Fakultní nemocnice Ostrava	Design documentation, Processing of energy audit, author's supervision	690/27,22	0/0	1680/66,25	12617/498	145/5,72
Fakultní Thomayerova nemocnice	Energy Assessment, Project Management of Projects	0/0	0/0	0/0	95/3,75	530/20,89
Fatra, a.s.	Project documentation	340/13,41	0/0	26/1,02	0/0	0/0
FEBREX a.s.	Monitoring services for equipment used to generate electricity from renewable sources	148/5,83	156/6,14	151/5,95	74/2,92	0/0
Fischer TPD s.r.o.	Energy assessment	150/5,92	0/0	0/0	0/0	0/0
Bjarke Ove Andersen, FLSmidth A/S (Denmark)	Additional measurements to verify the functionality of the Coromax system	0/0	0/0	0/0	402/15,85	0/0
FMIB, s.r.o.	Energy assessment	0/0	70/2,76	0/0	0/0	0/0
FORLIT, s.r.o.	Energy analysis	0/0	69/2,72	0/0	0/0	0/0
Fortemix produkce s.r.o.	Project Documentation for	0/0	0/0	0/0	0/0	20/0,79

	PV Systems, Grant Consulting					
Františkolázeňská výtopna	Guarantee measurements	0/0	0/0	0/0	0/0	200/7,88
FREE COMPANY, s.r.o.	Sample analysis	0/0	0/0	9/0,36	0/0	10/0,41
FRYGESTA, a.s.	Grant consultancy	0/0	0/0	0/0	24/0,95	16/0,62
Fundacja Europejskie Centrum Czystego Powietrza (Poland)	Measurement of emission factors of selected pollutants	0/0	0/0	0/0	0/0	481/18,98
FVE ČELADNÁ, s.r.o.	Operation of the EnergoGuard monitoring system	218/8,59	218/8,59	218/8,59	218/8,59	218/8,59
GASCONTROL, společnost s r.o.	Measurement of flue gases behind gas turbines	0/0	0/0	0/0	0/0	53/2,07
GD Druckguss s.r.o.	Energy assessment	170/6,71	0/0	50/1,97	0/0	0/0
GENTEC CHP s.r.o.	Project documentation	185/7,3	0/0	0/0	0/0	0/0
Glazura s.r.o.	Energy performance certificates for buildings	0/0	0/0	0/0	0/0	76/3
GO Steel a.s.	Emission measurement	0/0	0/0	0/0	17/0,67	63/2,49
GRANITOL akciová společnost	Processing of energy audit	0/0	0/0	0/0	285/11,24	0/0
Greiner Assistec s.r.o.	Sample analysis	0/0	0/0	0/0	0/0	5/0,21
Grupa Wolff spółka jawna, ORkD (Poland)	Carrying out tests to determine the explosion characteristics of dust dispersions	0/0	342/13,48	1190/46,94	473/18,66	849/33,47
Hanácká potravinářská spol. s r. o.	Energy assessment	80/3,16	0/0	0/0	45/1,78	0/0
Hanácká zemědělská společnost Jevíčko, a.s.	Technical-economic study	0/0	0/0	0/0	0/0	399/15,74
HANAKOV, spol. s r.o.	Project documentation	0/0	0/0	0/0	0/0	130/5,13
Hanon Systems Autopal s.r.o.	Technical-economic study, Assessment of energy saving possibilities	0/0	0/0	0/0	530/20,91	0/0
Hansen Electric, spol. s r.o.	Processing of an energy assessment	0/0	112/4,42	0/0	39/1,54	0/0
Havířovská teplárenská sp	Analysis - Concept of heat energy supply of the city of Havířov	0/0	0/0	99/3,89	35/1,38	90/3,55
Hettich ČR k.s.	Energy assessment	0/0	0/0	0/0	0/0	80/3,16
HH Trade Corporate	Sample analysis	0/0	0/0	0/0	5/0,18	0/0

s.r.o.						
Hilding Anders Česká republika	Assessment of the possibility of installing a PV system	0/0	0/0	0/0	48/1,89	0/0
HLAVNÍ MĚSTO PRAHA	Preparation of analysis-conducting the selection of suitable buildings for obtaining subsidies	0/0	0/0	1207/47,63	0/0	0/0
HOLPLAST, s.r.o.	Energy assessment	0/0	157/6,19	0/0	0/0	0/0
Horské lázně Karlova Studánka	Energy audit, Processing of project documentation, Provision of operation of EnergoGuard monitoring system	0/0	0/0	0/0	1033/40,75	96/3,79
Hotel ČHS s.r.o.	EPC suitability analysis	0/0	25/0,99	0/0	0/0	0/0
Houdek MZ s.r.o.	Grant consultancy	0/0	144/5,67	30/1,18	20/0,79	0/0
HOXTER, a.s.	Conducting combustion tests of fireplace inserts	0/0	0/0	0/0	600/23,67	0/0
HRONOVSKÝ s.r.o.	Energy assessment	0/0	0/0	0/0	0/0	89/3,51
Hroší stavby Morava a.s.	Project documentation	0/0	0/0	0/0	0/0	70/2,76
HS Flamingo	Professional inspection activities, Performing non-accredited informative tests of a series of fireplace inserts	505/19,92	0/0	0/0	0/0	0/0
HT- design, s.r.o., (Slovakia)	Sample analysis	0/0	0/0	0/0	49/1,94	0/0
Hyundai Motor Manufacturing	Analysis, Processing of the opposing opinion on cost-saving measures	0/0	0/0	0/0	65/2,56	113/4,46
IBG Česko s.r.o.	Guarantee measurement KGJ	0/0	0/0	0/0	75/2,96	0/0
Idemia Czech s.r.o.	Analysis for energy saving options	0/0	0/0	0/0	0/0	152/6
IHAS s.r.o.	Determination of PTCH of dust samples	504/19,89	252/9,92	270/10,63	300/11,82	505/19,92
IKEA Industry Slovakia s.,B to B	Analysis of fuel samples	0/0	28/1,11	0/0	0/0	0/0
IMPRA spol. s r.o.	Processing of an energy assessment	0/0	145/5,72	0/0	0/0	0/0
Ing. Radim Oříšek	Technical supervision of the project	0/0	0/0	403/15,9	0/0	0/0

	investor - TDI E-Mobility Porsche ČR					
Ingka Centres Česká republika s.r.o.	Providing operation of the EnergoGuard monitoring system	43/1,68	102/4,02	117/4,62	0/0	68/2,68
Ingka Centres Slovensko (Slovakia)	Providing operation of the EnergoGuard monitoring system	225/8,88	0/0	100/3,94	120/4,73	120/4,73
innogy Energo, s.r.o.	Project documentation for the DPS	143/5,64	0/0	0/0	0/0	0/0
INSULO s.r.o.	Energy assessment	0/0	0/0	0/0	0/0	156/6,15
INTERCUT, spol. s r.o.	Energy assessment	0/0	0/0	0/0	0/0	130/5,13
Intermont, Opatrný, s.r.o.	Project documentation for the reconstruction of the existing boiler room	0/0	110/4,33	22/0,87	0/0	0/0
INVEKTA s.r.o.	Energy assessment	0/0	0/0	110/4,34	0/0	0/0
INVELT SERVIS, s.r.o.	Guarantee measurements	0/0	0/0	55/2,17	0/0	0/0
IPM - Lösungen aus Stahl	Activities in the product performance assessment process	0/0	0/0	85/3,35	0/0	0/0
IREL, spol. s r.o.	Project documentation	0/0	0/0	0/0	98/3,87	0/0
Jablonecká energetická a.	Project documentation	0/0	0/0	0/0	0/0	291/11,48
Kaňka + Partners s.r.o.	Project documentation for charging stations	0/0	125/4,93	0/0	0/0	158/6,23
KERA GREEN s.r.o.	Energy assessment	0/0	34/1,34	0/0	0/0	0/0
Keramika CZ s.r.o.	Energy assessment	0/0	0/0	0/0	0/0	135/5,33
KGJ Flexibilita s.r.o.	Guarantee measurements	0/0	0/0	0/0	0/0	59/2,34
KH TEBIS s.r.o.	Energy assessment	0/0	152/6	0/0	0/0	0/0
KLATOVSKÁ TEPLÁRNA a.s.	Energy assessment, Processing of emission assessment	0/0	0/0	286/11,28	0/0	0/0
KLEIN automotive s.r.o.	Eenergy assessment	125/4,93	0/0	0/0	0/0	0/0
KOFING, a.s.	Verification of continuous measurement of PZL emissions in the QAL2 range including functional tests, warranty measurement	0/0	0/0	0/0	0/0	430/16,96
KOGENERACE s.r.o.	Project documentation	0/0	0/0	39/1,54	19/0,75	0/0

KOMÍNY CZ	Non-accredited tests in a calorimetric chamber, Accredited thermal overload resistance tests	0/0	160/6,31	0/0	25/0,99	0/0
KONEKO marketing, s.r.o.	Methane measurements to correct TOC emission factors	50/1,97	70/2,76	0/0	35/1,38	0/0
KOREKT EXPORT s.r.o.	Providing operation of the EnergoGuard monitoring system	344/13,59	340/13,43	340/13,43	340/13,43	340/13,43
KORUND BENÁTKY, s.r.o.	Continuous measurement of Hg emissions during sorbent testing	0/0	50/1,97	0/0	0/0	0/0
KOVOLIS HEDVIKOV a.s.	Energy assessment	0/0	0/0	0/0	0/0	88/3,47
KPMG Česká republika, s.r.o.	Documents for insourcing of production, distribution, administration of technological units of heat management	0/0	0/0	0/0	4248/167,57	0/0
Krajská zdravotní, a.s.	EPC project suitability analysis	0/0	0/0	0/0	0/0	948/37,4
Královéhradecký kraj	Technical-economic study	0/0	0/0	0/0	739/29,15	170/6,71
KRPA PAPER, a.s.	Technical-economic study, Assessment of energy saving possibilities	0/0	0/0	0/0	242/9,55	0/0
KS Kolbenschmidt Czech Republic, a.s.	Energy analysis	0/0	61/2,41	0/0	0/0	0/0
KSR Industrial, s.r.o.	Energy Assessment, Processing of Project Documentation	882/34,77	0/0	0/0	0/0	0/0
KUKO s.r.o.	Energy assessment	0/0	0/0	0/0	0/0	69/2,72
KVS EKODIVIZE a.s.	Author's supervision	23/0,89	0/0	0/0	0/0	0/0
Lázně Velké Losiny, s.r.o.	Feasibility study	0/0	0/0	0/0	155/6,11	0/0
LEDER-PELLICCE, s.r.o.	Energy Assessment, Processing of Project Documentation	0/0	0/0	0/0	0/0	529/20,87
Lenzing Biocel Paskov a.s.	Authorized and accredited emission measurements, technological operational measurements of energy quantities	556/21,93	435/17,16	620/24,46	465/18,33	1039/40,97

Lesy České republiky, s.p.	Project documentation for the PV system	0/0	0/0	0/0	330/13,02	0/0
Liberecký kraj	Analysis for the Potential of Energy Savings	0/0	0/0	0/0	295/11,64	862/34
Liberty Ostrava a.s.	Evaluation of immissions	50/1,97	0/0	0/0	0/0	0/0
LIFT SERVIS WORK s.r.o.	Risk analysis	0/0	0/0	42/1,66	0/0	0/0
Lovochemie, a.s.	Authorised emission measurement	777/30,65	254/10,02	311/12,27	556/21,92	359/14,16
LOYD GROUP s.r.o.	Services related to the preparation of a public procurement procedure for the selection of an energy service provider	0/0	0/0	2277/89,8	766/30,2	667/26,33
Lubomír Unar	Energy assessment	0/0	86/3,39	0/0	0/0	0/0
M - SILNICE a.s.	Project documentation for the PV system	0/0	0/0	0/0	0/0	202/7,97
MAGNETON a.s.	Energy assessment	135/5,33	0/0	0/0	25/0,99	0/0
Marek Boruta	Processing of an energy assessment	0/0	0/0	188/7,42	0/0	0/0
M-BIO s.r.o.	Eenergy assessment	0/0	0/0	105/4,14	0/0	0/0
MCAE Systems, s.r.o.	Assessment of the possibility of installing PV power plants, analysis of energy-saving measures	0/0	0/0	0/0	786/31,01	0/0
MEDUNA vakuová kalírna	Grant consultancy	0/0	194/7,64	8/0,32	0/0	0/0
MENHIR Praha, s.r.o.	Sample analysis	0/0	0/0	0/0	0/0	6/0,24
Město Bechyně	Assessment of the heat source and CZT system	0/0	0/0	0/0	145/5,72	0/0
MĚSTO BROUMOV	Administration of a public contract	0/0	0/0	0/0	0/0	35,5/1,4
Město Česká Kamenice	Processing of the project documentation, Processing of the project study for the action Energy measures	0/0	0/0	547/21,56	48/1,91	0/0
Město Dačice	Processing of Local Energy Concept	0/0	0/0	0/0	388/15,31	0/0
Město Horní Slavkov	Technical-economic	0/0	170/6,71	0/0	0/0	0/0

	study					
Město Jeseník	Feasibility study of the PV plant, feasibility study of the CZT boiler room modernization	0/0	0/0	0/0	582/22,96	175/6,9
Město Nejdek	Energy study	0/0	350/13,81	0/0	0/0	0/0
Město Nový Jičín	Project documentation	428/16,89	0/0	0/0	0/0	0/0
město Otrokovice	Analysis for the Potential of Energy Savings	0/0	0/0	0/0	0/0	1370/54,04
Město Valašské Meziříčí	Study on municipal waste management	0/0	0/0	0/0	270/10,65	0/0
Město Vamberk	Technical-economic study	0/0	0/0	0/0	0/0	225/8,88
Město Vítkov	Project documentation, grant consultancy	0/0	0/0	0/0	0/0	150/5,92
Město Vrchlabí	Administration of a public contract	0/0	0/0	83/3,25	83/3,25	0/0
Město Znojmo	Energy assessment, Processing of building-technology study	0/0	0/0	0/0	0/0	50/1,97
Město Žatec	EPC method rank analysis	0/0	0/0	0/0	0/0	550/21,7
Městská nemocnice Ostrava	Project documentation for DPS-Mar and EnMa for control of thermal management and selected HVAC and refrigeration sources	0/0	477/18,82	0/0	0/0	0/0
Městská nemocnice v Odrác	Project documentation-Reconstruction of distributor, collector and control nodes	0/0	68/2,66	0/0	0/0	0/0
Městský dopravní podnik Opava	Processing of the technical-economic study	0/0	107/4,22	0/0	0/0	0/0
Městys Litultovice	Project documentation, grant consultancy, grant administration	0/0	0/0	0/0	0/0	189/7,46
Metalšrot Tlumačov a.s.	Processing of an energy assessment	0/0	111/4,38	0/0	0/0	0/0
Mikroelektronika spol. s r. o.	Processing of an energy assessment	0/0	75/2,96	0/0	0/0	0/0
Ministerstvo kultury	Processing of Energy Assessment, Grant	0/0	0/0	252/9,94	0/0	0/0

	Consulting					
Mlékárna Kunín a.s.	Technical-economic study	0/0	0/0	115/4,54	0/0	0/0
Model Obaly a.s.	Providing operation of the EnergoGuard monitoring system	19/0,75	138/5,44	379/14,95	175/6,89	320/12,61
Moravskoslezské cukrovar	Energy assessment	0/0	68/2,68	0/0	0/0	0/0
MORAVSKOSLEZSKÉ DRÁTOVNY	Energy Assessment, Grant Consulting	0/0	0/0	0/0	0/0	313/12,36
Moravskoslezský kraj	Educative show SMOKEMAN	195/7,69	0/0	0/0	0/0	0/0
MS - stavby s.r.o.	Processing of an energy assessment	0/0	168/6,63	0/0	0/0	0/0
MS UTILITIES & SERVICES a.s.	Processing of a study to assess the possibility of reducing heat losses	291/11,46	72/2,84	120/4,73	0/0	0/0
MSV Metal Studénka, a.s.	Energy audit	276/10,89	0/0	0/0	0/0	62/2,45
Národní energetický klastr	Operating characteristics of waste heat to electricity technology	0/0	400/15,78	0/0	0/0	458/18,07
Národní rozvojová banka	Provision of consultancy-technical consultancy, analysis of the use of EPC	0/0	0/0	0/0	2030/80,07	1093/43,1
Nehlsen Třinec, s.r.o.	Analysis of fuel samples	10/0,41	0/0	0/0	0/0	0/0
Nemocnice AGEL Jeseník a.s.	Energy assessment	0/0	0/0	0/0	0/0	131/5,17
Nemocnice s poliklinikou	Technical-economic study	0/0	79/3,12	199/7,83	0/0	0/0
NEPRO stavební a.s.	Energy assessment, processing of DPS documentation	0/0	120/4,73	425/16,77	0/0	230/9,07
NORSOL s.r.o.	Technical-economic study	0/0	0/0	0/0	130/5,13	0/0
NORTHMAN OUTDOOR s.r.o.	Energy assessment	0/0	128/5,05	98/3,87	0/0	0/0
NOSTA-HERTZ spol. s r.o.	Energy assessment, Preparation of project study and project documentation	40/1,58	120/4,73	0/0	0/0	0/0
Obec Drnovice	Energy Savings Analysis, Administration of Energy Savings	0/0	0/0	385/15,19	472/18,62	67/2,64
Obec Dvorce	Project	0/0	0/0	0/0	0/0	125/4,93

	documentation, grant consultancy					
Obec Háj ve Slezsku	Grant consultancy	0/0	0/0	0/0	0/0	125/4,93
Obec Hlavnice	Project documentation, grant consultancy	0/0	0/0	0/0	0/0	102/4,02
Obec Jakartovice	Project documentation, grant consultancy	0/0	0/0	0/0	0/0	94/3,71
Obec Náklo	Building technology study and energy assessment, grant consultancy	0/0	0/0	0/0	0/0	172/6,79
Obec Vrchoslavice	Project documentation	79/3,12	0/0	0/0	0/0	0/0
Obecní úřad ČAVISOV	Project documentation	0/0	0/0	0/0	0/0	30/1,18
Oblastní nemocnice Kolín	Energy assessment	120/4,73	0/0	0/0	0/0	0/0
Oderská městská společnost, s.r.o.	Project documentation	285/11,24	0/0	0/0	0/0	0/0
OKK Koksovny, a.s.	Energy Assessment, Consulting Services for Grant Applications	62/2,45	254/10,02	0/0	0/0	0/0
Okresní soud Děčín	Processing of expert opinion	0/0	0/0	0/0	6/0,25	0/0
Olomoucký kraj	Waste Management Plan update	0/0	0/0	0/0	0/0	255/10,06
OMB composites EU a.s.	Project documentation, processing of static calculation of roof load capacity, subsidy consulting	0/0	0/0	0/0	144/5,68	1230/48,52
ON SEMICONDUCTOR Czech Republic, s.r.o.	Feasibility study, Processing of project documentation for the DPS	0/0	98/3,87	126/4,97	0/0	0/0
OP papírna, s.r.o.	Project documentation, processing of feasibility study of the possibility of installing PV systems	0/0	0/0	0/0	226/8,92	420/16,57
OPOP spol. s r. o.	Sample analysis	8/0,3	282/11,13	0/0	0/0	0/0
ORGREZ, a.s.	Continuous measurement of Hg concentration, Technical assistance in the preparation of the accreditation of	630/24,85	65/2,54	1101/43,43	2900/114,41	1209/47,7

	the KME Hg method					
ORLEN UniCRE a.s.	Cooperation on project preparation - investments in RES in transport, Conceptual study of the pilot Fischer-Tropsch unit	0/0	0/0	0/0	129/5,09	0/0
ORLEN Unipetrol RPA s.r.o.	Feasibility study	0/0	0/0	0/0	0/0	749/29,56
ORLOVAN, bytové družstvo	Project documentation	0/0	0/0	0/0	0/0	259/10,22
Ostravské vodárny a kanalizace	Project documentation	0/0	0/0	118/4,65	802/31,64	0/0
OSTROJ a.s.	Energy assessment, Processing of energy audit	95/3,73	252/9,94	85/3,35	175/6,9	97/3,83
OTIS a.s.	Technical-economic study	0/0	0/0	0/0	90/3,55	0/0
Oto Szakos	Project study	0/0	0/0	0/0	50/1,97	0/0
OZM Research	Testing and evaluation of hybrid mixtures on the CA 20L explosion autoclave	0/0	84/3,31	0/0	0/0	0/0
P3 Ostrava s.r.o.	consulting services, processing of the energy concept	0/0	0/0	0/0	194/7,67	0/0
P4 Plaza s.r.o.	Energy assessment	0/0	0/0	0/0	0/0	85/3,35
Palivový kombinát Ústí	Technical-economic study	0/0	320/12,62	0/0	0/0	0/0
PAPOS Trade s.r.o.	Energy Assessment, Emission Report, Project Study	0/0	0/0	400/15,78	619/24,44	0/0
Pardubický kraj	Processing of the technical-economic study	0/0	0/0	0/0	198/7,81	0/0
PDI a.s.	Sample analysis	0/0	0/0	0/0	0/0	5/0,18
Pekárny a cukrárny Klatovy, a.s.	Organisation of the tender for the supply of the photovoltaic system and project monitoring	27/1,07	0/0	0/0	0/0	0/0
pewag nemovitosti s.r.o.	Energy assessment of the PV system	0/0	90/3,55	0/0	0/0	0/0
PHT a.s.	Analysis of the possibility of installing PV power plants	0/0	0/0	0/0	58/2,29	0/0
Pila MSK, a.s.	Technical supervision	0/0	0/0	889/35,06	143/5,64	0/0
Plzeňská teplárenská,	KME measurement of	0/0	0/0	270/10,64	61/2,41	190/7,5

a.s.	Hg emissions, guarantee measurement					
Plzeňský Prazdroj, a.s.	Project study, opposing opinion, Processing of the energy and emission assessment	0/0	0/0	69/2,7	165/6,51	655/25,84
Pobtex s.r.o.	Energy assessment	0/0	172/6,79	0/0	0/0	0/0
POHL cz, a.s.	Energy assessment	0/0	95/3,75	0/0	0/0	0/0
POLARBEAR ENERGY s.r.o.	Providing operation of the EnergoGuard monitoring system	0/0	0/0	28/1,1	35/1,38	0/0
Policejní akademie České	Project documentation	1180/46,55	0/0	0/0	0/0	0/0
POLICIE ČESKÉ REPUBLIKY	Analysis of fuels	25/0,97	0/0	0/0	0/0	0/0
PONAST spol.s.r.o.	Processing of project documentation	0/0	0/0	0/0	165/6,51	0/0
Porsche Immobilien CZ spol. s r. o.	Grant consultancy, processing of project documentation, Energy assessment	1247/49,19	363/14,32	252/9,94	387/15,25	3782/149,2
Porsche Immobilien Slovak, B to B (Slovakia)	Project documentation	0/0	0/0	0/0	0/0	240/9,48
PPS Kania s.r.o.	Energy performance certificates for buildings	0/0	0/0	60/2,37	0/0	0/0
PREFA PECINA s.r.o.	Grant consultancy	0/0	0/0	0/0	50/1,97	0/0
PRECHEZA a.s.	Project documentation	0/0	0/0	0/0	0/0	703/27,73
PRESBETON Nova, s.r.o.	Energy assessment	133/5,25	0/0	0/0	0/0	0/0
PROFITAPE s.r.o.	Application for connection of a PV system to the distribution system	0/0	0/0	0/0	20/0,79	0/0
První brněnská strojírna	Verification measurement	0/0	0/0	0/0	0/0	214/8,45
První inženýrská, s.r.o.	Technical supervision of construction	0/0	0/0	62/2,43	283/11,17	108/4,26
QWERT Rubber, spol. s r.o.	Energy assessment	0/0	0/0	0/0	0/0	85/3,35
RABBIT Chotýšany a.s.	Project documentation	0/0	0/0	0/0	0/0	95/3,75
Ravensburger Karton s.r.o.	Study and project documentation for the PV system	0/0	0/0	0/0	59/2,33	0/0
REFLEX CZ, s.r.o.	Technical cooperation and consultancy	12/0,49	0/0	7,55/0,3	96/3,79	0/0

REGUTEC a.s.	Processing of an energy assessment	0/0	125/4,93	0/0	0/0	0/0
Rehabilitační ústav Kladruby	Processing of the technical-economic study	245/9,66	0/0	0/0	0/0	0/0
REKUPER SYCHROV, s.r.o.	Project Documentation for PV Systems, Grant Consulting	0/0	0/0	0/0	15/0,59	181/7,14
Remarkplast s.r.o.	Sample analysis	0/0	0/0	0/0	0/0	5/0,21
REVLAN s.r.o.	Energy assessment	0/0	0/0	0/0	180/7,1	0/0
RIGHT POWER, a.s.,	Project documentation	408/16,09	21/0,83	0/0	0/0	0/0
RMT s.r.o.	Measurements in the QAL2 range on the HCL, HF and VOC analyser	0/0	0/0	0/0	54/2,13	0/0
Robert Bosch odbytová s.r.o.	Technical-economic study	0/0	0/0	0/0	134/5,28	0/0
ROMOTOP	Analysis of fuel samples	0/0	530/20,93	0/0	0/0	0/0
Roosendaal Videnska s.r.o.	Processing of Analysis for the Evaluation of Energy Saving Measures	0/0	0/0	0/0	95/3,75	0/0
RTW Trans s.r.o.	Energy assessment	0/0	86/3,39	0/0	0/0	0/0
Sage Automotive Interiors	Technical-economic study, Processing of energy audit	0/0	0/0	0/0	540/21,3	0/0
SAKO Brno, a.s.	Performing and evaluating continuous HgT emission measurements	0/0	0/0	0/0	0/0	161/6,37
SAND TEAM, spol. s r.o.	Emission measurement	0/0	0/0	0/0	0/0	133/5,26
SBB Energy Spółka Akcyjna, (Poland)	Economic-technical-legal analysis of the construction of hydrogen production facilities	0/0	0/0	0/0	525/20,69	0/0
Sdružené zdravotnické zařízení Krnov, p.o.	technical-economic study	100/3,94	0/0	0/0	0/0	0/0
SEADON s.r.o.	Energy Assessment, Grant Consulting	0/0	0/0	0/0	0/0	155/6,11
SERVIS-CENTRUM CZ s.r.o.	Energy assessment	0/0	0/0	0/0	0/0	167/6,59
SES BOHEMIA ENGINEERING	Project documentation	54/2,13	0/0	0/0	0/0	0/0
Sev.en EC, a.s.	Measurement of the	347/13,69	0/0	0/0	0/0	0/0

	concentration of TZL in the flue gas					
Sev.en Engineering s.r.o.	Guarantee measurements	256/10,1	0/0	0/0	0/0	9672/381,52
SEWACO s.r.o.	Opinion on the technical proposal for an alternative investment	0/0	0/0	0/0	0/0	300/11,83
SICK spol. s r.o.	QAL2 measurement on boiler K4 in Opatovice Power Plant	0/0	0/0	0/0	0/0	160/6,31
SILVEKO, s.r.o.	Energy assessment	0/0	0/0	95/3,75	0/0	0/0
SITEZ s.r.o.	Processing of project documentation for the DPS	0/0	312/12,31	790/31,16	121/4,77	0/0
Skypartners, s.r.o.	Project documentation for the PV system	0/0	0/0	0/0	1587/62,6	165/6,51
SLADOVNY SOUFFLET ČR, a.s.	Organization of public procurement, preparation of PD of PV installation, subsidy consulting, preparation of energy assessment	0/0	291/11,49	161/6,35	285/11,24	173/6,82
Slovácká Fruta, a.s.	Project documentation for the DPS	789/31,12	0/0	0/0	0/0	0/0
Slovenské elektrárne, a.s (Slovakia)	Continuous HCl measurement, Chlorine measurement FK5 EVO	0/0	0/0	291/11,48	0/0	0/0
Slovenské energetické strojárne a.s. (Slovakia)	Guarantee measurements	0/0	0/0	115/4,53	0/0	0/0
Služby města Pardubic a.s.	Energy assessment, study of the construction and technological solution of the PV system	0/0	0/0	0/0	0/0	269/10,61
SNOWMANSPORT s.r.o.	Services related to the preparation of a public procurement procedure for the selection of an energy service provider	0/0	0/0	34/1,34	102/4,02	34/1,34
Sokolovská uhelná, právní zástupce, a.s.	Measurement of Hg concentration in flue	318,6/12,6	372/14,67	150/5,92	546/21,54	0/0

	gases from pulverized fuel boilers, Conducting of a test of sorbent efficiency to reduce Hg concentration in flue gases from lignite combustion, test of sorbent efficiency, experiments with wet flue gas desulfurization					
Solar CELI s.r.o.	Project documentation	9/0,36	0/0	0/0	0/0	0/0
SOLAR PÁLAVA s.r.o.	EnergoGuard monitoring system	150/5,92	150/5,92	150/5,92	150/5,92	150/5,92
Solární servis, s.r.o.	Processing of project documentation for the PV system	0/0	69/2,72	0/0	186/7,32	0/0
Special Service Internati	Consultancy services	0/0	450/17,75	490/19,33	135/5,32	0/0
Společenstvo kominiků ČR	Research to determine the water dew point temperature of flue gas from coal and biomass combustion in an automatic boiler and comparison of chimneys	202/7,97	0/0	0/0	0/0	0/0
Správa státních hmotných rezerv	Project documentation	0/0	0/0	849/33,49	0/0	0/0
Správa železnic	Processing of project documentation for the PV system	0/0	93,4/3,68	0/0	0/0	0/0
STAREZ - SPORT, a.s.	Technical-economic study	100/3,94	0/0	0/0	0/0	0/0
Státní léčebné lázně Janské lázně	Provision of energy services using the EPC method	600/23,67	0/0	0/0	600/23,67	0/0
Statutární město Brno	Preparation of building passports for the Brno City Centre	0/0	222/8,76	0/0	0/0	0/0
Statutární město Frýdek-Místek	Feasibility study of the PV system	0/0	0/0	0/0	370/14,6	0/0
Statutární město Opava	Technical-economic study, Processing of energy assessment, Processing of project documentation	0/0	0/0	75/2,96	430/16,96	652/25,72
Statutární město Ostrava	Project documentation,	0/0	2336/92,15	0/0	330/13,02	683/26,92

	author's supervision					
Statutární město Pardubic	Analysis of energy savings	0/0	0/0	0/0	484/19,1	0/0
Stavební spořitelna České spořitelny a.s.	Document processing in ELENA	0/0	0/0	0/0	0/0	124/4,89
STEINBAUER LECHNER s.r.o.	Energy assessment	0/0	0/0	13/0,49	0/0	0/0
Stowarzyszenie Krakowski, (Poland)	Preparation of a report on actual pollutant emissions from local heaters	0/0	0/0	0/0	0/0	776/30,6
Strojírenský zkušební ústav, s.p.	Sample analysis	0/0	92/3,64	114/4,51	108/4,26	208/8,2
Strojírny a stavby Třinec, a.s.	Energy Assessment, Processing of Energy Analysis	0/0	0/0	0/0	157/6,19	0/0
Strojírny Podzimek, s.r.o.	Grant consultancy	0/0	0/0	0/0	24/0,95	40/1,56
STRONG ENCO s.r.o.	Project documentation for the PV system	0/0	0/0	275/10,85	0/0	558/22,01
Studio A s.r.o.	Energy audit	0/0	0/0	120/4,73	0/0	0/0
SUAS Clean Energy s.r.o.	Documentation for the submission of a subsidy application	0/0	0/0	0/0	1600/63,12	0/0
SUNJAS s.r.o.	Energy services using the EPC method	300/11,83	0/0	0/0	0/0	0/0
ŚWIĘTOKRZYSKIE KOPALNIE S, B to B (Poland)	Preparation of a Research and Development Report on the feasibility of using green hydrogen fuel oil	0/0	0/0	0/0	103/4,06	0/0
SYNERGION ALFA CZ s.r.o.	Project documentation	108/4,24	0/0	0/0	0/0	0/0
Synthesia, a.s.	Verification of AMS N2O in nitric acid production including functional tests of the analyser	0/0	0/0	57/2,24	49/1,93	0/0
ŠKODA PARS a.s.	Energy assessment	0/0	0/0	0/0	250/9,86	0/0
ŠKO-ENERGO, s.r.o.	Continuous measurement of mercury in flue gas on fluidized bed boilers	303/11,95	529/20,85	0/0	0/0	0/0
Štumpovka a Dvoračky s.r.o.	Energy assessment	0/0	185/7,3	0/0	0/0	175/6,9
Tank Wash s.r.o., Služby	Processing of an energy assessment	0/0	0/0	0/0	0/0	248/9,78
TARGO PROMOTION	Energy Assessment,	0/0	0/0	0/0	152/6	444/17,5

PRAHA spo,	Grant Consultancy					
TEDOM a.s.	Project documentation for a photovoltaic rooftop power plant	0/0	65/2,56	0/0	0/0	0/0
TECHNIA, a.s.	Analysis for the Possibility of Installing PV (Photovoltaic) Systems	0/0	0/0	51/2,01	0/0	0/0
Technická univerzita v Liberci	Measuring exhaust gas extraction temperatures on the engine test bench	0/0	26/1,03	0/0	0/0	0/0
Technoprojekt, a.s.	Project documentation for the PV system	0/0	0/0	0/0	95/3,75	75/2,96
TENZA, a.s.	Guarantee measurements	82/3,25	153/6,04	0/0	0/0	0/0
Teplárna Otrokovice a.s.	Technological measurement of Hg concentration in flue gas from K3 and K4 powder boilers	0/0	145/5,72	0/0	0/0	0/0
Teplárny Brno a.s.	Opinion on the technical proposal for an alternative investment	0/0	0/0	150/5,92	0/0	0/0
TEPLO - CHLAD s.r.o.	Energy assessment	137/5,4	0/0	0/0	0/0	0/0
TEPLO VRBNO s.r.o.	Project documentation for the DPS	138/5,44	0/0	0/0	0/0	0/0
TEPO s.r.o.	Processing of heat price assessment from CZT	0/0	50/1,97	0/0	351/13,85	0/0
TERMONTA PRAHA a.s.	Technical-economic study	0/0	0/0	0/0	860/33,93	425/16,77
TESYCO GROUP, a.s.	Project documentation	0/0	0/0	0/0	0/0	290/11,43
TETA s.r.o.	Energy assessment	0/0	150/5,92	0/0	0/0	0/0
Thomayerova nemocnice	Services related to the preparation of a public procurement procedure for the selection of an energy service provider	30/1,18	100/3,93	1236/48,74	0/0	0/0
TISKÁRNA GRAFICO s.r.o.	Organisation of the selection procedure	0/0	57/2,25	0/0	0/0	0/0
TOMA RECYCLING a.s.	Analyses of PET material samples	0/0	9/0,35	0/0	0/0	0/0
TOMA, a.s.	Providing operation	143/5,65	143/5,65	143/5,65	143/5,65	152/6

	of the EnergoGuard monitoring system					
TRANSFORM a.s. Lázně Bohdaneč	Sample analysis	0/0	0/0	13/0,53	0/0	0/0
TRCZ s.r.o.	Energy assessment of the PV system	0/0	145/5,72	195/7,69	0/0	0/0
TŘINECKÉ ŽELEZÁRNY, a.s.	Energy assessment of the PV system	0/0	87/3,43	0/0	0/0	0/0
TÜV NORD Czech, s.r.o.	Sample analyses Determination of ash melting temperatures on supplied samples	193/7,6	8/0,33	0/0	0/0	0/0
UCED Energy s.r.o.	Analysis of Operating Parameters of the Energocenter DOV	0/0	78/3,08	0/0	130/5,13	0/0
UCED Hranice s.r.o.	Guarantee measurement of gas KGJs	0/0	0/0	0/0	89/3,51	0/0
UCHYTIL s.r.o.	Energy assessment	0/0	0/0	0/0	0/0	55/2,17
ÚJV Řež, a.s.	Continuous analysis of NH ₃ in fly ash and flue gas	220/8,68	220/8,68	0/0	0/0	0/0
Union Grid s.r.o.	Project documentation for DPS and DSP	0/0	0/0	0/0	548/21,6	0/0
UNIPETROL RPA, s.r.o.	Study - calculation of variable costs of steam prices	195/7,69	0/0	0/0	0/0	0/0
Unipromit s.r.o.	Sample analysis	0/0	0/0	0/0	0/0	5/0,21
United Energy, a.s.	Measurement of emissions, Measurement of temperatures in the upper part of the combustion chamber of the fluidized bed boiler	0/0	0/0	695/27,42	200/7,89	0/0
Univerzita Karlova	Technical-economic study	0/0	0/0	0/0	289/11,4	0/0
Úřad pro technickou normalizaci	Comparison of dust concentration results	149/5,87	0/0	0/0	0/0	0/0
Ústřední knihovna ČVUT	Technological measurement of Hg concentration	150/5,92	0/0	0/0	0/0	0/0
VALLATE energy s.r.o.	Processing of an energy assessment	135/5,33	0/0	0/0	0/0	0/0
Valmet Technologies Oy	Single measurement of PCDD/F	0/0	0/0	0/0	0/0	432/17
Vápenka Čertovy schody a.s.	Energy audit	0/0	632/25	0/0	0/0	0/0

Varroc Lighting Systems	Energy audit	0/0	0/0	1173/46,27	0/0	0/0
Veg Kitchen s.r.o.	Technical-economic study	0/0	0/0	0/0	0/0	150/5,92
Veolia Energie ČR, a.s.	Project documentation - Greening of TFM - Ventilation calculation, emission measurement	2985/118	5064/200	6433/254	6129/242	8452/333
Veolia Energie Kolín, a.s.	Emission measurement	148/5,84	476/18,8	237/9,36	314/12,37	526/20,75
Veolia Energie Praha, a.s.	Emission measurement, Guarantee measurement of newly installed gas boilers	131/5,17	675/26,62	348/13,74	363/14,34	346/13,65
Veolia Průmyslové služby ČR, a.s.	Emission measurement	183/7,21	402/15,84	826/32,59	598/23,58	560/22,11
VIAGNOSTICS s.r.o.	Processing of the analysis	0/0	0/0	575/22,68	0/0	0/0
Vrchní soud v Olomouci	Energy audit	0/0	0/0	0/0	0/0	220/8,68
VYNCKE NV (Belgium)	Biofuel analysis, sample analysis FTIR analyzer optimization	3369/132,9	1790/70,63	3104/122,46	2154/84,99	3098/122,21
VÝTAHY KVADRO, s.r.o.	Energy assessment	0/0	85/3,35	0/0	0/0	0/0
Výzkumný ústav bramborářský Havlíčkův Brod	Sample analysis	0/0	0/0	15/0,58	0/0	0/0
Výzkumný Ústav Železniční, a.s.	Grant consultancy	0/0	0/0	0/0	0/0	50/1,97
WHITEBEAM D.O.O. (Slovenia)	Technical Report - Equipment Testing	0/0	0/0	61/2,41	0/0	173/6,84
winks MJM, s.r.o.	Energy assessment	0/0	112/4,42	0/0	0/0	0/0
WTE PowerBolt s.r.o.	Energy assessment	0/0	0/0	0/0	0/0	65/2,56
Základní škola a Mateřská škola Ostrava-Zábřeh	PV system study	0/0	0/0	0/0	0/0	75/2,96
Zařízení služeb pro Ministerstvo vnitra	Processing of project documentation	823/32,48	0/0	2796/110,3	25/0,99	953/37,59
Zdravotní ústav se sídlem v Ostravě	Sample analysis	0/0	0/0	71,1/2,8	43,7/1,72	0/0
ZEVETA Bojkovice, a.s.	KGJ project documentation, assessment of PV installation	0/0	0/0	0/0	188/7,42	0/0
ZODPA s.r.o.	Sample analysis	0/0	0/0	0/0	5/0,21	17/0,66

Veolia Energie ČR	Assessment of conditions for Silesia coal combustion on selected sources	740/29	0/0	0/0	0/0	0/0
Agotec s.r.o.	Tests and specialized measurements of the design of hydraulic fittings	70/3	0/0	0/0	0/0	0/0
Technologická platforma	Technological foresight and industrial challenges in the field of energy in the Czech Republic (2nd version)	83/3	0/0	0/0	0/0	0/0
VVUÚ a.s.	Determination of granulometry of samples	5/0,2	4/0,16	3/0,12	0/0	0/0
Uchytíl s.r.o.	Warranty measurements on the K6 boiler at ECJH	169/7	0/0	0/0	0/0	0/0
Technické služby ochrany ovzduší Ostrava	Guarantee measurement of parameters of boiler K3 before reconstruction in Teplárna Otrokovice a.s.	250/10	0/0	0/0	0/0	0/0
Elektrárny Opatovice, a.s.	Determination of the dynamic bulk angle of a sample of energy gypsum, slag and moistened fly ash (Opatovice)	5/0,2	0/0	0/0	0/0	0/0
BOCHEMIE a.s.	Granulometric analysis of NiOH ₂	2/0,08	0/0	0/0	0/0	0/0
TENZA, a.s.	Verification measurements of temperatures and flue gas quantities on boiler K4	179/7	0/0	0/0	0/0	0/0
GENTEC CHP	Guarantee tests of KGJ (Náchod)	46/2	0/0	0/0	0/0	0/0
"2299" spol. s r.o.	Fuel analysis - analysis of wood chips	16/1	0/0	0/0	0/0	0/0
UCHYTIL s.r.o.	Repeated guarantee measurement of TZL on boiler K6 in ECJH (Hodonín)	19/1	0/0	0/0	0/0	0/0
ČEZ, a.s.	Measurement of granulometry, distribution and analysis of coal	219/9	0/0	0/0	0/0	0/0

	powder and raw fuel at two mills in Ledvice Power Plant					
Ing. Petr Šantavý	Comprehensive set of measurements and analyses for the recovery of waste energy-poor gas from the zinc production process	395/16	0/0	0/0	0/0	0/0
Veolia Energie Kolín	Measurement of emissions from gas boilers at the Pila Heating Plant - Vlašim	58/2	0/0	0/0	0/0	0/0
TAMERO INVEST	Measurement of the efficiency of boiler K 1 and preparation of a report	117/5	0/0	0/0	0/0	0/0
iO System s.r.o.	Comprehensive set of measurements and analyses for the recovery of waste energy-poor gas from the zinc production process	421/17	0/0	0/0	0/0	0/0
ČEZ, a.s.	Preparation of analysis of coal powder and raw fuel on the grinding circuit	228/9	0/0	0/0	0/0	0/0
Teplárna Otrokovice	Measurement of primary mixture velocity and flow K4	214/8	0/0	0/0	0/0	0/0
PROVYKO s.r.o.	Warranty and verification measurements and evaluation, boiler upgrades, warranty tests	578/23	352/14	0/0	0/0	0/0
TAMEH Czech	DeNOx K8 NH3 emission measurement	47/2	0/0	0/0	0/0	0/0
ORGREZ, a.s.	Measurement of the flue gas temperature field in the boiler combustion chamber at the Malešice incinerator	256/10	0/0	0/0	0/0	0/0
Teplárna Otrokovice	Measurement of primary mixture velocity and flow rate VM41-VM44 of boiler K4 for three power	54/2	0/0	0/0	0/0	0/0

	levels (Otrokovice heating plant)					
VEOLIA Průmyslové služby	Technical assistance - assessment of conditions for combustion of Silesia fuel on K1 and K3 boilers - Teplárna ČSM (Stonava)	139/5	0/0	0/0	0/0	0/0
G-Team	Preparation of GM project and supervision during guarantee measurement of gas boiler room of Temelín NPP	271/11	0/0	0/0	0/0	0/0
Veolia Energie	Technical assistance for the assessment of Silesia coal auto-ignition conditions	146/6	0/0	0/0	0/0	0/0
TENZA	Measurement of flue gas temperatures in the combustion chamber of boiler K4	27/1	0/0	0/0	0/0	0/0
Energotrans	Simulations of the design of flue gas flow and entrained VOCs with respect to the operation of the electro separator of the boiler K6 in EMĚ I - Energotrans, a.s.	297/12	0/0	0/0	0/0	0/0
GENTEC CHP	Implementation of the GZ of the CHP unit - Teplárna Innogy, Náchod	46/2	0/0	0/0	0/0	0/0
ABB s.r.o.	Ensuring the implementation of the technology of the fast charging station system with additional storage and photovoltaic system (PV system)	554/22	554/22	0/0	0/0	0/0
TENZA a.s.	Performing and evaluating flue gas temperature measurements in the combustion chamber of the K4 boiler for a steam output of 75t/h	10/0,4	0/0	0/0	0/0	0/0
TENZA a.s.	Informative measurement of flue	93/4	0/0	0/0	0/0	0/0

	gas parameters behind the catalyst in the flue gas duct of the K4 boiler (Tepl. Otrokovice)					
RESORBENT	Pelletization of coal dust sample	3/0,12	0/0	0/0	0/0	0/0
Envir&Power Ostrava	Verification measurement of parameters of the flue gas duct of the R201 cracking furnace at Spolana Neratovice	154/6	0/0	0/0	0/0	0/0
ČEZ Energetické služby	Elaboration of the project of guarantee measurement in the framework of the action "Construction of a new energy centre for Spolana s.r.o."	34/1	0/0	0/0	0/0	0/0
ČEZ a.s.	Measurement of flue gas temperatures at the inlet to the rotary air heater (ROV) of boiler K6 (Trmice)	48/2	0/0	0/0	0/0	0/0
TENZA a.s.	Optimisation of the operation of boiler K4, Informative measurement in the flue gas before catalyst K4 (Otrokovice)	301/12	0/0	0/0	0/0	0/0
Slovenské energetické strojárne a.s. (Slovakia)	Guarantee measurement of fluidized bed boiler - Synthesia Pardubice	521/21	0/0	0/0	0/0	0/0
SES Tlmače (Slovakia)	Measurement and calculation of efficiency of two cyclones of mill circuits MO121 and MO122, MOK12 at two operating conditions	97/4	0/0	0/0	0/0	0/0
SAKO Brno	Measurement of TZL concentration behind the boiler in the ZEVO operation of SAKO Brno, a.s.	63/2	0/0	0/0	0/0	0/0
U.S. Steel Košice (Slovakia)	Laboratory testing of agglomerate - reducibility and	353/14	0/0	0/0	0/0	0/0

	disintegration					
Ostravská LTS	Partnership cooperation in the field of science and research - Analytical work, semi-operational test on Pyromatic 200 including pyrolysis test report	399/16	0/0	0/0	0/0	0/0
AmpluServis	Guarantee measurements of DeSOx and DeNOx on the K5 boiler at the Olomouc Heating Plant	101/4	0/0	0/0	0/0	0/0
Elektrárna Dětmorovice	Verification of the possibility of incineration of sewage sludge, performance of emission measurements during the combustion test of dried sewage sludge at a selected production unit at Dětmorovice powerplant	191/8	0/0	0/0	0/0	0/0
Dopravní podnik Ostrava	Investment plan - Development of hydrogen mobility in Ostrava, 1st stage	384/15	0/0	0/0	0/0	0/0
ČEZ Energetické produkty	Determination of mechanical and physical properties of fly ash	56/2	0/0	0/0	0/0	0/0
ENERGOSPOL	Analysis of two samples of ash - analysis of combustible material and PTCH analysis	140/6	0/0	0/0	0/0	0/0
TENZA a.s.	Measurement of homogeneity of NH3 and NOx concentration in two channels of boiler K4 in Tepl. Otrokovice	149/6	0/0	0/0	0/0	0/0
Technická univerzita v Košicích	Determination of reducibility of agglomerates	39/2	0/0	0/0	0/0	0/0
G-Team	Measurement of emissions during the	135/5	0/0	0/0	0/0	0/0

	guarantee measurement of the gas boiler room at Temelín NPP					
Veolia Energie ČR	Determination of the Rx curve for two limestone samples	2/0,08	0/0	0/0	0/0	0/0
BOSS montáže	Verification of the removal of undesirable substances from wash water during experimental operation of a cogeneration unit with stripping and carbon filtration technologies	328/13	0/0	0/0	0/0	0/0
WOTAN Forest	Preparation of an assessment on the basis of the tender documentation	310/12	0/0	0/0	0/0	0/0
TAMEH Czech s.r.o.	Determination of NH ₃ content in fly ash	13/1	0/0	0/0	0/0	0/0
ČEZ	Measurement and evaluation of flue gas and GHG parameters including balance verification	414/16	0/0	0/0	0/0	0/0
VUT v Brně	Laboratory services, analyses, analyses	62/2	188/7	31/1	31/1	0/0
Veolia Energie Kolín	Technical cooperation and supervision during modifications of the K8 boiler (optimization of combustion)	53/2	0/0	0/0	0/0	0/0
DAJZR	Services aimed at improving the technical and performance characteristics of the design of the annealing furnace under development	399/16	0/0	0/0	0/0	0/0
ECM ECO MONITORING	Creation of a process to retrieve actual data from measurement points in the form of an XML data structure. Technology to ensure the lowest possible	400/16	0/0	0/0	0/0	0/0

	latency in data transmission					
ORGREZ	Performing flue gas temperature field measurements at 4 boiler height levels at 4 boiler power levels in ELE	732/29	0/0	0/0	0/0	0/0
MEGAWASTE-Ekoterm	Determination of T2s in waste incineration plant	60/2	0/0	0/0	0/0	0/0
G-Team	Measurement of lining temperature during drying on HAD1-5 boilers	35/1	0/0	0/0	0/0	0/0
ČEZ Energetické produkty	Measurement of mechanical properties of fly ash	112/4	0/0	0/0	0/0	0/0
AmpluServis	Performing guarantee tests of denitrification of boiler K5 at Teplárna Olomouc	158/6	0/0	0/0	0/0	0/0
Tamero Invest	Measurement of the efficiency of gas boiler K1 - deNOx K1	98/4	0/0	0/0	0/0	0/0
ABB Power Grids	Monitoring system - Hall probe	6/0,24	0/0	0/0	0/0	0/0
United Energy	Technical assistance and accredited measurements within the combustion test of sewage sludge at Komořany Heating Plant	438/17	0/0	0/0	0/0	0/0
Vysoké učení technické v Brně	Qualitative analysis of gaseous and liquid combustion samples	39/2	0/0	0/0	0/0	0/0
ČEZ Energetické služby	Guarantee tests of gas boilers K1 and K2	376/15	0/0	0/0	0/0	0/0
ČEZ, a.s.	Performing and evaluating measurements on the boiler smoke fan in Prunéřov II	179/7	0/0	0/0	0/0	0/0
SES Tímače (Slovenko)	Carrying out temperature measurements including measurement report - Počerady	243/10	0/0	0/0	0/0	0/0
GENTEC CHP	Execution of GM of	65/3	0/0	0/0	0/0	0/0

	cogeneration unit					
Uchytíl	Guarantee measurements on boiler K7 (7,5 MW) in Třebíč	169/7	0/0	0/0	0/0	0/0
RPS Ostrava	Measurement of yield stress and viscosity of biological waste	10/0,39	0/0	0/0	0/0	0/0
Technické služby ochrany ovzduší Ostrava s.r.o.	Guarantee measurement of parameters of boiler K4 after implementation of primary and secondary measures - Otrokovice	0/0	480/19	0/0	0/0	0/0
G - Team a.s.	GM project and supervision of the guarantee measurement of the gas boiler room of Temelín NPP	0/0	271/11	0/0	0/0	0/0
DPO a.s.	Preparation of the investment plan for the construction "Investment plan-Development of hydrogen mobility in Ostrava", 1st stage	0/0	384/15	0/0	0/0	0/0
G - Team a.s.	Measurement of emissions during the guarantee measurement of the gas boiler room at Temelín NPP, Measurement of the temperature of the lining during drying on boilers HAD1-5.	0/0	170/6	0/0	0/0	0/0
Orgrez	Measurement of flue gas temperature field in 4 boiler height levels at 4 boiler power levels in ELE	0/0	395/16	0/0	0/0	0/0
ČEZ, a.s.	A series of tests to evaluate the thickness of the electroplating layer by conventional and innovative technological procedures	0/0	179/7	0/0	0/0	0/0
SES Tlmače	Performing	0/0	243/10	0/0	0/0	0/0

	temperature measurements including measurement report - ELE. Počerady					
VAPES CE	Guarantee tests of two biomass boilers in Bytíz Prison	0/0	159/6	0/0	0/0	0/0
Zlatý beránek	Development of a new prototype fly reel	0/0	397/16	0/0	0/0	0/0
Energotrans	Measurement of the velocity field at the inlet to the electro separator in EGT	0/0	74/3	0/0	0/0	0/0
Martia	Measurement of the evaporator at the PPC EPOC	0/0	36/1	0/0	0/0	0/0
Orgrez	Measurement of the flue gas temperature field in the boiler combustion chamber at the Malešice incinerator, Measurement of the NH3 and NOX concentration in the flue gas of boiler K14 located on the premises of spol. Synthesia	0/0	369/14	0/0	0/0	0/0
Liberty Ostrava	Reducibility analysis of agglomerate	0/0	47/2	0/0	0/0	0/0
Plzeňský prazdroj	Preparation of a technical assessment of the condition of boiler K3	0/0	25/1	0/0	0/0	0/0
Metrostav a.s.	Reduction of Nox and SO2 in the Trmice heating plant	0/0	147/6	0/0	0/0	0/0
Tenza	Measurement of flue gas parameters - informative network measurement of the flue gas parameters before the catalyst in the flue gas duct of the K3 boiler	0/0	159/6	0/0	0/0	0/0
VAPES CE	Additional guarantee measurement of the 1500kW biomass boiler on two power levels in Bytíz Prison	0/0	58/2	0/0	0/0	0/0
TAMEH Czech s.r.o.	Guarantee tests of	0/0	72/3	0/0	0/0	0/0

	boiler K10 - guarantee of NH3 in TAMEH					
C-Energy	Guarantee measurement of two gas engines including HRSG boilers	0/0	200/8	0/0	0/0	0/0
Hyundai Motor Manufacturing	Measurement of the amount of heat from the cement kiln exhaust	0/0	27/1	0/0	0/0	0/0
Veolia Energie ČR, a.s.	Measurement of emissions and residence time on boiler K5 in Teplárna Olomouc - combustion test of dried sludge from WWTP	0/0	60/2	0/0	0/0	0/0
Innogy Energo, s.r.o.	Guarantee measurements - performance and evaluation of measurements at KGJ Ostrava, Plynární Street	0/0	56/2	0/0	0/0	0/0
Plzeňský prazdroj	Preparation of an assessment of possible options for the replacement of boiler K3	0/0	35/1	0/0	0/0	0/0
TAMEH Czech s.r.o.	Combustion test of TAP INGEA - measurement of emissions	0/0	341/13	0/0	0/0	0/0
ČEZ, a.s.	Development of a numerical model of the primary coal mixture flow through the pulverized coal pipelines for the selected mill circuit No.1 and the combustion of brown coal powder at the burner mouth incl. NOx and CO formation - El. Prunéřov	0/0	708/28	0/0	0/0	0/0
Vítkovice Cylinders	Assessment of evaporation from technical plant 1 and 3	0/0	29/1	0/0	0/0	0/0
Orgrez	Measurement of NH3	0/0	42/2	0/0	0/0	0/0

	and NOX concentrations in the flue gases from boiler D1 located on the premises of Co. DEZA, a.s., ValMez					
DUP - družstvo	Cooperation on development projects of the metal production division of the client.	0/0	399/16	0/0	0/0	0/0
Innogy Energo, s.r.o.	Implementation and evaluation of GM KGJ in the Innogy Praha 8- Troja boiler house	0/0	55/2	0/0	0/0	0/0
Veolia Energie ČR, a.s.	Measurements, research and expert work on boilers at the customer's premises	0/0	42/2	0/0	0/0	0/0
Innogy Energetika Plhov	Execution and evaluation of GZ KGJ1 and KGJ2 at the Náchod Heating Plant	0/0	79/3	0/0	0/0	0/0
Frýdecká skládka, a.s.	Research and development work - testing of fuel suitability for pyrolysis	0/0	155/6	0/0	0/0	0/0
PWR Composite	Implementation of a set of specialised measurements of breakdown voltage, dielectric strength and creep current for specific material samples G10 and G11	0/0	345/16	0/0	0/0	0/0
ČEZ	Technical assistance - measurements, research and expert work on boilers at the customer's sites.	0/0	105/4	0/0	0/0	0/0
Energotrans, a.s.	Measurement of velocity profiles at the flue gas inlet to the electrostatic precipitator of boiler K4	0/0	97/4	0/0	0/0	0/0
Tenza a.s.	Cooperation in adjustment of boiler K3, Otrokovice Heating Plant	0/0	29/1	0/0	0/0	0/0
Energo Příbram	Emission measurement of K3	0/0	169/7	0/0	0/0	0/0

	CZT Energo Příbram					
Plzeňský Prazdroj	Preparation of the "Study of decarbonisation of the energy sector of the Nošovice Brewery", expert translation	0/0	91/3	0/0	0/0	0/0
Ekol spol. s.r.o.	Informative emission measurement of the K2 boiler in Energo Příbram	0/0	56/2	0/0	0/0	0/0
ČEZ a.s.	Determination of selected characteristics of coal powder from the mill circuits of boiler K6 in Elektrárna Ledvice	0/0	64/3	0/0	0/0	0/0
Ecocarb Julia	Expert opinion - possibility of coal sludge ignition	0/0	16/1	0/0	0/0	0/0
LB Cemix, s.r.o.	Assessment of the material flow from the steel lime and limestone storage silos at the LBC - Kotouč Štramberk production plant	0/0	71/3	0/0	0/0	0/0
Gentech	Execution and evaluation of GZ KGJ1 at the Náchod Heating Plant	0/0	43/2	0/0	0/0	0/0
Unipetrol RPA, s.r.o.	Performing "Guarantee measurements" of two boilers and related technologies	0/0	2714/107	0/0	0/0	0/0
Sako Brno	Guarantee measurements on the absorption pump ZEVO SAKO Brno	0/0	51/2	0/0	0/0	0/0
EFG Rapotín BPS SE	Preparation of the KGJ heat recovery assessment for the biofuel dryer	0/0	19/1	0/0	0/0	0/0
Schneider Electric CZ s.r.o.	Translation of Schneider Electric ADMS documentation	0/0	16/1	17/1	0/0	0/0
Precheza a.s.	Measurement of mechanical properties of pigment.	0/0	28/1	0/0	0/0	0/0

Invelt Servis, s.r.o.	Guarantee measurements Otrokovice heating plant - new boiler K	0/0	63/2	0/0	0/0	0/0
EFG Waste logictic, s.r.o.	Preparation of documents for fuel certification	0/0	24/1	0/0	0/0	0/0
Metrostav	Provision of technical assistance for the guarantee tests of the GT "A" and GT "B" DeHg units at the Mělník Power Plant	0/0	1098/43	0/0	0/0	0/0
Frontech	Services for development and testing purposes	0/0	1197/47	0/0	0/0	0/0
Veolia Energie ČR, a.s.	Determination of mechanical and physical properties of dried sewage sludge.	0/0	16/1	0/0	0/0	0/0
TAMEH Czech s.r.o.	Conducting combustion tests with alternative fuel SUBCOAL on boiler K14 at TAMEH heating plant	0/0	363/14	0/0	0/0	0/0
Vodní atrakce s.r.o.	Installation of a thermocouple on the HRSG G2 pressure system at the Počerady power plant	0/0	80/3	0/0	0/0	0/0
CPM	Pyrolysis testing	0/0	205/8	0/0	0/0	0/0
G-Consult spol. s r.o.	Laboratory work	0/0	18/1	0/0	0/0	0/0
Autoset Centrum CR plus s.r.o.	Creation of a configurator for electric vehicles	0/0	25/1	0/0	0/0	0/0
PEMA Energo, s.r.o.	Specialized measurement of the characteristics of two compressor elements	0/0	398/16	0/0	0/0	0/0
Orgrez a.s.	Full scale measurements as per the offer 2-5 November 2020	0/0	235/9	0/0	0/0	0/0
WISTA s.r.o.	R&D work on the development of a new generation of jetting equipment	0/0	170/7	0/0	0/0	0/0
EVECO Brno	Expert consultation in the field of experimental activities for the	0/0	40/2	0/0	0/0	0/0

	needs of the SPETEP project					
Smolo	Cooperation in the preparation of alternative fuels based on energy recovery waste	0/0	22/1	0/0	0/0	0/0
ČEZ a.s.	Development of a numerical model of the mill circuits of the Prunéřov 2 power plant	0/0	186/7	0/0	0/0	0/0
Kovovýroba Králíček	Specialised measurements and tests of the parameters of the misting nozzle	0/0	395/16	0/0	0/0	0/0
Energotrans a.s.	Performing and evaluating velocity and concentration field measurements in Mělník	0/0	96/4	0/0	0/0	0/0
Vyncke	Measurement of flow rates in individual pipes of the boiler grate cooling system	0/0	18/1	0/0	0/0	0/0
PBS, a.s.	Guarantee measurements for order 19K016 Uniper	0/0	100/4	0/0	0/0	0/0
Kozák	Series of tests to evaluate the thickness of the electroplating layer by conventional and innovative technological process	0/0	300/12	0/0	0/0	0/0
Autoset Centrum CR plus s.r.o.	Modifications to the configurator for electric vehicles	0/0	15/1	0/0	0/0	0/0
WISTA s.r.o.	Collaboration on the development of a new generation of blasting equipment	0/0	170/7	0/0	0/0	0/0
Schneider Electric CZ s.r.o.	Modification and optimization of the software used as a configurator for the selection of EVs. vehicle and charging station configurator	0/0	35/1	0/0	0/0	0/0
První brněnská strojírna, a.s.	Guarantee measurement - Komořany	0/0	3/0,12	0/0	0/0	0/0

Dasfos	Network analysis of ore sample for ISO 4696-1 test and weighing of the sample	0/0	44/2	0/0	0/0	0/0
ZODPA	Combustion tests	0/0	0/0	244/10	0/0	0/0
Kompresory PEMA, s.r.o.	Calibration of dew point sensor	0/0	0/0	5/0,2	0/0	0/0
Innogy	Guarantee measurement	0/0	0/0	67/3	0/0	0/0
Boh.Omelka, s.r.o.	Sampling and analysis of samples during gasification of composite fuel	0/0	0/0	495/20	0/0	0/0
B&Bartoni Machinery, spol. s r.o.	Reconnaissance activities and testing	0/0	0/0	410/16	0/0	0/0
REMOV	Physical and mechanical properties of wood chips	0/0	0/0	29/1	0/0	0/0
A+Generation	Implementation and evaluation of GM KGJ in Čáslav Hospital	0/0	0/0	45/2	0/0	0/0
InfraWaste, a.s.	Combustion test with waste material at the catalytic combustion unit in Seredi	0/0	0/0	243/10	0/0	0/0
Campus Energy spol. s r.o.	Draft PV plant with hydrogen technology	0/0	0/0	6/0,2	0/0	0/0
Veolia Energie ČR, a.s.	Analysis of dried sludge from WWTP	0/0	0/0	13/1	0/0	0/0
Metrostav	Pre-gasification measurements for the construction "Nox and SO2 reduction in the Trmice heating plant	0/0	0/0	169/7	0/0	0/0
Uchytíl s.r.o.	Guarantee measurements of ECJH	0/0	0/0	168/7	0/0	0/0
Distep a.s.	Facility utilization study for the implementation of a pilot installation of a photovoltaic system	0/0	0/0	26/1	0/0	0/0
INVIRA s.r.o.	Cooperation on the client's development project	0/0	0/0	283/11	0/0	0/0
Plzeňský Prazdroj, a.s.	Elaboration of the assessment of boilers K1 and K2	0/0	0/0	22/1	0/0	0/0

Veolia Utilities Žiar nad Hronom, a.s. (Slovakia)	Contract research	0/0	0/0	380/15	0/0	0/0
TRAFIN OIL a.s.	Analysis and measurement of the acidity of edible oils and fats	0/0	0/0	34/1	0/0	0/0
Eternal Electric s.r.o.	Data analysis for Velká Pecka s.r.o.	0/0	0/0	5/0,2	0/0	0/0
Teplárna Otrokovice	Determination of fuel analysis	0/0	0/0	32/1	0/0	0/0
Bono Auto (Renault)	Data processing program, modification of the software application "Electric Vehicle Selection and Charging Assistant"	0/0	0/0	65/2	0/0	0/0
AXIOM TECH s.r.o.	Sampling and analysis of samples from thermal processing of solid alternative fuels	0/0	0/0	499/20	0/0	0/0
Veolia Průmyslové služby ČR	Guarantee measurements of CHP units	0/0	0/0	516/20	0/0	0/0
TAMERO	Measurement of emissions from the K3 gas boiler	0/0	0/0	68/3	0/0	0/0
ENERGYia, s.r.o.	Guarantee tests of K7 in the Přerov heating plant	0/0	0/0	12/0	0/0	0/0
Mitsubishi	Measurements Dětmarovice power plant	0/0	0/0	650/26	0/0	0/0
Teplárna Otrokovice	Slag and fly ash analysis	0/0	0/0	49/2	0/0	0/0
Veolia Energie ČR, a.s.	Guarantee measurement of steam boiler K7	0/0	0/0	82/3	0/0	0/0
Žilinská teplárenská (Slovakia)	Cooperation during measurements and preparation of measurements	0/0	0/0	36/1	0/0	0/0
Veolia Energie ČR, a.s.	Technical assistance in the design of the Olomouc heating plant gasification	0/0	0/0	26/1	0/0	0/0
B&Bartoni Machinery, spol. s r.o.	Research in the field of electromagnetic field influence on the directed plasma flow by means of modelling	0/0	0/0	239/9	0/0	0/0

ZODPA	Assessment of emission limits and TAPs for co-firing under power sector conditions	0/0	0/0	13/1	0/0	0/0
ORGREZ, a.s.	Measurement of NH ₃ and NO _x concentration in the flue gas of the K2 boiler located on the premises of DEZA VALMEZ	0/0	0/0	44/2	0/0	0/0
ZVVZ Machinery	Performing and evaluating measurements at the Tušimice II Power Plant to calculate the operating point of the CHP	0/0	0/0	179/7	0/0	0/0
TRAFIN OIL a.s.	Sulphur testing, PH measurement, chlorides, transesterification test	0/0	0/0	62/3	0/0	0/0
Ústav chemických procesů AV ČR, v.v.i.	Pyrolysis tests	0/0	0/0	100/4	0/0	0/0
Energetika Třinec	Transport test project at E3 Thermal Power Plant	0/0	0/0	40/2	0/0	0/0
Distep a.s.	Study for the implementation of charging infrastructure for electric vehicles	0/0	0/0	33/1	0/0	0/0
Veolia Energie ČR, a.s.	Determination of mechanical and physical properties of plant fuel samples	0/0	0/0	48/2	0/0	0/0
Bertsch	Measurement testing	0/0	0/0	398/16	0/0	0/0
Energotrans, a.s.	Measurement of velocity profiles at the flue gas inlet to the electro separator of the K4 boiler	0/0	0/0	259/10	0/0	0/0
TEDOM a.s.	Evaluation of guarantee measurements of KGJ12 and KGJ 14 at the site of the Dole ČSM heating plant	0/0	0/0	30/1	0/0	0/0
PKP Cargo International a.s.	Inspection of 400kVA transformer at Paskov site	0/0	0/0	19/1	0/0	0/0

Moravskoslezské energetické centrum, p.o.	Preparation of a study focusing on the optimization of central heat supply systems in the Moravian-Silesian Region	0/0	0/0	997/39	0/0	0/0
Metrostav	Guarantee tests of GT "A" and GT "B"	0/0	0/0	962/38	0/0	0/0
SES Tlmače (Slovakia)	Measurement of mill circuits K13 and K14 at Třebovice Power Plant, measurement of flow and air parameters, determination of O ₂ , collection and analysis of fuel samples	0/0	0/0	192/8	0/0	0/0
ARGOS ELEKTRO	Measurement and evaluation of the power supply system	0/0	0/0	24/1	0/0	0/0
INVIRA s.r.o.	Testing and evaluation	0/0	0/0	375/15	0/0	0/0
CPM (France)	Pyrolysis and pelletization tests, pelletization of biomass with iron ore	0/0	0/0	83/3	153/6	258/10
BaSPOL s.r.o.	R&D in the field of optimization of energy consumption of membrane compressor units	0/0	0/0	498/20	0/0	0/0
Elvac	Installation of partial discharge detector	0/0	0/0	17/1	0/0	0/0
ČEZ	Analysis of power ratios in a selected part of the self-consumption of the Dětmarovice power plant	0/0	0/0	11/0,43	0/0	0/0
Mlýny j. Voženílek, spol.s.r.o.	Pyrolysis tests	0/0	0/0	85/3	0/0	0/0
miracIS, SE	Testing workflow management, automation, smart monitoring	0/0	0/0	480/19	890/35	0/0
Solvitec-pro s.r.o.	Testing the mechanical and physical properties of a submitted feedstock sample for suitability for fluid transport	0/0	0/0	10/0,39	0/0	0/0

B&Bartoni Machinery, spol. s r.o.	Series of tests, implementation of tests and measurements for the formation of diffusion bonding of plasma electrode material	0/0	0/0	480/19	0/0	0/0
PEMA Energo, s.r.o.	Specialised measurement of the performance characteristics of the expander	0/0	0/0	499/20	0/0	0/0
Moravskoslezské energetické centrum, příspěvková organizace	Supplementing the study with the issue of disconnection from central heating supply systems in MSK	0/0	0/0	83/3	0/0	0/0
Technosvar a.s.	Preparation of technical documentation of the handling pallet for use in parking houses	0/0	0/0	300/12	0/0	0/0
Danfoss Drives	Diagnostics of the asynchronous drive of the Tondach Šlapanice extruder	0/0	0/0	0/0	45/2	0/0
Tespo ENGINEERING S.R.O.	Modification of existing raw coal storage tanks	0/0	0/0	0/0	87/3	0/0
ETERNAL ELECTRIC, s.r.o.	Technical support for the implementation of training, Technical solutions for the model of charging infrastructure for electric vehicles	0/0	0/0	0/0	243/101	0/0
Schneider Electric	Analysis of the low-voltage network at Tatra	0/0	0/0	0/0	50/2	0/0
Povodí Odry	Analysis of transients in the 6 kV substation of the Slezská Harta waterworks	0/0	0/0	0/0	30/1	0/0
Pekařství a cukrářství Sázava	Renewable energy study	0/0	0/0	0/0	190/7	0/0
DISTEP a.s.	Preparation of the liquid fraction by thermal decomposition of solid fuel	0/0	0/0	0/0	280/1	0/0
SMOLO	Analysis of	0/0	0/0	0/0	12/0,47	0/0

	parameters for combustion in the Ladec cement plant					
AL Invest Břidličná a.s.	Testing of thermal decontamination of waste aluminium foil using a continuous pyrolysis unit	0/0	0/0	0/0	235/9	0/0
Auto Kubiček, s.r.o.	Design of a new system for visualization of process variables of car showroom power supply infrastructure	0/0	0/0	0/0	375/15	0/0
Povodí Odry	VD S1 Harta - diagnostics of G14 and R2.01 surge arresters	0/0	0/0	0/0	61/2	0/0
CEMEL	Measurement and evaluation of voltage quality, according to ČSN EN 50160 standard - plant Precheza a.s.	0/0	0/0	0/0	31/1	0/0
Povodí Odry	Diagnostics of TG2 generator for VD Slezská Harta and G2 generator for VD Šance	0/0	0/0	0/0	74/3	0/0
Daido Metal	Size and flow characterization of AL2O3 powders	0/0	0/0	0/0	20/1	0/0
Schneider Electric	Technical support for training implementation	0/0	0/0	0/0	40/2	7/0
Jsem Zero Waste s.r.o.	Research on the possibilities of wax microfilm coating on textiles	0/0	0/0	0/0	499/20	0/0
SMOLO	Analysis - determination of chlorine, Hg, calorific value including homogenization and pretreatment of samples	0/0	0/0	0/0	47/2	0/0
MEVRA computers s.r.o.	Research on pyrolysis decomposition of plastic waste	0/0	0/0	0/0	0/0	5/0,2
Papírny Moudrý s.r.o.	DSC analysis	0/0	0/0	0/0	0/0	18/1
ETERNAL ELECTRIC s.r.o.	Design and development of a new software	0/0	0/0	0/0	0/0	498/20

	solution for evaluation, optimization and visualization of operational and process variables of charging infrastructure for electric vehicles					
Kompresory PEMA	Research on the energy consumption of compressed air production	0/0	0/0	0/0	0/0	499/20
Orgrez, a.s.	Battery condition analysis and development of a prototype interconnect module for measuring electric vehicle batteries	0/0	0/0	0/0	0/0	81/4
Moravskoslezský kraj	Development of material comparing chem. compounds identified in the air of the industrial zone in Hrabová	0/0	0/0	0/0	0/0	20/1
KAYAKU Safety Systems Europe a.s.	Rheological characterisation of granules	0/0	0/0	0/0	0/0	23/1
Greiner assistec s.r.o.	Pelletization of waste toner	0/0	0/0	0/0	0/0	35/1
Prusa Polymers a.s.	Characterisation of polymer powders	0/0	0/0	0/0	0/0	22/1
WTS-J World Trade Services a.s.	Physical analysis	0/0	0/0	0/0	0/0	48/2
Mondi Štětí a.s.	Assessment of the screw conveyor	0/0	0/0	0/0	0/0	55/2
Žilinská univerzita	Experimental development of laboratory equipment for monitoring emission production	0/0	0/0	0/0	0/0	64/3
AG ENERGOCOM	Thermal imaging measurements of switchboards for the "Transfusion Service Inc." in Šumperk	0/0	0/0	0/0	0/0	15/1
Libros Ostrava	Assessment of the technical condition of the transformer	0/0	0/0	0/0	0/0	16/1
Moravskoslezské	Elaboration of	0/0	0/0	0/0	0/0	150/6

energetické centrum, p.o.	analysis of Geothermal energy from deep boreholes for green heat production					
Moravskoslezské energetické centrum, p.o.	Development of low-emission train transport in MS region	0/0	0/0	0/0	0/0	100/4
Alliance Laundry CE s.r.o.	Wastewater analysis - chemical analysis	0	0	2/0,06	0	0
ALS Czech Republik, s.r.o.	Analysis of specialised gas samples	0	0	7/0,28	0	0
AmpluServis, a.s.	Analytical support for alternative fuels analysis	28/1,10	24/0,95	75/2,96	76/3	409/16,13
ArcelorMittal Ostrava a.s.	Analysis of metal samples - SEM	11/0,43	0	0	0	0
Austin Detonator s.r.o.	Powder characterization of manufacturing materials	40/1,58	6/0,24	0	0	0
Belis a.s.	Analysis of enamel surfaces -phase and elemental composition	0,00	0	0	0	9/0,36
BOCHEMIE a.s.	Oil analysis	3/0,12	4/0,16	0	5/0,2	0
BorsodChem MCHZ, s.r.o.	Characterisation of catalysts	56/2,21	45/1,78	14/0,55	7/0,28	13/0,51
Bystroň group a.s.	Evaluation of building materials	1/0,04	0	0	0	0
Calumite, s.r.o.	Analysis of slags for further production	0	19/0,75	0	0	0
CCL Secure Pty Ltd. (Austria)	Development of safety holograms using FDP deposition	0	0	27/1,07	114/4,50	593/23,39
Centrum výzkumu Řež s.r.o.	Preparation of powders by reduction methods	0	8/0,32	16/0,63	0	20/0,79
Certifikační sdružení pro personál - APC, z.s.	Report writing for educational activities	0	10/0,39	0	0	0
České vysoké učení technické v Praze	Collaboration on analyses in the project	0	0	19/0,75	26/1,03	0
DEMIX, spol. s r.o.	Analysis of materials for drapes	0	5/0,20	0	0	0
DispoMask Czech s.r.o.	Analysis of materials for drapes	0	2/0,08	0	0	0
Daido Metal Co., Ltd.	Tribological testing of	2/0,08	0	0	0	0

	bearings					
ECOCOAL, s.r.o.	Evaluation of waste materials chemical composition	15/0,59	18/0,71	0	15/0,59	194/7,65
ECM ECO MONITORING spol. s r.o.	Device verification	20/0,79	0	0	0	0
EKOSAM TT s.r.o.	Emission measurement - evaluation	16/0,63	50/1,97	16/0,63	22/0,87	10/0,39
Elmontex Air a.s.	Evaluation of filters from air handling equipment	0	0	0	0	4/0,16
ELVAC EKOTECHNIKA s.r.o.	Characterization of TAP and emissions	25/0,99	22/0,87	4/0,16	8/0,32	18/0,71
Envisolar Energy s.r.o.	Evaluation of construction waste	12/0,47	4/0,16	12/0,47	0	0
Expol Trade, s.r.o.	Evaluation of fuel composition	0	0	2/0,08	0	0
Fortemix, s.r.o.	Characterisation of construction materials	0	0	2/0,08	0	0
FEVE s.r.o.	SEM analysis of metal surfaces	3/0,10	0	0	0	0
Futurecycling Technology a.s.	Evaluation of waste materials chemical composition	0	0	0	3/0,12	0
GasNet, s.r.o.	Chemical composition of gas line deposits	0	0	0	0	2/0,08
Hanon Systems Autopal s.r.o.	Composition study of filters - chemical and SEM analysis	0	11/0,43	9/0,36	11/0,43	40/1,58
HSF Systém a.s.	Evaluation of building materials	0	1/0,04	0	0	0
Ing. Leo Hula	Analysis of blast furnace seals	0	2/0,08	5/0,2	2/0,08	0
IPS Třinec, a.s.	Evaluation of building materials	5/0,2	0	0	0	0
Isabela Jelínková	Drinking water analysis	2/0,08	0	1/0,04	0	0
JKV Test s.r.o.	Evaluation of building materials	0	0	0	4/0,16	0
JOB AIR Technic a.s.	Analysis of lubricants for aerospace engineering	0	0	15/0,59	2/0,08	7/0,28
KMK Granit, a.s.	XRD characterisation of rocks	0	0	6/0,24	0	0
KMP Burotechnik, s.r.o.	VOC analysis of toners	0	0	4/0,16	0	0
Laboratoř MORAVA	Consultation of	1/0,04	0	0	0	0

s.r.o.	analytical procedures					
LABTECH s.r.o.	Analysis of F and Cl in waste	2/0,08	3/0,12	0	0	1/0,04
LB Cemix, s.r.o.	Characterisation of cements and slags	1/0,04	1/0,04	56/2,21	28/1,10	29/1,14
LAC s.r.o.	Evaluation of refractory materials	0	3/0,12	0	0	0
LEARKA a.s.	Determination of metals in lubricants	3/0,12	0,5/0,02	0	0	1/0,04
Liberty Ostrava a.s.	Analysis of metal samples - SEM	10/0,39	0	0	0	0
Martin Dobřichovský	Evaluation of environmental pollutants	42/1,66	13/0,51	0	0	0
Marpo s.r.o.	Technical specification of building materials	0	0	14/0,55	0	0
Miroslav Jílek	Research in optical components	0	0	0	0	232/9,15
mcePharma s. r. o.	Analysis of heavy metals in food supplements	1/0,04	0	0	5/0,20	0
MediGlobe s.r.o.	Analysis of parts for medical purposes	0	2/0,08	12/0,47	0	0
Město Mohelnice	Elemental analysis of ash after boiler revision	0	0	0	3/0,12	0
Morrow Technologies (Norway)	LiS battery cathode material technology	0	0	100/3,94	0	0
Nano4people s.r.o.	Analysis of nanoparticles - size and composition	0	0	3/0,12	0	0
NenoVision s.r.o.	Design of evaluation procedures for AFM measurements	0	390/15,38	480/18,93	0	0
NWM Research Spolka z ogr. (Poland)	Report writing for nanotechnology	61/2,41	139/5,48	0	0	0
ORGREZ, a.s.	Emission measurement and fuel analysis	117/4,62	116/4,58	70/2,76	29/1,14	0
Ostravská univerzita	Set of analyses for collaborative projects	1/0,04	2/0,08	12/0,47	0	0
OZO Ostrava s.r.o.	TAP evaluation -XRFS elemental	35/1,38	0	0	0	11/0,43
PrimeCell Advanced Therapy, a.s.	Evaluation of medical material	46/1,81	0	0	0	0
RadPro Team, z.s.	Analysis of drape materials	0	4/0,16	0	0	30/1,18
Remoska s.r.o.	Material analysis	0	1/0,04	0	0	0

Severomoravské vodovody a kanalizace Ostrava a.s.	Water and pollutant analysis	0	1/0,04	3/0,12	0	0
Sigma Pompy PL Spolka (Poland)	Equipment Functional Assessment Report	0	0	2/0,08	0	0
Slezské zemské muzeum	Evaluation of restoration materials	21/0,83	0	0	13/0,51	0
Smilefish s.r.o.	Specialized heavy metal analysis	0	4/0,16	0	0	2/0,08
Sokolovská uhelná, právní nástupce, a.s.	Determination of Br, Cl, S in waste fuels	12/0,47	19/0,75	5/0,20	6/0,24	0
Stanislav Klocek	Analysis of parts for medical purposes	0	0	0	0	14/0,55
Stavorenol stavební s.r.o.	Evaluation of building materials	0	0	19/0,75	0	0
STP Group, s.r.o.	Evaluation of building materials	2/0,08	0	0	0	0
SUAS Lab s.r.o.	Determination of Br, Cl, S in waste fuels	0	0	0	0	12/0,47
Technický a zkušební ústav stavební Praha s.p.	Evaluation of building materials	140/5,52	172/6,79	132/5,21	136/5,36	130/5,13
Technické Služby Ochrany Ovzduší Ostrava, spol. s r.o.	Measurement of emissions	83/3,27	52/2,05	50/1,97	71/2,80	62/2,45
Technistone, s.r.o.	Aggregate characterisation	0	0	0	2/0,08	0
Technological Institute Of Plasma Application s.r.o.	Evaluation of waste gases	0	0	0	0	33/1,30
Theion GmbH (Germany)	Development of battery electrode material	0	0	0	60/2,37	0
TOMA RECYCLING a.s.	Evaluation of secondary raw materials for the construction industry	17/0,67	0	0	6/0,24	11/0,43
Ústav chemických procesů AV ČR, v. v. i.	Evaluation of analyses of gases generated during testing of laboratory wastes	0	0	0	0	2/0,08
Ústav struktury a mechaniky hornin AV ČR, v. v. i.	XRD characterisation of rocks	0	50/1,97	0	0	0
UNIGEO a.s.	geological materials characterization samples	2/0,08	0	0	0	0
Univerzita Palackého v Olomouci	Cooperation on projects	0	0	0	0	50/1,97

Varroc Lighting Systems s.r.o.	SEM materials characterization	0	0	38/1,50	0	0
Veolia Vedlejší produkty ČR, s.r.o.	Water analysis - chemical analysis	0	5/0,2	0	0	0
Viega s.r.o.	Analysis of sediments from sanitary and heating systems	0	0	0	1/0,04	0
Vitesco Technologies Czech Republic s.r.o.	Screening analysis of contamination of manufactured components	61/2,41	7/0,28	0	105/4,14	61/2,41
VÚHŽ a.s.	SEM analysis of metal surfaces	0	32/1,26	35/1,38	17/0,67	0
VVUÚ, a.s.	Fuel analysis	0	0	4/0,16	0	0
Výzkumný ústav pro hnědé uhlí a.s. Most	Fuel ash analysis	7/0,26	4/0,16	4/0,16	4/0,16	5/0,2
Weppeler Czech s.r.o.	SEM surface characterisation	0	8/0,32	0	0	0
WTS-J a.s.	Characterisation of recyclates	0	0	0	0	18/0,71
Zdravotní ústav se sídlem v Ostravě	Comparison of analysis results - Circular test	1/0,04	2/0,08	0	0	0
Zkušebna kamene a kameniva, s.r.o.	Rock evaluation	0	0	2/0,08	0	0
ŽĐAS, a.s.	Characterisation of enamels	0	0	3/0,12	0	0
Total		74 145 / 2 925	72 486 / 2 859	83 585 / 3 297	102 082 / 4 027	114 442 / 4 514

Note: List and describe contract research activities with a revenue in a given calendar year, regardless of the amount of financial revenue.

3.4 Research results with existing or prospective impact on society

The evaluated unit shall briefly comment on a maximum of 10 (considered most significant by the evaluated unit) research results already applied or realistically heading towards application during the period of 2019–2023, based on the overview annex table 3.4.1 (it is recommended to indicate results with a link to projects listed in indicator 3.3). The evaluated unit must demonstrate in its description that the research results have led or will soon lead to positive impacts²⁸⁵, on society (e.g. description of how the results are used by various users, the range of persons/institutions for which the result is relevant, measurable economic impacts, etc.). The evaluated entity shall indicate in its commentary whether the gender dimension is considered in these results and discuss the impacts of the results regarding sustainability.

Maximum range 300 words/result.

1) Design of a new technology designed for the incineration of waste from the automotive industry and non-recyclable residues from car wrecks (Pilot plant 004/08-12-2022_PO)

During processing of car wrecks, polymeric materials emerge that are not suitable for material recycling due to contamination by operating fluids and the impossibility of separating plastics of

²⁸⁵ See Terms definition.

different compositions. Technology developed allows their energy recovery due to combustion of polymer waste in rotary kiln at a minimum temperature of 730 °C, followed by reheating of the flue gas to 850 °C. The waste incinerated is seats, interior parts and dashboards. Technology includes dosing additives (calcium hydroxide) into the flue gas reducing concentration of HCl, HF and SO₂, and filtration of the flue gas on fabric filter, ensuring the permissible emission limits according to Czech Decree 415/2012 Coll.

Positive impacts on society: Significant impacts reducing the amount of waste that would end up in landfills. The proposed flue gas cleaning system reducing emissions (HCl emissions by 45 %, HF by 15 % and SO₂ by 35 %). Technology contributes to energy self-sufficiency due to the high calorific value of the processed polymers (25 MJ/kg).

Gender dimension: The benefits of the technology (environmental, economic and social) have a positive impact on the general public regardless of gender.

Sustainability impacts: Emission reduction and energy recovery of waste contributes to environmental sustainability. Replacing fossil fuels with waste from wrecks increases energy independence, supports the EU's emission limit targets and the priorities of the circular economy. Its benefits are relevant for incinerator operators and industrial companies.

The result was created within the project "Technology for optimal thermal treatment of automotive waste (2020-2022)" number: CZ.01.1.02/0.0/0.0/19_262/0019993 in cooperation with SMS CZ Company, which uses the result in its portfolio of supply of technological units for waste incineration plants.

2) Mechanical and technological equipment for reducing nitrogen oxide emissions by catalytic reduction method with simultaneous support of an additive containing iron oxides (Pilot plant 002/27-08-2019_PO)

This innovative solution reduces nitrogen oxide (NO_x) emissions in industrial combustion processes. Technology is based on selective catalytic reduction (SCR) using ammonia as a reducing agent. Its unique feature is addition of an iron oxide additive increasing efficiency by more than 5 % compared to SCR methods, significant help for plants struggling to adapt to stricter emission standards. A suitable additive is fine-grained waste scale.

Positive impacts on society: Reduction in NO_x emissions has a direct effect on air quality, improving health of population and reducing costs associated with treatment. Utilization of waste scale supports circular economy principles. Technology offers lower operating costs due to the use of cheaper waste additives instead of commercial chemical ones. It is relevant for operators of stationary power plants, heating plants, waste incinerators and suitable for both retrofit and new projects.

Gender dimension: Technology is gender neutral. Improvement of air quality has a positive impact on the whole population, including more sensitive groups (children, elderly).

Sustainability impact: Technology supports principles of the circular economy by using waste products as additives, reducing the need for raw materials and saving operating costs. The result is an innovative solution reducing NO_x emissions and contributing to meeting environmental legislation.

The result was created within the project "New low-cost technology for catalytic reduction of nitrogen oxides in flue gases designed for small and medium emission sources (2017-2019)" number: CZ.01.1.02/0.0/0.0/15_019/0004522 in cooperation with SMS CZ s.r.o., which ensures the commercialization of the technology. The company plans to deliver at least 1 installation per year, which would increase its turnover by up to 5 %. The result was rated as Result at an excellent level (grade 2) in Module 1 in H22 according to M17+ Methodology for Evaluating Research Organizations.

3) A pulse detonation engine and a biogas energy recovery unit (Patent EP 4103828)

The result is an innovative cogeneration unit using a pulse detonation engine for efficient biogas processing. The technology reduces investment and operating costs and design complexity, thus supporting decentralised power and heat generation. It offers access to a combination of biogas and hydrogen for various applications, and is suitable for industrial and municipal use.

The positive impacts on society are to promote sustainable development and reduce greenhouse gas emissions through the use of renewable energy sources, to increase energy self-sufficiency and the availability of decentralised energy production in rural and urban areas, and to reduce the economic burden on SMEs through lower operating costs.

Gender dimension: the project indirectly promotes gender equality by opening opportunities for women entrepreneurs and managers, especially in the field of biogas plant operation and renewable energy. Decentralised energy can improve living conditions and job opportunities in areas with high female participation, such as rural areas.

Impacts on sustainability: The result contributes to the transition to renewable energy, reducing dependence on fossil fuels and supporting the goals of the Paris Climate Agreement and climate neutrality by 2050. The technology supports the circular economy by using organic waste to produce biogas. Improving local energy efficiency reduces losses due to long-distance energy distribution.

The result has been developed within the framework of the OP RDE DMS project for ITI " Support for cross-sectoral cooperation in the field of reduction of pollutants in the environment and waste recovery (2018-2023)" CZ.02.1.01/0.0/0.0/17_049/0008419 in cooperation with UNIKASSET s.r.o., which ensures its commercialization.

4) Method of preparation of a catalyst for the removal of nitrous oxide from waste industrial gases and the catalyst prepared by this method (Patent EP 3737498)

The result consists in a method for the preparation of a catalyst for the removal of nitrous oxide (N_2O) from industrial waste gases. The active layer of the catalyst, consisting of Co_3O_4 is formed on the surface of a ceramic foam and contains the alkaline promoter caesium. This catalyst effectively removes nitrous oxide in reactions taking place at temperatures between 300 °C and 450 °C.

The positive impact on society is to improve air quality, which has a direct positive effect on human health and the environment. The promotion of eco-innovation in the context of the development of efficient catalysts promotes cleaner and greener industrial processes, which can contribute to an overall improvement in living conditions.

Gender dimension: Research and implementation of this technology can provide opportunities for women in science, research and engineering, particularly in the field of environmental technology and industrial innovation. The technology contributes to job creation in green sectors, which can promote equality of opportunity in industry.

Sustainability impacts consist of reducing greenhouse gas emissions and promoting sustainable industrial processes that are environmentally friendly while reducing the negative impacts of industrial production on health and air quality.

The result has been developed within the framework of the project GA CR A14-13750S "Structured catalysts with active oxide layer for removal of gaseous pollutants" and the project OP RDE Call for Excellent Research "IET-Excellent Research" (2018-2022) CZ.02.1.01/0.0/0.0/16_019/0000853 and its commercialization is carried out in cooperation with the Centre for Technology Transfer of VSB-TUO.

5) Device for dosing sludge into a fluidized bed (Patent CZ 308288)

The result is a patent of device for dosing sludge into a fluidized bed that solves the problems with the safe and efficient incineration of sewage sludge. The device consists of dosing nozzle

connected to a sludge supply line, which is surrounded by a cylindrical casing allowing the passage of the clarifying air. A specific feature is the openings in the wall of the nozzle connecting its internal space with the space between the nozzle and the cylindrical jacket, allowing the homogeneous consistency of the sludge to be disturbed and to be broken down into smaller particles.

Positive impact on society: Contributes to environmental protection by reducing the amount of sludge disposed of in landfills and protecting the soil and groundwater. Efficient sludge incineration minimises emissions of harmful substances e.g. methane and sulphur oxides produced when sludge decomposes in landfills. Another benefit is the removal of pathogens, toxins and other harmful substances contained in the sludge reducing the risk of spreading infections and environmental pollution.

Gender dimension: The patent implementation may have indirect gender impacts, particularly in the areas of employment opportunities, improved quality of life and decision-making processes. It offers equal opportunities for both men and women associated with the development, application and operation of the technology.

Sustainability Impacts: The patent implementation reduces landfilling and emissions of harmful substances, promotes the efficient incineration of waste sludge and converts it into energy, thus contributing to the circular economy. By eliminating pathogens and toxic substances, it protects public health and improves the quality of life for residents.

The result was developed within the framework of the project TN01000007-National Centre for Energy and its commercialisation is being carried out in cooperation with the Centre for Technology Transfer at VSB-TUO.

6) ATHOS licensed software (SW 007/14-02-2023_SW)

ATHOS software is a tool for simulating energy balances and economics of operation of technologies for electricity, hydrogen and related commodities. It allows modelling the use of renewable sources of energy such as photovoltaic and wind power plants for hydrogen production by electrolysis. The simulations take into account the location, type of technology, cost and efficiency, allowing for optimisation of hydrogen production and the use of by-products such as oxygen or waste heat. ATHOS supports decision-making in the energy sector to maximize efficiency and minimize environmental impacts.

Positive impacts on society: ATHOS promotes sustainability, economy and technological progress. It optimises the use of renewable resources to produce 'green hydrogen', reduces emissions and supports the transition to an emission-free energy sector. It helps with economic investment decisions; stabilises electricity grids and increases regional energy self-sufficiency. It raises awareness of sustainable energy and promotes planning strategies for cleaner air and a better quality of life.

Gender dimension: ATHOS does not directly include gender considerations, but its use can promote gender balance in technical and decision-making areas. Supporting women in these areas contributes to diversity and inclusion in energy and technology.

Sustainability impacts: the ATHOS optimises the use of renewable resources to produce "green hydrogen", reduces greenhouse gas emissions and promotes emission-free energy. Simulations of energy balances and operating economics allow efficient planning of production and by-product use. ATHOS promotes energy decentralisation, energy self-sufficiency and sustainable systems with positive impacts on the environment and society.

The result was developed within the National Centre for Energy II project and licensed by the Moravian-Silesian Energy Centre, an organisation established by the Moravian-Silesian Region, which provides expert advice in the field of energy and smart region development.

7) Method and device for balancing electrical power quality parameters in an electrical network (Patent CZ 307935)

The patent provides an effective solution for improving the stability and quality of electricity in decentralized and community power systems, hybrid systems (PV with batteries) and microgrids with islanded operation. By optimizing appliance operation and predicting power quality behaviour, it minimizes the risks associated with low short-circuit power, voltage and frequency fluctuations, extending equipment lifetime, reducing probability of failures and increasing operational safety. Patented method allows maintaining power quality in accordance with EN 50160 without the need for costly investments.

Positive impact on society: Increasing the safety and reliability of electricity supply allows minimising voltage and frequency fluctuations, reducing the risk of power outages and contributing to protection of the health of population. The method introduced has the potential to extend lifetime of electrical equipment, as stable power quality reduces excessive wear and tear on household appliances, industrial machinery and sensitive electronics, leading to reduced repair and replacement costs for households and businesses.

Gender dimension: Gender neutral. Positive impact on the human population, including more vulnerable groups (children, seniors).

Sustainability Impacts: Contributes significantly to sustainability by promoting the efficient use of renewable energy sources, reducing the need for back-up capacity and the carbon footprint. Extends the lifetime of electrical equipment and the amount of electrical waste. Promoting community energy and microgrids increases energy self-sufficiency and resilience while stable electricity supplies improve the quality of life for residents. Increases grid efficiency and creates new opportunities for jobs in the energy sector.

The output was produced within the project LO1404 Sustainable Development of the ENET Centre and the project TG01010137 PRE SEED fund of the VSB-TUO. After patent protection was granted, the patent was licensed and a license agreement was concluded with IMOKA, s.r.o.

8) Reactor for biomass processing by torrefaction (Patent CZ 309086, International patent application PCT/CZ2021/050110)

Biomass torrefaction technology uses waste heat from industrial processes to refine biomass with low recovery. The system comprises a tubular reactor where inert gaseous media transfer heat, allow the material to move and ensure homogeneity. The process runs at temperatures of 200-300 °C depending on the available heat source. Technology is particularly useful in agriculture, where it improves soil quality and reduces the need for artificial fertilisers. In the energy sector, torrefied biomass can be used as an environmentally friendly fuel with a higher calorific value, while in industry it brings efficient use of waste heat and increases the efficiency of production processes.

Positive impacts on society: The main benefits of this technology are environmental sustainability, reduction of CO₂ emissions, prevention of erosion and improvement of soil structure. It allows savings in fertiliser and energy costs and opens the possibility of obtaining environmental subsidies. It is an innovation that promotes the circular economy and contributes to environmental protection.

Gender dimension: The results and long-term effects of the application are beneficial for all people, regardless of gender.

Impacts on sustainability: Positive effects to sustainability are expected, both immediate and long-term. The immediate impacts are reduction of waste material produced, use of the waste heat and reduction in the emissions produced. Long-term impacts are particularly evident in the impact on the soil stock, reduction of the burden of artificial fertiliser application, with secondary improvements in the fauna and flora of the areas concerned and an increase in the nutritional parameters of the crops grown.

The output itself is protected by international patent protection and was sold under licence to a foreign company Eurotech Sp. z. o. o. in July 2024 under licence agreement number: 5038/24-9370-01.

9) Establishing and operating a local platform for disaster risk reduction (N_{metC}, MZP/2022/070/885)

The methodology aims to harness the support of communities and civil society in both disaster prevention and mitigation. Elaborated into a logical sequence of thirteen steps represents a systematic approach to the creation of a local platform for initiation and implementation of prevention and preparedness measures.

Positive impacts on society: Concept is based on the United Nations Global Strategy for Disaster Risk Reduction and the documents outlined in the Sendai Framework (2015). A key role is played by local communities, responsible for addressing prevention and resilience building to existing threats and risks, and whose rapid response can be based on local knowledge and assessment of local options for dealing with situations of different nature. The methodology aims to harness the support of communities and civil society in both prevention and mitigation of disasters, allowing for a more efficient overall disaster risk reduction process.

Gender dimension: Gender neutral. Improving crash prevention solutions has a positive impact on all, including more vulnerable groups (children, elderly).

Impact on sustainability: The usability is on the public administration. Risk reduction must be coordinated by local government managers and Integrated Rescue System units.

The presented methodology is the result of the project "Comprehensive reduction of risks of disasters of epidemiological, natural and technical nature by building resilience at the local level" VI04000064, implemented jointly with the Research Institute of Occupational Safety within the programme of the Czech Ministry of Interior. Methodology is widely used by regional fire brigade units for the prevention and subsequent handling of crisis situations. The methodology can also be used by non-profit organisations or local action groups. The National Network of Local Action Groups of the Czech Republic, z.s., has expressed interest.

10) Anti-corrosion treatment of Al-Si alloys (Utility model 35245)

The manufacturing industry faces increasing demands for high-quality surface treatments to enhance product durability and functionality. Conventional hard anodizing for AlSi10Mg alloys is limited by the alloy's microstructure, resulting in oxide layers with inadequate abrasion and corrosion resistance.

Micro-arc oxidation (MAO) offers a superior alternative, producing highly resistant oxide layers suitable for Al-Si alloys. In collaboration with VUHŽ a.s., their performance was tested in corrosive steel mill environments, including applications in aluminum switchgear cabinet parts used in electromagnetic steel level sensors.

Positive impacts on society: MAO is an eco-friendly process compared to conventional hard anodizing, as it reduces the use of hazardous chemicals. Enhanced material longevity decreases waste generation and the need for frequent replacements, promoting sustainability. Testing MAO-coated components in corrosive steel mill environments ensures their reliability in extreme conditions. This is particularly beneficial for industries relying on aluminum components, such as steel production and electromagnetic sensing technology.

Gender dimension: While technological advancements in surface treatments have broad societal benefits, integrating gender perspectives ensures more inclusive progress in workforce participation, safety, and product design.

Impact on sustainability: Sustainable, non-toxic alternative for surface treatments, MAO contributes to eco-friendly industrial manufacturing and opening up new possibilities in medicine.

These advancements help create longer-lasting products in automotive, aerospace, and medical fields, ultimately benefiting both the environment and human health.

The result was created based on TP01010036 – PRE SEED fond II VSB-TUO (2020 - 2022) working with the industrial partner ECOCOAL, who will utilize the coating in application of waste gases cleaning. Following project TREND FW10010383, running from January 2024 to April 2026, explores MAO technology for creating catalytically active oxide layers in low-temperature plasma reactors, aiming to reduce gaseous emissions and expand MAO's industrial applications.

Table 3.4.1 - Overview of research results in the period under evaluation

Type of result ²⁸⁶	Year of application	Name
Pilot plant	2022	Design of a new technology designed for the incineration of waste from the automotive industry and non-recyclable residues from car wrecks. 004/08-12-2022
Pilot plant (Z _{polop})	2019	Mechanical and technological equipment for reducing nitrogen oxide emissions by catalytic reduction method with simultaneous support of an additive containing iron oxides. 002/27-08-2019_PO
Patent (P)	2023	A pulse detonation engine and a biogas energy recovery unit. EP 4103828, DE 60 2021 002 086.4, CZ 21745230.9
Patent (P)	2020	Method of preparation of a catalyst for the removal of nitrous oxide from waste industrial gases and the catalyst prepared by this method. EP3737498
Patent (P)	2020	Device for dosing sludge into a fluidized bed. CZ 308288
Software (R)	2023	ATHOS - Assessment Tools for Hydrogen Outputting Systems. 007/14-02-2023_SW
Patent (P)	2019	Method and device for balancing electrical power quality parameters in an electrical network. CZ 307935
Patent (P)	2021	Reactor for biomass processing torefaction. CZ 309086, PCT/CZ2021/050110
Methodologies certified by the authorised body (N _{metC})	2023	Local Platform of Disaster Risk Reduction. ZP/2022/070/885
Utility model (F _{uzit})	2021	Anti-corrosion treatment of Al-Si alloys. 35245

Note 1: Please list and describe the results already applied in practice or heading towards application in practice with existing or prospective impact on the society (e.g. domestic or foreign patents, sold licenses, spin-offs, prototypes, varieties and breeds, methodologies, significant analyses, surveys, expert outputs for policymaking or other forms of non-publication outputs, etc.). Indirect results of research, development and creative activities with documented societal impact, e.g. expert activities, services to the public/government/scientific community, may also be reported.

²⁸⁶ Specify the specific type of result. Add rows as needed.

TRANSFER OF RESULTS INTO PRACTICE

3.5 Transfer of results into practice

The evaluated unit shall briefly describe its system for transferring results into practice. It shall also indicate up to five of the most typical users of its results, whether in the university environment or in the non-university application/corporate sphere, detailing how it collaborates with them and how it seeks out new users (using a maximum of five specific examples).

It will also indicate whether and how it commercialises R&D&I results (e.g. selling licences, setting up start-up or spin-off companies, etc.)²⁸⁷, providing brief description of the commercialisation methods used. The effectiveness of the transfer of results and the commercialisation of R&D&I results will be described using a selection of results (max. five) listed in annex table (Table 3.4.1).²⁸⁸ Additionally, the evaluated unit shall briefly comment on the funds received during the period of 2019–2023 from non-public, non-grant sources (e.g. licences sold, spin-off revenues, donations, etc.). A full summary shall be provided in annex table (Table 3.5.1). *Maximum 500 words plus 200 words for each provided example of finding a new user of results and commercialization.*

SYSTEM FOR TRANSFERRING RESULTS INTO PRACTICE

The evaluated CEET unit applies a systematic approach to the transfer of research results into practice, including:

- Cooperation with industrial partners and the application sphere through contract research (see Table 3.3.2) and partnerships in research projects.
- Participation in technology fairs, conferences and meetings focused on technology transfer, e.g. Infotherma, Ampér, E-salon.
- Internal support through the Technology Transfer Centre of VSB-TUO, which assists in the protection of intellectual property, preparation for the verification of the applicability of the result, including legal, economic or other issues related to future commercialisation, in the search for partners and preparation of licensing agreements.
- Supporting young scientists and students in the application of their results in practice through the VSB-TUO Green Light innovation and start-up support programme organised at the university level.

Partnership with application sphere in the areas according to ENG-NACE SECTION: Construction (5,5 %), Electricity, gas, steam and air conditioning supply (16,2 %), Manufacturing (31,7 %), Mining and quarrying (2,3 %), Professional, scientific and technical activities (16,8 %), Public administration and defence; compulsory social security (5 %), Real estate activities (2,4 %), Transportation and storage (2,0 %), Wholesale and retail trade; Repair of motor vehicles and motorcycles (3,9 %).

THE MOST TYPICAL USERS OF THE RESULTS AND THE WAY OF COOPERATION

1. Industrial companies (e.g. energy sector, chemical industry, waste management, environmental technologies, mechanical and automotive industry)

Companies with the largest volume of research contracts:

- Sev-en, s.r.o., Hg emissions reduction from fossil and alternative fuels (EUR 391 623).
- Veolia Energie ČR, a.s., combustion efficiency testing including emission measurement systems (EUR 1 146 455).

²⁸⁷ In the case of military HEIs, their specific position is taken into account when evaluating the commercialisation/evaluation of R&D&I results.

²⁸⁸ If the commercialisation of R&D&I results is carried out in this way.

- ČEZ, a.s., tests of Hg emissions reduction from fossil and alternative fuels, (EUR 243 098).
- Armádní Servisní, p.o., technical-economic study, project documentation, engineering activities (EUR 606 875).
- Bosch Diesel, s.r.o., technical-economic study, project documentation, consulting (EUR 856 718).
- ČEZ Energetické služby, project documentation, author's supervision (EUR 477 526)
- Vyncke NV, analysis of fuels and post-combustion products (EUR 533 182).
- Envitech Bohemia s.r.o., measurement technology for air quality monitoring (EUR 100 000).

Collaborative research:

- VEOLIA Energie ČR - prototype developed on the basis of patent P308288 "Device for dosing sludge into a fluidized bed" created within the NCE project into operation of their Olomouc Heating Plant.
- SMS CZ - several applied research results increasing efficiency of technologies for energy recovery and flue gas cleaning under projects CZ.01.1.02/0.0/0.0/15_019/0004522 and CZ.01.1.02/0.0/0.0/15_019/0004523.
- OKK Koksovny a.s. - uses outputs of the IIS-Intelligent Identification System of Air Pollution Sources project in optimising emissions at coking plant.

2. Public administration

Expert studies and consultancy through contract and collaborative research. Research contracts with the largest volume:

- National Development Bank (EUR 126 166): Consultancy-technical advice, analysis of of EPCs.
- České dráhy a.s. (EUR 57 199): Consultancy, cost-saving measures.
- Statutární město Ostrava (EUR 39 941): Project documentation for building savings, author's supervision.
- Fakultní nemocnice Ostrava (EUR 596 899): Documentation for energy saving buildings, energy audit, author's supervision.
- Město Praha (EUR 47 629): Analysis and selection of suitable buildings for energy saving solutions subsidies.
- Fakultní nemocnice Královské Vinohrady (99 605 EUR): consulting and technical services for submission of subsidy titles, project documentation for the DPS.
- Dopravní podnik hl.m. Prahy (EUR 88 737): EPC projects for energy savings.
- Město Otrokovice (54 043 EUR): Analysis of energy saving opportunities.

Users of the results of collaborative research:

- Moravian-Silesian Region: using Floreon instrumentation and database portal acquired within the IIS-Intelligent Identification System for Air Pollution Sources project for air quality monitoring in the regional municipalities (Havířov, Metýlovice, Opava, Orlová, Karviná, Český Těšín, Třinec, Rychvald, Frýdek-Místek).
- Statutory City of Ostrava: using results of CLAIRO project (UIA) to develop a strategy for planting trees reducing the effects of climate change. The methodology has also been offered for use to the State Environmental Fund.

3. State administration

- In its methodological material "Communication of the Ministry of the Environment, Department of Air Protection on the operation and control of stationary combustion sources with a rated thermal input of 300 kW and below", the Ministry of the Environment used the "Methodology for demonstrating waste incineration through the analysis of ash samples taken from the operator" developed under public contract T002/16/V00048151 - contract number 160295.
- Long-term cooperation with the Ministry of the Environment aimed at identifying sources of air pollution. With the support of a project for sensor checking using reference methods called IIS-Intelligent Identification System for Air Pollution Sources, a software tool was developed in the Floreon+ environment that allows monitoring measurements on-line, working with data, graphs and models. This collaboration has led to the creation of a trusted system for public administration, guaranteed by the Ministry of Environment and operated by CEET.

4. International organisations

- Cooperation with Polish partners Stowarzyszenie Rozwoju Współpracy Regionalnej 'Olza' and Instytut Chemicznej Przeróbki Węgla within Interreg CZ SK "i AIR Region" project. Identification of the air pollution causes in the Czech-Polish border region.
- Cooperation with JRC Petten (Netherlands) in optimisation of energy systems. A library for simulation of asymmetric disturbances was created and shared by the global scientific community for control of grid power distribution system E.GD. One of the members of the ENET CEET research team, Jan Vysocky, elaborated the outputs of the library in his PhD thesis, which won the first prize in the Werner von Siemens Prize in 2022 in the Smart Infrastructure category.
- Cooperation with NORSK ENERGI (Norway), within the Norwegian TROMSO funds project TENT. Air quality assessment and action plans to reduce air pollution.
- Smart grids and related technologies research. CEET-ENET Centre was approached by the Ministry of Industry and Trade to involve experts in intergovernmental cooperation between Czech Republic and Korea in the project Smart Systems Resilience 4.0 for the Czech Republic through the "Knowledge sharing program", areas Strategies to Secure Reliable Operation Plans for Regional Power Distribution System and Development of Smart Power System through Introduction of Vehicle-to-Grid (V2G).

5. Accredited measurement groups, in particular within the Association of Laboratories for Measurement of Emissions (ALME)

- The accredited measurement groups, members of ALME, participate annually in a proficiency testing programme for the ALME-OR-06 method "Determination of the mass flux of particulate matter (PM) in flowing air" on a unique test track built in the Modern Heating Systems Laboratory of the CEET-ERC (Energy Research Centre). The programme is also open to other interested parties from the Czech Republic and abroad. So far, measuring groups from Slovakia, Poland, Serbia, Germany and Greece have participated in the CEET- ERC measurements (Estia Consulting and Engineering s.a.; AEROLAB d.o.o.; Institute of Nuclear Sciences Vinča, PUC Beogradske Elektrane; ZWP EMITOR s.c.; Institut za Bezbednost i preventivni inženjering; Grupa Ekoprojekt Sp. Z o.o.; ANAHM

LABORATORIJA D.O.O. Beograd; Deutsches Biomasseforschungszentrum; Wessling Polska Sp. Z.o.o.; SUSTCHEM Consulting S.A.; Zavod za večjilje zdravlje Čačak; Centralne Laboratorium Pomiarowo-Badawcze Sp. Z.o.o.; Bio Ekološki Centar D.O.O Zrenjanin; JKP "Beogradske Elektrane).

EXAMPLES OF SEARCHING FOR NEW USERS

1) Participation in professional forums, industry fairs and active presentations at professional conferences in the Czech Republic and abroad, where application partners participate.

- The CEET-ENET presented the results of research in the field of electromobility at the E-Salon 2019 trade fair, where cooperation was established with Renault Czech Republic, a.s., for which we organised training in electromobility in 2021 thanks to the established cooperation.

2) Active promotion and presentation of important results and research services offered through the website, CEET Newsletter and the Centre's social networks.

- Establishment of cooperation with Spolana a.s. through targeted promotion of the services offered in the field of wastewater analysis and treatment on the CEET website and subsequent implementation of contract research focused on sludge management solutions.
- The CEET-ENET was approached by the Moravian-Silesian Energy Centre, a contributory organisation of the Moravian-Silesian Region, due to the portfolio of services presented on the CEET website. On the basis of this inquiry, cooperation was established, which resulted in the preparation of 3 large-scale studies, the first study being the "Impact study of coal combustion phase-out in the Moravian-Silesian Region" prepared in November 2020, the second study is the "Impact Study on the Issue of Disconnection of End-Users and Optimisation Proposal in the Central Heat Supply Systems in the Moravian-Silesian Region" prepared in January 2022 and the third study is the "Study on Hydrogen Production and Utilisation in the Moravian-Silesian Region until 2030" prepared in March 2022.

3) Organization of professional workshops and seminars for application partners.

- The CEET-ERC in cooperation with the Faculty of Mechanical Engineering VSB-TUO organises an annual conference "Energy and Environment", at the Sepetná Hotel in Ostravice. The conference is attended by representatives of industrial partners and companies to whom we present the results of contract research and with whom we also discuss future cooperation. In this way, cooperation has been established, for example, with Areas. s.r.o., BFS Industry, s.r.o., Sev.en Engineering s.r.o., Enegotrans a.s., and others.
- For industrial partners, CEET-ERC organizes annual technical workshops for the Heat Machines Technical Group, in the form of a two-day workshop at the Sluníčko Hotel, Ostravice, where representatives of CEET and CTU Prague explain and present the results of contract research carried out for ČEZ, a.s.

4) Cooperation with the University's Centre for Technology Transfer in approaching potential partners.

The potential partner base is built on effective support from the Centre for Technology Transfer (CTT) to streamline the commercialisation process. This is implemented at the following points in the process:

- Market analysis and identification of potential partners with the support of the CTT: The CTT conducts a market survey focusing on sector structure analysis, competitor analysis

and customer analysis, where it then identifies companies that might be interested in the potential commercialisation of the research result, using its contacts and databases in the industrial sector.

- **Networking and networking with companies:** the CTT organises networking events, workshops and conferences where it is possible to establish cooperation with industrial partners and is actively involved in national and international technology transfer networks.
- **Promotion of research results:** The CTT assists with the preparation of "PITCH DECK" presentations and promotional materials to introduce the commercial potential of research results to potential industry partners and uses professional platforms and databases to promote the technologies.
- **Commercialisation consultancy:** CTT provides consultancy and training on the commercialisation process, idea/technology valuation and licensing strategy.

5) Creation of the position of "Director of Sales and Strategy", whose agenda includes prospecting for new users.

New users secured by approaching them directly:

- Bosch Group (e.g. Bosch Powertrain)
- ČSOB
- National Development Bank (NDB)
- Czech Savings Bank
- Porsche Immobilien CZ and SK
- Fakultní nemocnice Královské Vinohrady Praha
- Thomayerova nemocnice Praha
- Statutární město Opava
- Město Hodonín
- Město Znojmo
- ČEZ Group
- Krajská zdravotní a.s.
- Czech Railways
- Fakultní nemocnice Ostrava
- Pardubický kraj
- Statutární město Liberec

COMMERCIALISATION OF R&D&I RESULTS

In the period under review, commercialisation took place on two levels:

- Contract research: direct cooperation with application partners represents a significant share of revenue., The largest contract was with Sev.en. Engineering, s.r.o. for (381.52 thousand EUR), see Table 3.3.2.
- Sale of licences under agreement with partners from the application, public or governmental sphere. The largest revenue of (45.37 thousand EUR) was from sale of the ATHOS software licence, see Table 3.5.1.

Our partners preferred the option ad i) direct order of research with a clear definition of content, financial and time. CEET is a leader in this area not only within the university (more than 50% of

the total volume of the university contract research) but also within the Czech Republic.

The low number of commercialization through licence sales ad ii), was highlighted by the MEP in the previous evaluation. CEET management, prioritised addressing this shortfall and over the period 2019-2023, commercialisation through licence sales increased by almost tenfold, from a value of EUR 8,4 thousand to EUR 75,86 thousand. However, it must be reiterated that the option of additional activity in the form of economic contracts, i.e. option ad i) described above, is still clearly preferred by our partners.

Another ready form of commercialisation is:

- iii. Spin-off: CEET has prepared a financial balance sheet to establish a spin-off in 2023, within the organization at the level of the individual research centers, as a legislative preparation for the commercialization of selected outputs. The activation of the spin-off is thus ready and its condition will be the selection of the product within R&D activities, if this option is preferred by partners to the direct ordering of the service in the form of an economic contract or the sale of a licence.

EXAMPLES OF RESULTS TRANSFER AND COMMERCIALISATION SYSTEM

1. Methodology for demonstrating waste incineration through analysis of an ash sample taken from the operator (Semafor), result N_{met} .

The implementation of the Semafor methodology was carried out by inclusion in the state administration standards, namely publication in the Communication of the Ministry of the Environment, Air Protection Department on the operation and control of stationary combustion sources with a rated thermal input of 300 kW and below.

The active use of the method for the control of operators of combustion plants occurs in cases of reasonable suspicion of the combustion of unauthorised fuels. These inspections are carried out by officials of regional and municipal authorities and municipalities with extended competence (see obligations of operators of stationary combustion sources and inspections of these sources under Act No 201/2012 Coll., on air protection).

The Semafor method is regularly included as a core topic in the ecological heating course organized at the VSB-TUO; CEET, the Energy Research Centre for representatives of government and education. This course is accredited by the Ministry of Interior (Accreditation No. AK/PV-276/2020).

2. ATHOS, result R.

The CEET-CENET research team within the NCE project developed a software application for simulating energy balances of technological units combining renewable sources with technologies for hydrogen production using water electrolysis called ATHOS. The application allows the generation of simplified techno-economic analyses of these units. A licence agreement for the use of this product was subsequently concluded with the Moravian-Silesian Energy Centre, a contributory organization. The staff of the Moravian-Silesian Energy Centre use this application to quickly verify project plans in the field of renewable energy sources in combination with hydrogen technologies.

3. The technology of continuous measurement of mercury emissions (KME Hg)

An accredited method, implemented by ČEZ, a.s., Energotrans a.s., Sev.en Engineering s.r.o., EPH, a.s., SUAS, a.s., led to its implementation in the framework of continuous monitoring at

the power plant operations of the above-mentioned contractual partners after verification of the provided results, validation with the reference method and subsequent accreditation by the CEET-ERC staff. The implementation of the methodology has been of major benefit for the verification of real mercury concentrations and mass fluxes from lignite combustion. The use of KME Hg has significantly helped in testing and optimizing technologies to reduce Hg below the required emission limit.

4. Diagnostic equipment for electrochemical accumulators and batteries, result F_{uzit}.

A license agreement for the use of utility model No. UV33280 was signed with TMV SS spol. s r.o. TMV SS spol. s r.o. implemented this technical solution in its portfolio and thus expanded its activities in the field of battery diagnostics by means of machine processing of thermograms. The technical solution has been used in several projects to continuously diagnose backup storage systems providing backup power for critical infrastructure elements.

5. Method and device for balancing electrical power quality parameters in an electrical network, result P.

A license agreement for the use of patent No. CZ 307935 was signed with IMOKA, s.r.o. IMOKA, s.r.o. used the technical solution protected by the patent in the development of equipment for improving the quality of electricity in distribution networks. Its use may be crucial for distribution system operators, industrial enterprises and other entities involved in the management and optimization of electricity networks. The device is currently being tested for applications in several application areas, such as optimising the operation of a part of the grid, preventing faults and improving the reliability of grid operation, or supporting the integration of renewable energy sources into the grid.

FUNDING FROM NON-PUBLIC NON-GRANT SOURCES FOR THE ASSESSMENT PERIOD 2019-2023:

- **Licences sold:** total revenue of CZK 1.92 million (EUR 75,86 thousand).
- **Contract research:** total revenue of CZK 446 740 million (EUR 17,623 million).
- **Donations from industrial partners:** CZK 111 thousand (EUR 4,38 thousand).

Table 3.5.1 - Summary of non-public revenues received during the period under evaluation

Type of revenue	Revenue (in thousands CZK/EUR)				
	2019	2020	2021	2022	2023
Licence sale (MEC) – ATHOS software					1150/ 45,37
Licence sale (iO System s.r.o.) – Method of stabilisation of methane number of process gases and equipment for carrying out this method for single-fuel engines				120/ 4,73	
Licence sale (Eternal Electric s.r.o.) – Battery monitoring device for a set of electric vehicles				109/ 4,3	
Licence sale (“TMV SS” spol. s r.o.) – Diagnostic equipment for electrochemical accumulators and batteries	117/ 4,6				
Licence sale (IMOKA s.r.o.) – Method and equipment for balancing power quality parameters		117/ 4,62			

License sale (AERPLAST) – Method and wiring for wind power plant control	10,7/ 0,42	10,7/ 0,42	10,7/ 0,42	10,7/ 0,42	7,14/ 0,28
Licence sale (PTV spol. s r.o.) – Disintegration method of solid microparticles to the dimension of nanoparticles using cavitating liquid jet and apparatus for making the same	50/ 1,97		50/ 1,97		
Licence sale (ENSYTRA) – Proposal for a methodology for identifying the burning of unsuitable fuels in domestic heating				160/ 6,31	
Donation – Organisation of the conference "Energy and Environment 2023" (SIAD Czech spol. s r.o.)					20/ 0,79
Donation – Energy education funding (Energetika Třinec a.s.)	10/ 0,39				
Donation – Support for education, science and research in the framework of the activities of the Energy Research Centre (Rubing s.r.o.)	71/ 2,8				
Donation – Presentation of the company name and logo in the seminar room in the conference proceedings (Vyncke s.r.o.)	10/ 0,39				
Total	269/ 11	128/ 5	61/ 2	400/ 16	1 177/ 46

Note: Enter funds raised for R&D&I from non-public sources besides grants or contract research (e.g. licences sold, spin-off company revenues, donations, etc.) in the calendar year.

POPULARIZATION OF R&D&I

3.6 The most important activities in the field of popularization of R&D&I and communication with the public

The evaluated unit shall briefly describe its main activities related to the popularisation of R&D&I and communication with the public (e.g. popularisation lectures, citizen science initiatives, etc.) during the period of 2019–2023 and provide up to 10 examples that it considers the most significant.

Maximum 500 words plus 200 words for each example given.

Based on the recommendations of the Self-evaluation report from the previous period, we focused more on activities in the field of popularization of R&D&I and communication with the public:

Popularization events and public lectures

CEET employees regularly participated in popularization events organized at the level of the University of Science and Technology, such as the Night of Scientists and Art and Science (both annually in 2019-2023), where we prepared guided tours of laboratories and interactive experiments. We have also regularly participated in the Open Doors Day of the VSB-TUO (27-28 January 2019, 24-25 January 2020 and 27-28 January 2023) and the Open Doors Day for PhD students, where we presented our activities to the public and students through lectures and an accompanying programme in the laboratories.

In addition to the events organized by VSB-TUO, we had interactive stands focused on the promotion and support of environmental protection at Majáles Ostrava (17 May 2019 and 13 May 2022) and Earth Day (26 April 2019, 16-17 September 2020, 26 April 2022, 25 April 2023).

In terms of the number of events and media reach, the most significant was the Smokeman Intervenes educational show. A total of 83 such shows were held in the period under review, across the Czech Republic and Slovakia.

Popular publications and media

CEET employees have regularly published in popular science magazines such as Science and

Research, CTK, MF Dnes, 5+2, Průmyslová ekologie, Pro Města a obce, Seznam, Sciencemag, Týden, Novinky, 21. století. They have also appeared on television, radio or thematic podcasts, such as Czech Television, Barrandov TV, Radio Impuls, Polar, Czech Radio, Science is calling podcasts. In addition to publications and appearances in these media, we are also the creators of popular educational videos, for example, a whole series called The Ten Commandments of a Proper Hitchhiker.

Cooperation with schools and educational activities

We also worked to develop cooperation with schools and supported educational activities. During the period under review, students from 19 primary and secondary schools, in total 435 students, were on tours to our laboratories. We also organised summer schools, such as the 2021 Summer School with Permoniks, the Summer School of Physics and the International Summer School of Architecture. Beyond the events organised by us, we also participated, for example, in the Science and Chemistry Fair and other natural sciences at Silesian Ostrava Castle and were involved in the Junior University event. In addition, we have organised and participated in competitions for students, for example, the Doctoral Grant Competition implemented from the OP RDE project, or the Student Scientific Professional Activity (2019, 2023). We also developed activities in the area of mentoring talented students and sought to involve them in scientific activities, for example, the Junior Researchers Meeting (2021, 2022, 2023).

Online communication and social networks

Managing and regularly publishing news on social media was also an integral part of our activities. We are active on Facebook (291 followers), Twitter (51 followers), LinkedIn (1,167 followers) and YouTube (35 followers).

The most important examples of implemented actions:

1) Educational show Smokeman intervenes

The show is designed for both children and adults and offers a variety of interesting things. The aim is to introduce the general public to proper combustion in local fireplaces. With a mobile boiler room we come directly to a specific town or village and offer practical demonstrations on how to (not) heat properly. The public can learn how efficiently they run their combustion equipment at home or what influences the composition of the flue gas the most. Visitors have the opportunity to learn about the basic types of combustion appliance designs, their characteristics, how to properly operate and care for boilers, stoves and fireplaces. The interactive programme ensures a wide range of useful advice and information during practical demonstrations. Everything is presented in a fun and engaging way. Throughout the whole period under review 83 such events were held not only in the Czech Republic but also in Slovakia. This activity also includes promotional materials - the Manual of correct heating and a series of educational videos. The implementers of this initiative are also regular guests on TV and radio and have participated in approximately 30 sessions during the reporting period.

2) CEETe opening ceremony with the Open Day

The opening ceremony of the new CEETe polygon was an important moment for the entire research community, industry and the public. Visitors had a unique opportunity to see the state-of-the-art equipment and laboratories that CEETe offers. During the day, presentations were made on innovative projects and technologies being developed at the centre. The opening ceremony was attended by representatives of the Moravian-Silesian Region, representatives of the Ministry of Industry and Trade and was also attended by Růt Bízková and Prime Minister Petr Fiala. Guests had

the opportunity to meet with CEET's research teams and partners and discuss current research directions and the future of energy. The opening symbolized a new beginning for the region, but also strengthened cooperation between science, industry and the community in the field of sustainable energy. Approximately 300 visitors attended the event, and the opening ceremony was covered by national media. These included the newspapers Dnes, Universitas, the web portals Věda a výzkum and iDnes. Information about the opening ceremony was also presented on the portal of the Government Office or the portal of the City of Ostrava.

3) Chemistry at Silesian Ostrava Castle

One of the events we regularly participate in is the popular scientific and educational event organized annually by the Czech Chemical Society, whose chairwoman for the Ostrava branch is Prof. Koci from CEET-IET. CEET is one of the financially supporting partners. The event is aimed at popularizing natural and technical sciences among primary and secondary school students and the public introducing chemistry and science through interactive experiments, lectures, workshops and demonstrations of interesting chemical processes. The main attraction is the more than 30 stands that make up the chemistry fair, where visitors can see or try out interesting experiments (coloured fires and explosions, various physico-chemical magic experiments with luminescence). A number of chemistry and science games and competitions are organised for visitors, as well as mathematical puzzles for children and adults. Schools, organisations and companies involved are also presented in the area. Attendance during the reporting period was approximately 7000 people. The activity has its own website, moreover it has also been promoted on portals such as Chemistry Europe, EuChemS. During the reporting period, it took place on 25 June 2019, 7 September 2021, 7 June 2022 and 20 June 2023.

4) Meltingpot

This event, we participate regularly in is part of the largest Czech multi-genre music festival Colours of Ostrava. Festival attracts up to 50 thousand spectators every year. The event features more than 200 inspiring speakers from all over the world from science, politics, culture, business and social life. We regularly participated in the Meltingpot where we focus on showcasing our projects and technologies that are part of the wider trend towards sustainable development and environmental protection. In 2019, Prof. Mišák presented "Freedom of access to energy and life.", Prof. Danihelka presented "Freedom and security - do they go together or against each other?". In 2022, Dr. Motyka presented the topic "Will nanotechnology save the environment?". In 2023, Prof. Mišák was part of the discussion block "Colours and voices of hydrogen". In the lectures and discussions, we try to inspire others to think innovatively and to show how modern technologies can be an important tool for a sustainable future. These discussions create a space for the mutual exchange of experiences and approaches that can have a real impact on our activities. We participated in the events on 17-19 July 2019, 13-14 July 2022 and 22 July 2023.

5) Travelling exhibition Energy in Transition - Powering Tomorrow

CEET in cooperation with the Embassy of Germany in Prague and the Fraunhofer Innovation Platform prepared a travelling digital exhibition called "Energy in Transition - Powering Tomorrow." This inspiring exhibition was on display from 16 October - 27 October 2023 at the VSB-TUO in Building C. The goal of this SMART exhibition was to open a dialogue with the public about the global energy transition. The exhibition was divided into several parts, representing different perspectives on energy and sustainability issues, both from national governments, society, the private sector and the scientific community. Scientists of our research institute are working on highly topical issues that are of major importance not only for our region, but also for the whole

country and the European Commission, as our work reflects the Green Deal strategy. We then seek to transfer and communicate this knowledge to the public. As the exhibition was free to attend, more than a thousand people visited. The event was made visible on the websites of the University of Applied Sciences, the German Embassy, and all social networks, from school networks to CEET networks.

6) Regular holiday camps and events for children

CEET pays attention to schoolchildren interested in science and technology and is annually involved in suburban camps and events organized by the Popularization Department of VSB-TUO. We also organize our own events for this target group. Children can visit laboratories where our staff work with them and together conduct scientific experiments helping them understand the basic principles of science and technology. We try not only to foster their interest, but also to develop their creative thinking and ability to solve complex problems. The programs are designed to be fun and interactive, teaching also practical skills that participants can use in their future careers. On 20 July and 24 August 2021, 14 July and 18 August 2022, children visited the CEET labs as part of the Hitech Swanky Summer Camp and JuniorUniversity (13 and 20 October 2021). In 2021, we participated in the Summer School with the Permons 2021. In 2022, we hosted International Summer School of Architecture on July 11-15 and Summer School of Physics on August 23. There were also several excursions for children (University Kindergarten, PRIGO Gymnasium). In total, more than four hundred children participated in these activities.

7) Popularization of unique equipment

To familiarize the public with our infrastructure, we regularly inform about new equipment at our departments. The acquisition of an explosion autoclave, which allows the study of explosion parameters even at low temperatures, has received a great deal of media coverage. Its characteristics make it unique, even on an international scale. This device has aroused great interest not only among professionals but also among the public. Information about its acquisition and its introduction was presented, for example, in the printed periodical Dnes, but also on various online platforms such as iDnes, Impuls, Science and Research, Sciencemag, and the university magazine Universitas, where it attracted considerable interest. To reach as wide a public as possible, Dr. Jan Skřínský (CEET-ERC) also participated in the podcast Science is calling (35), where he not only discussed this device. The presentation of the research equipment and the media coverage it generated confirms the interest in the news from our centre.

8) Popularisation of the ENREGAT Large Research Infrastructure

The ENREGAT Large Research Infrastructure offers open access to research services on energy and material recovery and gas treatment. Its popularisation was carried out through presentation of the infrastructure at professional conferences (SSCHE 2019, CHISA 2021, TVIP 2019, ICCT 2019, Catalytic seminar 2019, Congress of Chemists 2020, International Congress and Exhibition - Waste Luhačovice 2020, TVIP 2021, CzePoCat 2022, ICCT 2022). Seminars for students were also organized, e.g. Student Scientific Expert Activity and information days for potential users e.g. from UJEP, WASTEN and PRIGO and foreign universities (University of Oulu, Technical University of Crete). In addition, popularization articles were published in the journals Vesmír 99 (150), 7-8 2020, 461, Odpadové Fórum 3 (21) 2020, 31, Akademik 3/2019, 28, and on the portal Vědavyzkum.cz. (ENREGAT's research infrastructure has a track record of success, 18.11.2021, The promotion of infrastructures should be improved, 20.1.2022). Promotional campaigns included an information panel in front of the IET research pavilion and a promotional video on PIOS and on Facebook, LinkedIn and YouTube. Regular posts on Facebook, LinkedIn helped to reach a wider

professional and lay public and raise awareness of the importance and benefits of ENREGAT infrastructure.

9) Infotherma and cooperation with TZB-info

We regularly participate in the international exhibition Infotherma, which focuses on heating, energy savings and renewable energy sources and takes place in Ostrava, at the Exhibition Grounds Černá louka. This event is held under the auspices of the Government of the Czech Republic, the Ministry of the Environment, the Ministry of Industry and Trade, the State Environmental Fund of the Czech Republic, the Chamber of Commerce of the Czech Republic and the Moravian-Silesian Region. The event is attended by 300 exhibitors and tens of thousands of visitors every year. Our research institute is regularly involved in this event and the speakers are Dr. Jiří Horák and Dr. Jiří Ryšavý, who try to introduce the public to the field of heating, energy saving and renewable energy through interactive experiments, lectures, workshops and interesting demonstrations. The results of this event are then presented, for example, on the TZB-info portal, Youtube, Estav.tv We participated in the events on 21-24 January 2019, 20-23 January 2020 and 23-26 January 2023.

10) Podcast Science is calling

One of the other platforms we have also used to communicate our activities to the general public is Podcast Science is Calling. It is a popularization program that focuses not only on science itself, but also on what is happening at the university. Through interviews with experts and scientists, we try to offer listeners topics in various fields such as energy, material sciences, robotics, computer science or artificial intelligence. In each episode, various scientific projects, technologies and personalities associated with the University of Science and Technology were presented. The podcast is available on platforms such as Spotify, Apple Podcasts and YouTube. The guests of this show from CEET were Assoc. Prof. Dombek (16), Prof. Mišák (32), Dr. Neufinger (34), Dr. Skřínský (35), Dr. Borovec (38), Prof. Plachá and Prof. Simha Martynková (39), Dr. Vysocký (40), Assoc. Prof. Lukáš Prokop (46 and 48), Dr. Leštinský (47) and Dr. Jezerská (48). The podcast has more than 2 650 subscribers and each of them is viewed by hundreds of users.

IMPLEMENTATION OF RECOMMENDATIONS

3.7 Implementation of the recommendations in Module 3

The evaluated unit will briefly describe how it has implemented the recommendations for Module 3 from the previous evaluation period, if applicable.

Maximum 1000 words.

Due to the description of the implementation of recommendations for four evaluated units, we have taken the liberty of increasing the word count.

The implementation of the recommendations from the International Evaluation Panel's Evaluation Report for Module 3 was carried out in three stages as part of the reorganisation of the research units.

(Stage 1) In 2020, the Panel evaluated four centres (CENET, CNT, ERC, IET) as stand-alone institutes. After the evaluation of the recommendations, their implementation was started. In the same year, the merger of the centres into one institute CEET was initiated and approved with effect from 1 January 2021. The aim was to use the infrastructure more efficiently, to eliminate duplications and to strengthen the international role in the field of sustainable energy.

(Stage 2) In 2021, another evaluation of the VSB-TUO institutions was carried out by an independent organisation, IEP, which recommended organisational changes inspired by the IT4I model. CEET has implemented a two-tier management system with centralized strategic leadership and autonomy for operational centers. CEET's motto is "e pluribus unum / Out of many, one".

(Stage 3) The recommendations of the 2020 Panel have been implemented with positive results in the following areas:

- Increasing revenue from non-public sources and foreign projects.
- Involvement in European research projects and winning international awards.
- Expansion of research topics in nanomaterials and biomedicine.

Emphasis was placed on research commercialisation and multidisciplinary collaboration. CEET has achieved a significant share of commercialisation revenues within the university and expanded participation in international projects. The results show the successful implementation of the Panel's recommendations and the enhancement of research excellence in line with the CEET's strategic objectives.

Incorporation of comments within individual centres

IET

Req. Focus on winning more contracts, or contracts with higher revenue, (especially from non-public sources).

Rep. The average annual income from contract research increased to EUR 140,71 thousand in 2021-2023 compared to EUR 126,23 thousand in 2014-2018.

Req. Focus on the application of results within the non-economic sphere and to earn revenue from spin-off companies or licence sales.

Rep. Results obtained from cooperation with cities and municipalities in the framework of AIR TRITIA, CLAIRO, Intelligent Information System IIS, Norwegian Funds projects and several contract research projects aimed at identifying causes of air pollution, innovative tree planting and action plans to reduce pollution. Spin-off companies, see 3.5 chapter.

Req. Absence of international patents.

Rep. 2 international patents EP 4103828, EP 3737498 and 3 applications PCT/CZ2021/050065, PCT/CZ2021/050057, PCT/CZ2020/050013.

Req. Increase international recognition and popularise results.

Rep. Involvement in preparation of international conferences (EuropaCat 2023) and organization of IET own international seminars (CzepoCat), and several invited lectures. Involvement in 2 COST projects (CA16106, CA18125).

Req. Increase the activities of young researchers to gain greater recognition by the international R&D&I community.

Rep. Invited lectures of young scientists (Assoc. Prof. Pacultová, Dr. Matějová), participation in project evaluation (Dr. Leštinský, Dr. Reli). Prof. Obalová became a representative in EFCATS, interview "Reducing emissions with the right research" of Prof. Obalová in the Times Higher Education magazine.

CENET

Req. Absence of revenue from applied research projects supported by foreign providers.

Rep. Implementation of projects supported by foreign providers: EnviSafeBio, Virtual open Course of Automotive Life Cycle Assessment.

Req. Limited revenue from non-public entities.

Rep. Sale of 5 licenses in the amount of EUR 63,63 thousand.

Req. Absence of European and American patents and spin off's.

Rep. 1 European patent (EP 3730890) applied for, and 7 international patent applications (PCT/CZ2019/050056, PCT/CZ2019/050061, PCT/CZ2020/000056, PCT/CZ2021/050001, PCT/CZ/CZ202/050035, PCT/CZ2022/000021, PCT/CZ2022/050085). Spin-off companies, see 3.5 chapter.

Req. Broaden the scope of collaboration within the EU.

Rep. Cooperation extended, see list of international projects in 1st Req.; successful H2020 project submitted in 2023. Implementation of projects with international consortium: i-AIR Region, Electromobility in the Czech-Polish border area, i-AIRP's Identification of air pollution causes on the Czech-Polish border.

CNT

Req. Increase the revenue from research projects, contractual research and from non-public sources (besides grants or contractual research).

Rep. Revenue from research projects increased from EUR 650 thousand to EUR 3 697 thousand. The revenue generated from contractual research remained relatively stable (EUR 247 thousand).

Req. Increase the number of international awards in prestigious competitions.

Rep. Prestigious awards received, e.g. Materials Science in Czech Republic Leader Award, Chemistry in Czech Republic Leader Award, Highly Cited Researchers 2021, Miloš Hudlický Award.

Req. Small number of applied research projects and poor participation in international professional societies.

Rep. Number of projects increased from 6 to 56 projects. Participation in international professional societies American Chemical Society, Czech or Czechoslovak Microscopy Society.

Req. It is fundamental to broaden the spectrum of research topics, focusing on nanomaterials for neuromorphic and biomedical applications.

Rep. The suggested inclusion of both topics was not pursued, as the center shifted its primary focus toward the fields of energy and the environment. This strategic realignment reflects the center's commitment to addressing pressing global challenges in sustainable energy solutions and environmental conservation.

Req. In order to improve research performance, grow the critical mass of research personnel.

Rep. A reorganization took place, and the number of research groups was reduced to increase number of research personnel.

ERC

Req. Improve the revenue from non-public sources. EU funding is not high and during 2017-18, none was received.

Rep. Contract research income was increased by approximately 30% in the period under review. EU income in 2017-2018 is increased to EUR 78 thousand.

Req: Bring to society not only economic but also “non-economic” progress. e.g. cleaner air and preventing new and reducing existing disaster risks. Increase the applied results in the non-economic sphere and develop international patents.

Rep: Emission measurement methods and technology implemented to reduce emission burden in industrial agglomerations of the Czech Republic with high level of social relevance were developed. Cleaner air due to SMOKEMAN popularization activities to introduce the general public to proper combustion in local fireplaces. Research projects with applied results in the non-economic sphere were solved: “Real-LIFE Emissions” (LIFE20PRE/FI/000006) and “Improving the implementation of programs to improve air quality in Slovakia by strengthening the capacities and competences of regional and local authorities and supporting measures in the area of air quality” (LIFE18 IPE/SK/000010). No international patents in evaluated period.

Req: In terms of recognition by the scientific community, ERC achievements deserve a high score. To obtain higher scores in the next evaluation cycle, the activities mentioned in 3.10 and 3.11 should also be continued in the future.

Rep: Activities of this type continue.

Req. ERC staff should participate in inventions fairs, etc., to obtain more international awards in prestigious competitions.

Rep. ERC participated in several competitions during the period under review and the team won an Award of the Technology Agency of the Czech Republic for the best project in the Governance category year 2019.

Req. Improve scientific cooperation with foreign countries, also with Asia countries and United States.

Rep. New scientific cooperation has been implemented with Finland, French, Germany in EU research project LIFE20PRE/FI/000006 and with national Taipei University of Technology and Industrial Technology Research Institute (Taiwan) in project TA CR TM04000021.

Req. The sum of achievements in popularising R&D&I and communication with the public deserves a high rating. Similar activities should be continued in the future. ERC may consider online, TV, and radio methods of publicising its research outcomes.

Rep. Appearances on TV, Déčko, interviews from the Energy and Environment conference, invited lectures by Polish and Slovak speakers, podcasts, promotion at FCB, seminars and conferences abroad.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 3

Document name	No. criteria	Location (link in HTML)
Information about the unit under evaluation:		
CEET website	3.1	https://ceet.vsb.cz/en
CEET annual reports	3.1	https://ceet.vsb.cz/export/sites/ceet/.content/galerie-souboru/Annual-Report-2021.pdf https://ceet.vsb.cz/export/sites/ceet/.content/galerie-souboru/CEET_Vyrocnizprava-2022_EN_elektronicka-verze.pdf https://ceet.vsb.cz/export/sites/ceet/.content/galerie-souboru/CEET-vyrocnizprava-2023-EN_06.pdf
CENET centre website	3.1	https://ceet.vsb.cz/cenet/en/
Nanotechnology Centre website	3.1	https://ceet.vsb.cz/cnt/en/
Energy Research Centre website	3.1	https://ceet.vsb.cz/vec/en/
Institute of Environmental Technology website	3.1	https://ceet.vsb.cz/iet/en/
Informational Brochure CEET	3.1	https://ceet.vsb.cz/export/sites/ceet/.content/galerie-souboru/CEET-portfolio-EN_revize.pdf
CEET promotional video	3.1	https://www.youtube.com/watch?v=D-RWow2loq8
Certificates of the most important invited lectures:		
Photocatalytic reduction of CO ₂ using Pt doped C ₃ N ₄ photocatalysts – Prof. K. Kočí	3.2	https://ceet.vsb.cz/iet/.content/galerie-obrazku/Invitation-IL-Kamila.jpg
Catalytic decomposition of nitrous oxide - evaluation of pilot plant results – Prof. L. Obalová	3.2	https://ceet.vsb.cz/export/sites/ceet/iet/.content/galerie-souboru/LObalova_certificate.pdf
Design of TiO ₂ -based photocatalysts in various macroscopic forms for environmental pollution reduction – Dr. L. Matějová	3.2	https://ceet.vsb.cz/export/sites/ceet/iet/.content/galerie-souboru/Lenka-Matejova_JOPES-2021_CERTIFICATE.pdf
Constructed p-n heterojunction of NiO/TiO ₂ nanorods structure photocatalysts for enhancing H ₂ production- Prof. K. Kočí	3.2	https://ceet.vsb.cz/export/sites/ceet/iet/.content/galerie-souboru/IL-2021EPM4-Prof.-Koci.pdf
Hydrogen production from methanol-water	3.2	https://ceet.vsb.cz/export/sites/ceet/iet/.content/galerie-souboru/IL_Slovenina2022_Professor-Koci.pdf

mixture over NiO/TiO ₂ nanorods structure photocatalysts - prof. K. Kočí		
NO direct catalytic decomposition over cobalt based mixed oxides modified by potassium – Assoc. Prof. K. Pacultová	3.2	https://ceet.vsb.cz/export/sites/ceet/iet/.content/galerie-souboru/certifikat_KP.pdf
Photocatalytic CO ₂ reduction - prof. K. Kočí	3.2	https://ceet.vsb.cz/export/sites/ceet/iet/.content/galerie-souboru/Invitation-Lecture-Stetin.pdf
Recent trends in hydroxyapatite bioceramics for bone regeneration – Prof. Simha Martynková	3.2	https://ceet.vsb.cz/export/sites/ceet/cnt/.content/galerie-souboru/CCI_001925-3.pdf
Clay in Natural and Modified Forms for Nanotechnology – Prof. D. Plachá	3.2	https://ceet.vsb.cz/export/sites/ceet/cnt/.content/galerie-souboru/confirmation-letter_DAniela-1.pdf
Prestigious R&D&I awards:		
Gold medal for the invention „Technology for the reduction of nitrogen oxides by ammonia in the presence of an iron oxide additive“ mezinárodní výstavě inovací INTARG® v Katovicích (2022)	3.2	https://ceet.vsb.cz/iet/cs/veda-a-vyzkum/Zvane-prednasky/technology-for-the-reduction-of-nitrogen-oxides-by-ammonia-in-the-presence-of-an-iron-oxide-additive/
Award of the Technology Agency of the Czech Republic for the best project in the Governance category year 2019	3.2	https://www.vsb.cz/en/news-detail/?reportId=39627&linkBack=%2Fen%2Funiversity%2Fnews%2Findex.html
Award for the Best Applied Research Result of the Year 2020	3.2	https://ceet.vsb.cz/cenet/en/about-us/news/news-detail/?reportId=42652
Highly Cited Researchers 2021	3.2	https://www.vsb.cz/veda/en/science-evaluation/awards/
Miloš Hudlický Award	3.2	https://ceet.vsb.cz/cnt/en/news-detail/?reportId=49250&linkBack=%2Fcnt%2Fen%2Fnews%2Findex.html
Werner von Siemens Award	3.2	https://ceet.vsb.cz/cenet/en/about-us/news/news-detail/?reportId=45119
International scientific conferences and workshops organized by evaluated unit:		
NanoOstrava	3.2	https://www.nanoostrava.cz/
Conference Energy	3.2	https://ieec.vsb.cz/en/

and Environment		
CzePoCat	3.2	https://ceet.vsb.cz/iet/en/news-detail/?reportId=44985&linkBack=%2Fiet%2Fen%2Fabout_us%2Fnews%2Findex.html
Doctoral Catalytic Seminar	3.2	https://ceet.vsb.cz/iet/en/enregat/results/workshop/
Research projects:		
San4Fuel	3.3	https://san4fuel.com/
National Centre for Energy I, II	3.3	https://nce.vsb.cz/en
Large research infrastructure ENREGAT	3.3	https://ceet.vsb.cz/iet/en/enregat/ https://www.vyzkumne-infrastruktury.cz/en/energy/enregat/
Institute of Environmental Technology - Excellent Research	3.3	https://ceet.vsb.cz/iet/en/science-and-research/current-projects/Excellent-Research/
COOPERATION - Support for cross-sectoral cooperation in the field of pollutant reduction in the environment and waste recovery	3.3	https://ceet.vsb.cz/iet/en/science-and-research/current-projects/Support-for-cross-sectoral-cooperation-in-the-field-of-pollutant-reduction-in-the-environment-and-waste-recovery/
AIR TRITIA - Uniform Approach to the Air Pollution Management System for Functional Urban Areas in TRITIA Region	3.3	https://programme2014-20.interreg-central.eu/Content.Node/AIR-TRITIA.html
CLAIRO - CLean AIR and CLimate Adaptation in Ostrava and other cities	3.3	https://clairo.ostrava.cz/about-project/
SUWAT- Cross-border cooperation in the monitoring of chemical and radiation contamination of surface waters by mine waters	3.3	https://www.kontaminacevod.cz/en/home-2/
National Centre of Competence - Polymer Materials and Technologies for the 21st Century	3.3	https://polyenvi21.cz/en/frontpage-english/
Research results with existing or prospective impact on society:		
Heat Pump and Pellet Boiler in One	3.4	https://ceet.vsb.cz/vec/en/news-detail/?reportId=46347&linkBack=%2Fvec%2Fen%2Fabout_us%2Fnews%2Findex.html

Methodology Proposal for Identifying the Combustion of Inappropriate Fuels in Household Heating	3.4	https://ceet.vsb.cz/vec/en/news-detail/?reportId=46350&linkBack=%2Fvec%2Fen%2Fabout-us%2Fnews%2Findex.html
A New Technology That Can Utilize Waste from Biodiesel Production	3.4	https://ceet.vsb.cz/cnt/en/news-detail/?reportId=45180&linkBack=%2Fcnt%2Fen%2Fnews%2Findex.html
Newly Manufactured Chemicals and Industrial Products from Sunlight and Minerals	3.4	https://www.protext.cz/zprava.php?id=39387
CEET Assists with Hydrogen	3.4	VŠB helps with hydrogen, heating plants in Krnov and Frýdek-Místek will also be involved - Centre for Energy and Environmental Technologies VSB-TUO
Affordable and Efficient Photocatalyst for Hydrogen Production	3.4	https://ceet.vsb.cz/iet/en/news-detail/?reportId=44200&linkBack=%2Fiet%2Fen%2Fabout-us%2Fnews%2Findex.html
Research Infrastructure ENREGAT	3.4	https://ceet.vsb.cz/iet/en/enregat/
Reducing emissions with the right research	3.4	https://www.timeshighereducation.com/
Development of an Automatic Parking System with Electric Vehicle Charging	3.4	Czechs develop automatic parking system with electric car charging - ENET Centre - CEET VSB-TUO
Revolutionary UV Face Mask	3.4	Revolutionary UV mask by Czech scientists protects against viruses - Nanotechnology Centre - CEET VSB-TUO
Transfer of results into practice:		
Collaboration Examples – CEET portfolio	3.5	https://ceet.vsb.cz/export/sites/ceet/.content/galerie-souboru/CEET-portfolio-EN_revize.pdf
Inspection of Household Waste Combustion	3.5	https://ceet.vsb.cz/vec/en/news-detail/?reportId=49268&linkBack=%2Fvec%2Fen%2Fabout-us%2Fnews%2Findex.html
Eea and Norway Grants TROMSO-TENT	3.5	https://www.cost.eu/actions/CA18125/#tabs Name:overview https://www.youtube.com/@statnifondzivotnihoprostre3728
„Semafor“ Method	3.5	https://ceet.vsb.cz/vec/en/news-detail/?reportId=46350&linkBack=%2Fvec%2Fen%2Fabout-us%2Fnews%2Findex.html
Air quality forecasting system created in AIR TRITIA project	3.5	https://air-tritia-test.herokuapp.com/en
Czech Accreditation Institute	3.5	https://www.cai.cz/?page_id=12864&lang=en
The most important activities in the field of popularization of R&D&I and communication with the public:		

Smokeman's Education Show	3.6	https://ceet.vsb.cz/vec/en/smokemans-education-show/
Smokeman's Ten of the Right Smoker	3.6	https://www.youtube.com/playlist?list=PLMYSdf0zSP5bX7CvxfQKPzDJwQH2qbD3
CEETe Opening Ceremony	3.6	https://www.vsb.cz/en/news-detail/?reportId=45929 Ceete Opening Ceremony
Chemistry and other natural sciences at Silesian Ostrava Castle	3.6	https://ceet.vsb.cz/iet/en/news-detail/?reportId=45657&linkBack=%2Fiet%2Fen%2Fabout_us%2Fnews%2Findex.html
Energy in Transition - Powering Tomorrow travelling exhibition	3.6	https://ceet.vsb.cz/iet/en/news-detail/?reportId=46144&linkBack=%2Fiet%2Fen%2Fabout_us%2Fnews%2Findex.html https://ceet.vsb.cz/vec/en/news-detail/?reportId=46106&linkBack=%2Fvec%2Fen%2Fabout_us%2Fnews%2Findex.html
Physics Summer Schools	3.6	https://ceet.vsb.cz/vec/en/news-detail/?reportId=49267&linkBack=%2Fvec%2Fen%2Fabout_us%2Fnews%2Findex.html
International Summer School of Architecture	3.6	https://www.vsb.cz/en/study/exchange-students/summer-school/12th-INTERNATIONAL-SUMMER-SCHOOL-OF-ARCHITECTURE-ADVENTURES-OF-ARCHITECTURE-IN-OSTRAVA/
Summer School with the Permons 2021	3.6	Summer school with Permoniks 2021 - Institute of Environmental Technology - CEET VSB-TUO
Summer School SAN4Fuel	3.6	https://ceet.vsb.cz/vec/en/news-detail/?reportId=45392&linkBack=%2Fvec%2Fen%2Fabout_us%2Fnews%2Findex.html
Large research infrastructure popularization	3.6	https://www.vsb.cz/veda/en/news-detail/?reportId=42624 https://www.youtube.com/watch?v=LODdxMzfjDs
Podcasts „Science is calling“	3.6	16, 32, 34, 35, 38, 39, 40, 42, 45, 46, 47, 48
Open days VSB-TUO	3.6	https://www.vsb.cz/en/study/open-days/
Czech News Agency	3.6	Prospects of the Czech energy sector in a smart and safe way - Centre for Energy and Environmental Technologies VSB-TUO
Czech radio	3.6	Olomouc scientists develop nanomaterial to help reduce energy costs - Nanotechnology Centre - CEET VSB-TUO
Sciencemag.cz	3.6	https://ceet.vsb.cz/vec/en/news-detail/?reportId=49266&linkBack=%2Fvec%2Fen%2Fabout_us%2Fnews%2Findex.html
Tyden.cz	3.6	Scientists will use groundbreaking science and international collaboration on the road to green energy - Nanotechnology Centre - CEET VSB-TUO
Novinky.cz	3.6	Breakthrough Technology by Czech Scientists Utilizes Biodiesel Production Waste and Improves Fuel Properties - Nanotechnology Centre - CEET VSB-TUO
21Stoleti.cz	3.6	Biomaterial converts waste glycerol into a useful product - Nanotechnology Centre - CEET VSB-TUO
Art & Science	3.6	Art & Science: An event combining the creative side of youth with science and technology - Institute of Environmental Technology - CEET VSB-TUO
Science Fair	3.6	https://ceet.vsb.cz/cenet/en/about-us/news/news-detail/?reportId=45562
Czech European Researchers ' Night	3.6	https://www.nocvedcu.cz/en

Majales Ostrava	3.6	https://www.majalesostrava.cz/en/
Doctoral Grant Competition	3.6	https://ceet.vsb.cz/cnt/en/news-detail/?reportId=44256&linkBack=%2Fcnt%2Fen%2Fnews%2Findex.html
Social media (in Czech and English)	3.6	https://www.facebook.com/ceetvsbtuo https://www.linkedin.com/company/centrum-energetickych-a-environmentalnich-technologie-vsb-tuo https://www.instagram.com/ceetvsbtuo/ https://x.com/ceetvsbtuo https://www.linkedin.com/company/ietvsbtuo/ https://www.facebook.com/enregat
CEET in Media	3.6	https://ceet.vsb.cz/en/media/ceet-in-the-media/

SELF-EVALUATION REPORT FOR MODULES 4 AND 5

HIGHER EDUCATION INSTITUTION NAME:

VSB - Technical University of Ostrava

COMPANY REGISTRATION NUMBER (CRN): CZ61989100

MODULE 4 – VIABILITY

ORGANISATION AND MANAGEMENT OF R&D&I

4.1 Organisation and management of R&D&I

The HEI will briefly describe its organisational structure²⁸⁹ and describe the R&D&I management system including the role of the HEI's central management, the management of faculties, and the HEI's institutes in organizing and managing R&D&I. It should also describe the role and structure of the technical and economic apparatus. *Maximum 1000 words.*

VSB - Technical University of Ostrava (VSB-TUO) is a self-governing entity, and its organization and activities are decided by its bodies in accordance with the law and within its limits of the law. The University is headed by the Rector, who determines its direction and development with the assistance of four Vice-Rectors (Vice-Rector for Studies, Vice-Rector for Science and Research, Vice-Rector for Strategy and Cooperation, Vice-Rector for Quality and Investment Construction), determines its direction and development. The Rector's Office provides for the needs of VSB-TUO, mainly in terms of organisation, coordination, consultation, advice and accounting. It also ensures the control activities in the educational and creative, economic, personnel, legal, external relations, and internal administration fields. The Rector's College is the Rector's permanent advisory body, the composition of which is determined by the Rector. It consists of the Vice-Rectors, the Deans, the Directors of University Institutes, the Chairman of the Academic Senate (AS) of VSB-TUO, the Chairman of the Student Chamber of the AS VSB-TUO, the Bursar, the Chancellor, and the Director of the Information Services Centre (CIS). The Bursar, who is appointed by the Rector, and the entire staff manage the university's economy and internal administration (finances, property, energy, accommodation and catering services, etc.).

The rector's representative body is the Academic Senate (AS). Other self-governing academic bodies of VSB-TUO are:

The Academic Senate (AS) is the university's self-governing representative academic body, which is elected by the academic community, with each faculty represented by three members of the academic chamber and two members of the student chamber. University-wide educational and research departments are represented by a total of three members. Meetings of the AS are open to the public. The AS announces elections for the Academic Senate and elections for the candidate for the position of rector.

The Scientific Board (SB) is an academic body of the university that discusses important documents and primarily operates in the field of research, development and innovation (R&D&I). The chair of the SB is the Rector, who appoints its members. Members of the SB are distinguished representatives of the fields in which VSB-TUO carries out educational, scientific and research, development and innovation, artistic, or other creative activities.

International Scientific Advisory Board (ISAB) is an advisory body that provides recommendations to enhance the international reputation of the University, assesses the university's scientific and educational activities, advises on the development of new research areas and educational programs, and issues opinions and recommendations on matters requested by the Rector or Vice-

²⁸⁹ A graphical representation of the organisational structure will be provided as an annex.

Rectors.

The Internal Evaluation Council (IEC) approves proposals for the rules of the quality assurance system of educational activities, oversees the internal evaluation process of educational quality, prepares reports on the internal evaluation of educational quality, approves study programs within institutional accreditation, and evaluates applications for the accreditation of habilitation procedures (becoming associate professor) and professorship appointments.

The Pedagogical Board is an advisory body, which serves to strengthen long-term cooperation with secondary schools in the region via their representatives which are the members of the council.

The Industrial Board is an advisory body, with the aim of strengthening the connection between the university and business entities. The chair of the Board is the Rector, who appoints its members. The members of the council are legal entities with which VSB-TUO has long-term cooperation within its activities, such as closer integration of education with technical practice, support for technology transfer, and cooperation in the field of R&D&I.

The Ethics Commission reviews submissions related to compliance with the moral values outlined in the [Code of Ethics](#) and operates in accordance with the [Rules of Procedure of the VSB-TUO Ethics Commission](#).

The Administrative Board The Administrative Board consists of twelve members appointed and dismissed by the Minister of Education, Youth, and Sports. Its status and powers are defined by the Higher Education Act and governed by the Statute of the VSB-TUO Administrative Board. Following approval by the Academic Senate of VSB-TUO, the Administrative Board reviews the report on the internal evaluation of the quality of educational, creative, and related activities, approves the budget and strategic plan, and discusses the annual report on activities and financial management.

The university consists of seven faculties (Faculty of Mining and Geology, Faculty of Mechanical Engineering, Faculty of Electrical Engineering and Computer Science, Faculty of Safety Engineering, Faculty of Materials Science and Technology, Faculty of Economics, and Faculty of Civil Engineering), **and two university institutes** (IT4Innovations National Supercomputing Center - IT4I, and the Centre for Energy and Environmental Technologies - CEET). CEET was established in January 2021 through the merger of four research institutes - the Centre for Nanotechnology, the Energy Research Centre, the ENET Centre, and the Institute of Environmental Technologies.

VSB-TUO is further divided into **university-wide departments** (Department of Social Sciences, Institute of Languages, and Institute of Physical Education and Sports) and other units. Each faculty is headed by a dean, who, supported by vice-deans, determines its direction and development. The Dean's College is the dean's permanent advisory body, and the representative body of the dean is the Academic Senate of the respective faculty. Other self-governing bodies of each faculty are the Scientific Board (SB) and the Disciplinary Committee (DC). Members of the DC are appointed by the dean, with half of the members being students of the respective faculty.

Each university institute (UI) is led by a director who reports directly to the Rector. UIs primarily perform R&D&I activities, may participate in teaching, and do not have the right to conduct habilitation procedures (becoming an associate professor) or procedures for the appointment of professors. Each university-wide unit is led by a head, director, or Vice-Rector, who is directly responsible either to the Rector or to the relevant Vice-Rector for their activities and the activities of the unit they lead. The Rectorate oversees and administers R&D&I through the following mechanisms: distributing the R&D budget based on the performance of individual departments, funding development projects, and acquiring equipment to support the advancement of strategic R&D&I areas.

R&D&I QUALITY MANAGEMENT AND SUPPORT SYSTEM

4.2 System of support for a quality R&D&I environment and incentive measures for quality science

The HEI will briefly describe the systemic incentive measures/tools to support quality R&D&I (if applicable). For each measure/tool described, an example will be provided to illustrate the effectiveness of the measure/tool in practice (e.g. number of projects supported by internal grants, statistics on the use of advisory systems, number of newly established research teams, etc.). The description will pay particular attention to:

- A system of support for attracting national and international projects.
- A system for project consultancy/management/administrative support.
- Science management (e.g., personnel and financial capacity for R&D&I transfer, personnel and financial capacity of the project acquisition support system, science managers, data analysts, business and innovation advisors, etc.).
- The existence of internal funding schemes.
- Strategy/opportunities for establishing new research teams (including international ones) and supporting them within the HEI (e.g. sharing of R&D&I equipment, laboratory and information facilities, administrative support, etc.).
- Support system for students and early career researchers²⁹⁰.
- A system to support excellent science (e.g. support for excellent scientists, research teams, PhD students, collaborations, infrastructure, etc.).
- A system of support for interdisciplinary research and collaboration within the HEIs.
- The concept of providing conditions for the emergence of new, high quality research directions/topics, especially those with application potential.

Maximum 300 words per point.

A system of support for attracting national and international projects

Systematic incentive measures and tools to support high-quality R&D&I at VSB-TUO are designed to promote research excellence and enhance the university's competitiveness at both the national and international levels. One of the key measures is a project acquisition support system, which includes providing **financial resources for the preparation of project proposals** for national and international calls. This system also includes motivational tools for academics and researchers to encourage their participation in international consortia and the preparation of project proposals. Thanks to these measures, the number of projects submitted and successfully awarded in international calls has increased, leading to an increase in the number of supported projects funded under the Horizon 2020 and Horizon Europe programmes. The University rewards the best scientific and research achievements, such as [Horizon funded projects](#) (available only in Czech).

Another important aspect is the **training and development of researchers** at the beginning of their scientific careers. The [PhD Academy](#) has been established to provide a comprehensive range of training courses for PhD students and other researchers, as well as courses focusing on the development transferable skills, soft skills, publication practices, and other areas essential for career development. This contributes to the professional development and qualification of researchers, including in the area of project management.

The **Student Grant Competition** (SGC) is also part of the University's internal support for research activities. The aim of the SGC is to promote and support the research activities of doctoral and master's students in cooperation with academic staff, to improve the quality and efficiency of scientific, technical, and educational work, develop new, especially interdisciplinary fields of doctoral and master's studies, to establish international cooperation in these fields, and to support

²⁹⁰ Student grants, support for PhD students, postdocs and early career scientists.

the publication of the results achieved. The Student Grant Competition is funded by targeted national support for specific university research.

A system for project consultancy/management/administrative support

The project consulting and administrative support system for the promotion of high-quality R&D&I is provided by the **Project Support Centre (PSC)** and the R&D Department of the Rectorate. The PSC monitors funding programmes and calls for proposals and provides information on current opportunities through a monthly funding opportunities email. In addition, the PSC provides expert advice on both project concepts and project proposals prepared for specific calls. A key part of its support is the preparation and processing of project applications, assistance with gathering annexes and required documents, and project administration during implementation. The PSC also focuses on methodological support and the establishment of a unified methodological framework at the University. It organises training seminars and workshops for R&D staff on project-related topics and assists in the search for international partners.

Similarly, the R&D Department provides services and monitoring, especially for scientific research projects within the Czech Science Foundation (GACR) and the Technology Agency of the Czech Republic (TACR) calls. For both units and depending on the type of project, system management and process documents are prepared to regulate specific procedures, including the directive Support for Research and Development and process descriptions in documents H2.1 Research and Development Projects and H2.4 EU Structural Funds Projects. More information is on the website [Project Support Centre - VSB-TUO](#), [Science and Research - VSB-TUO](#).

Science management

A **Strategic Analysis Unit** has been established under the Vice-Rector for Research and Development to carry out strategic analysis at a university-wide level. This unit focuses primarily on scientometric analysis for budget allocation, programme quality assessment, regular reporting and other related activities. For the needs of individual university departments, the R&D portal has been created, where selected scientometric analyses are accessible to all employees.

VSB-TUO places great emphasis on the **effective transfer of R&D&I results into practice**. The University actively cooperates with more than 500 companies and supports projects with scientific and societal impact in collaboration with national and international partners, including research organisations, small and medium-sized enterprises, and industrial entities. This ensures an efficient transfer of knowledge and technology into practice. In this area, the [Technology Transfer Centre](#) (TTC – VSB-TUO) plays an active role, coordinating and managing the **commercialisation system at VSB-TUO**. This involves intellectual property specialists, business development managers, and legal representatives. Together with the Commercialisation Board and the Industrial Council, they form a comprehensive system that enables VSB-TUO to effectively support R&D&I and, most importantly, ensure its transfer into practice.

Since 2019, the Georgius Agricola Patent Fund has been used to finance technology transfer activities and support collaborations. Thanks to this fund, several new R&D&I results have been supported in the process of intellectual property protection. The Technology Transfer Centre also supports the verification of the practical applicability of applied research and experimental development results with high commercial potential through Proof of Concept activities (mainly funded by TACR under the SIGMA programme - DC1) ([Proof of concept - Technology Transfer Centre VSB-TUO](#)).

Strategy/opportunities for establishing new research teams

Supporting the establishment of new research teams is crucial for the development of the

University and its integration into the international scientific community. The actual support focuses on several strategic areas:

1. Financial and institutional support

- Seed funding for the support of new research teams – financial resources allocated from the University budget to support the employment of new researchers and to temporarily cover the financial co-financing of research teams with no previous history at the University.
- Utilisation of external funding sources for the employment of new researchers (e.g., Global Experts, Global Post-docs – both in cooperation with the Moravian-Silesian Region).
- Project support for participation in national and international programmes (GACR, TACR, Horizon Europe).

2. Shared research infrastructure

- Access to R&D equipment, laboratories, and information systems.
- Shared computing capacity and specialised software.
- Open access to research databases.

3. Administrative and project support (see project management support)

- Specialised support in research project management.
- Legal and financial consulting.
- Assistance in establishing international collaborations.

4. Human resources development

- Support for PhD students ([PhD Academy](#)) and post-doctoral researchers in developing their professional competences and transferable skills.
- International exchange programmes and research internships (Erasmus Programme, [U!REKA](#) Consortium).

These measures ensure the sustainable development of research teams, enhance the quality of scientific work, and strengthen the international reputation of the University. They apply not only to the creation of new teams but also to the appropriate reinforcement of existing teams with new members.

Support system for students and early career researchers

The system is based on a comprehensive integration of financial, professional, infrastructural, and career support. The aim is to create an environment that enables young researchers to enter research activities smoothly, to develop their professional potential, and to integrate progressively into both the academic and the applied sectors.

Every year, VSB-TUO announces the Student Grant Competition in accordance with the regulations of the Ministry of Education, Youth and Sports (MEYS), which is primarily aimed at students of doctoral and master's degree programmes. The aim of this support is to strengthen the independent creative activities of students in cooperation with academic staff in the field of R&D, leading to the intensive involvement of students in projects mainly within team-based R&D activities at VSB-TUO, the development of interdisciplinary cooperation, and the production of high-quality publication results.

At the same time, VSB-TUO regularly participates in the project "**Support for Talented Doctoral Students at VSB-TUO**" within the framework of the grant programme "Support for Science and Research in the Moravian-Silesian Region". The benefit for VSB-TUO is the increased success rate of students included in the programme. After successful completion of their studies and the

project, further involvement of supported students/graduates in R&D teams at VSB-TUO is expected.

The "**Voucher Programme for Universities in the Moravian-Silesian Region**", known as "**Global Postdoc**", serves as a start-up grant for Ph.D. holders (or equivalent) to carry out a research project. The aim of the programme is to create post-doctoral positions for excellent international graduates or persons with a Ph.D. and long-term international experience, thus promoting the development of excellent research teams.

The support system includes the following areas:

- **Financial support for young researchers**, which includes scholarships, mobility support, professional supervision and mentoring, and interdisciplinary cooperation.
- **Infrastructure and technical support** – access to cutting-edge scientific infrastructure, including supercomputing capacity, databases, or specialized experimental equipment, as well as digital tools, libraries, online courses, and software tools for data analysis.
- **Career development and networking** –Publishing support – workshops on writing scientific articles ([Writing Support Centre](#)), financial support for open-access publications, and assistance with peer review processes. Career counselling ([Career Centre](#)) – programmes for career development in academia and industry, including internships and involvement in projects with commercial potential. Networking and conferences – opportunities to present research at national and international forums, to network with experts and potential employers (e.g., [Kariéra+ - VSB-TUO](#) – available in Czech only).
- **Support for innovation and entrepreneurship** – [Green Light Accelerator Programme](#) – offering individual mentoring by experienced entrepreneurs and fifteen practical workshops focusing on key business areas such as business plan development, marketing, financing, and preparing for investor pitches. The [Technology Transfer Centre](#) provides legal and administrative support for intellectual property protection and patenting of research results.

These actions will create an environment that motivates students and early-stage researchers to actively engage in R&D&I, supports their career development, and helps them overcome the early stages of their academic careers.

A system to support excellent science

Fostering excellence in research at the University requires a comprehensive strategy that includes both individual support for outstanding researchers as well as the development of top research teams, infrastructure, and international collaboration. The aim is to create an environment that motivates the production of cutting-edge research, attracts talented scientists, and enhances the university's international competitiveness. VSB-TUO utilises internal and external grants focused on research excellence, provides financial incentives for recipients of prestigious awards, and conducts out strategic recruitment of international experts. At the same time, it supports the establishment of centres of excellence and research clusters that bring together experts from different fields. During the evaluation period, the University established several specialised laboratories, centres of excellence, and shared research facilities. A key part of the strategy is also the creation of alliances with world-leading research institutions, such as the [Fraunhofer Innovation Platform for Applied Artificial Intelligence for Materials & Manufacturing at VSB-TUO](#).

A system of support for interdisciplinary research and collaboration within the HEIs

Supporting interdisciplinary R&D&I and collaboration between faculties/university institutes is essential to address complex scientific and technological challenges. We create conditions for the effective networking of research teams and the promotion of interdisciplinary cooperation.

The University gives **priority to project proposals that interlink multiple departments**. This strategy is also beneficial in cases where the university is limited in the number of project proposals it can submit to a particular call. In such cases, a clear process is in place to manage the situation, to encourage mutual collaboration and to identify synergies between individual project teams. Our strategy is delivering tangible results, as evidenced by the success of projects such as [REFRESH](#), LERCO, [CirkArena](#), [MATUR](#), and projects within the Long-term Intersectoral Cooperation under the Programme Johannes Amos Comenius. We also support research that combines technological development with the assessment of its societal, economic, and security impacts. This promotes collaboration between technical faculties and, for example, the Faculty of Economics at VSB-TUO, and faculties of the University of Ostrava.

Interdisciplinary workshops, conferences, and networking events are also organised to further support these interdisciplinary research activities. This system promotes effective cross-disciplinary collaboration, strengthens the university's competitiveness, and contributes to addressing both scientific and societal challenges.

The concept of providing conditions for the emergence of new, high quality research directions/topics, especially those with application potential

The concept of creating conditions for the development of new high-quality research areas and topics with application potential at VSB-TUO is not managed centrally but at the level of individual faculties and institutes. A key element is the creation of a motivational and infrastructural framework that enables individual departments to independently identify and develop promising topics in cooperation with partners from industry, the public sector, or international research institutions.

4.3 Quality control system for R&D&I environment

The HEI will briefly describe the system of internal and external evaluation of research units, including the following aspects:

- Internal and external evaluation of R&D&I quality: This includes the evaluation of R&D&I by the HEI's authorities, the evaluation of research teams (if such a system exists), and the involvement of international scientific councils or other independent advisory bodies in quality control and of R&D&I management.
- The ethical aspects of research: This includes adherence to ethical principles and good scientific practice, compliance with related legislation (codes of ethics, ombudspersons, ethics committees and ethics hotlines, and systems for reporting whistleblowing and ethical misconduct).

The HEI shall demonstrate the functioning of the quality control systems in the R&D&I environment by examples (e.g., brief information on the evaluations carried out and their results, specific examples of the use of whistleblowing or the handling of ethical violations, etc.).

Maximum 500 words plus 200 words for each example described (max. five).

Internal and external evaluation of R&D&I quality

The key document for the internal evaluation of the quality of R&D&I at VSB-TUO is the internal regulation "Rules of the Quality Assurance System for Educational, Creative, and Related Activities and the Internal Evaluation of the Quality of Educational, Creative, and Related Activities of VSB-

TUO" ([Internal regulations and other regulations of VSB-TUO - VSB-TUO](#)). These regulations are based on quality assurance standards and procedures in the field of higher education both in the Czech Republic and abroad. In accordance with this document, the following takes place:

- Quality assurance means systematic care for the quality of educational, creative (R&D and innovation), and related activities, their maintenance, and continuous improvement.
- Quality evaluation involves verifying the fulfilment of the mission and objectives of VSB-TUO and the compliance with the standards of university activities, including Research, Development and Innovation (R&D&I).

The quality assurance system at VSB-TUO is based on the **regular implementation of internal evaluations**, including the evaluation of R&D&I activities. This is carried out as a self-critical assessment using feedback and the analysis of relevant qualitative and quantitative data obtained from available sources. The specific evaluation methods applied vary according to the nature of the activity being evaluated, with the results subsequently presented in a clear and comprehensible manner.

The **internal evaluation of the quality of educational and related activities** at VSB-TUO is managed by the Internal Evaluation Council (IEC) of VSB-TUO. The outcome of the internal evaluation is the Report on the Internal Evaluation of the Quality of Educational, Creative, and Related Activities of VSB-TUO (hereinafter referred to as the "Report"). The Report is prepared by the IEC once every five years, with annual updates for the previous calendar year, which, according to the law, are annexed to the Report ([Strategic Plans and Annual Reports of VSB-TUO - VSB-TUO](#)). In addition to the IEC, other self-governing bodies of VSB-TUO are involved in the preparation and approval process of the report: the Academic Senate, the Scientific Board, and the Administrative Board.

In its evaluation of VSB-TUO, the Internal Evaluation Council (IEC) may also consider the results of **quality assessments of VSB-TUO activities conducted by third parties, especially by an international evaluation agency**. For this purpose, VSB-TUO underwent an international evaluation in 2021. The university selected the [European University Association](#) (EUA), which specialises in evaluating higher education institutions through its [Institutional Evaluation Programme](#) (IEP). The main reason for the university's decision to undergo this international evaluation was the absence of such an assessment that could provide valuable input for improvements and suggestions for introducing new tools for more efficient management, based on best practices from other universities across the EU. Three years after the initial evaluation (which provided numerous suggestions and recommendations for improving its strategic management from international experts) VSB-TUO requested a re-evaluation. The purpose of this follow-up evaluation was not only to assess the impact of the original recommendations on the institution's development and strategic management but also to obtain new insights for further improvement and growth.

The results of the evaluation are summarised in two evaluation reports, which are the outcomes of both the initial and the follow-up evaluations. These reports are available here:

- [VSB-TUO IEP Initial Evaluation Report](#)
- [VSB-TUO IEP Follow-up Evaluation Report](#)

In order to provide recommendations for the definition and evaluation the strategic directions of the scientific and educational activities VSB-TUO, the University has established the [International Scientific Advisory Board](#) (ISAB). Its main tasks are to provide suggestions for improving the quality of scientific and educational activities in order to enhance the international reputation of VSB-TUO and strengthen its position as an internationally recognized research university. In addition, the board participates in the evaluation of the university's scientific and educational activities, makes

recommendations on newly introduced research areas and educational programmes, and gives opinions and advice on matters requested by the Rector or Vice-Rectors. International Scientific Committees also operate within some university departments or specific projects. One example is the MATUR project, which has an International Scientific Advisory Board (ISAB).

The ethical aspects of research

VSB-TUO has introduced a **system for reporting illegal activities**, known as whistleblowing. The procedure for submitting reports, the procedure for assessing them in accordance with the law, and the conditions of protection that must be provided to any person a report in accordance with the law are described in the policy "Internal Reporting System for Reporting Illegal Activities and Procedure for Submitting a Report by the Whistle-blower". The designated person receives and assesses the validity of reports from whistle-blowers and submits proposals to the Rector for appropriate corrective or preventive measures based on the submitted reports. Reports can be submitted in writing via email, in paper form by mail or in person to the VSB-TUO registry office, by phone, verbally, or in writing through the VSB-TUO data mailbox.

The [Ethics Commission](#) is established to evaluate submissions for compliance with the moral values outlined in the VSB-TUO [Code of Ethics](#) and to provide opinions, particularly on project proposals, student theses, and scientific research publications. The Commission operates in accordance with the [Rules of Procedure of the VSB-TUO Ethics Commission](#). In connection with the ethical aspects of research in the field of biomedical engineering, the Ethics Committee for Biomedical Research is established at the Faculty of Electrical Engineering and Computer Science (FECS).

VSB-TUO also has an [ombudsperson](#). Students and employees can turn to the ombudsperson if they are unable to resolve a situation on their own. The ombudsperson contributes to a more effective resolution of conflicts and problems at the university and acts as a mediator between the university management, teachers, and students or employees and their superiors. The ombudsperson provides advice on inappropriate behaviour, discrimination, and other negative phenomena. They help to find solutions to specific situations and coordinate communication between the parties involved in a conflict. In addition, the ombudsperson identifies potentially problematic behaviour and proposes measures to eliminate it. They make suggestions and recommendations to the University management for possible improvements that will contribute to the effective functioning of the University. Based on their findings, the ombudsperson may initiate changes in internal policies, documents, and procedures.

The PhD Academy is also active in the field of education on the ethical aspects of R&D&I, the [PhD Academy](#) is also actively involved. It organises courses not only for students but also for interested staff members, focusing on ethics in science and research — such as "Research Ethics, Research Integrity, Intellectual Property 360: Protection of Innovation Capital and Its Potential."

4.4 Sustainability and resilience of R&D&I

The HEI will describe the arrangements for sustainability and increasing the resilience of R&D&I, if such a system exists, and provide examples of its implementation. These include:

- The sustainable development concept (strategy, objectives, plan and implementation).
- Social responsibility strategy.
- A knowledge transfer system, if it is established at central level.²⁹¹
- The third role, the transfer of R&D&I results to society and interaction with local actors.
- The concept of research data management (data collection, access and sharing of data, use of the information obtained for R&D&I management, responsibility for data files, archiving and backup of data).
- Ethics and personal data protection.
- Intellectual property protection.
- Ensuring institutional resilience (resistance to foreign influence, cyber security, risk prevention, prevention of misuse of R&D&I and knowledge transfer results, a system to prevent or mitigate the negative impacts of R&D&I and knowledge transfer in society).
- Digitisation and the use of smart technologies.
- The institutional strategy for Open Science 2.0/Open Access (if one exists), including information on the operation of the institutional repository or similar tools.
- A system for training undergraduate and postgraduate students as well as staff in the field of intellectual property protection and technology transfer.

The HEI will demonstrate the effectiveness of its procedures by examples (e.g., the number of people trained in intellectual property protection and technology transfer, data on the usage of Open Access repositories, handling of risk incidents, etc.).

Maximum 300 words per point.

The sustainable development concept

VSB-TUO unifies its approach to environmental, economic, and social challenges through its **Sustainable Development Strategy (SDS 2024+)**. This document integrates four key areas: research and innovation, education and students, employees and operations, and public engagement. The strategy is built on the synergies between these areas and aims to provide a flexible response to global challenges and local needs.

Strategic Goals

- Supporting projects focused on the circular economy, ecological innovations, and the creation of living labs on the university campus.
- Integrating sustainability principles into study programmes, strengthening student initiatives, and promoting lifelong learning in this area.
- Modernising infrastructure to reduce energy and water consumption and support biodiversity.
- Collaborating with industry, municipalities, and the public on sustainable development projects and the organising outreach and community events.

Implementation and specific activities

Implementation includes the establishment of a **Sustainability Manager** position to coordinate activities related to sustainable development and social responsibility. The Sustainability Manager closely collaborates with faculties/institutes, administrative departments, and university leadership to achieve the defined goals.

Progress updates and project information are available on the [Sustainable University VSB-TUO](#)

²⁹¹ If the knowledge transfer system is decentralised to the unit level, the HEI shall describe how the system works.

platform, which provides an overview of specific projects, achieved results, and planned activities, while also supporting communication and engagement of the public, students, and staff.

The University implements specific projects that reflect its commitment to environmental responsibility. These include projects such as REFRESH and MATUR, as well as campus initiatives such as the installation of beehives, creation of flower meadows, rainwater harvesting, and infrastructure upgrade to achieve energy self-sufficiency and minimize waste.

Future plans include expanding research and innovation, developing sustainable infrastructure and education programmes focused on sustainability, and improving systems to track progress.

Forthcoming projects include reducing the carbon footprint, increasing solar panel coverage, expanding digitalisation, and introducing mandatory education courses on environmental responsibility. Another planned activity is a pilot project for on-site composting stations to reduce bio-waste from the campus and catering facilities.

The University's priority is to ensure energy and resource self-sufficiency supported by renewable energy sources, fully aligned with the European Union's goal of achieving climate neutrality by 2050, as outlined in the European Green Deal. The campus serves as an example of the use of modern technologies to reduce energy demand fully in line with the principles of the circular economy. Photovoltaic power plants, solar, and geothermal systems have been installed, contributing to an annual reduction in greenhouse gas emissions. **Up to 85% of the University's buildings meet the latest energy standards**, and active preparations are underway to renovate the remaining buildings.

Active water resource management, support for biodiversity, and efforts to minimise organic and municipal waste further demonstrate the University's commitment to sustainable development. Sustainable mobility is supported by bike-sharing stations and bike racks, as well as a low-emission vehicle fleet and extensive charging infrastructure for the University's electric service vehicles.

Social responsibility strategy

VSB-TUO systematically integrates social responsibility into all its activities with the aim of linking science with the needs of society. The strategy focuses on four main areas: regional, social, economic, and environmental responsibility.

Regional Responsibility

The University contributes to the quality of life in the Moravian-Silesian Region through educational programmes for schools, community events, and outreach activities. Students and staff actively participate in volunteering, fundraising and supporting non-profit organisations.

Social Responsibility

VSB-TUO creates an inclusive and open environment that promotes not only equal opportunities but also active engagement with society. The university collaborates with local schools, non-profit organisations, and public authorities, contributing to the development of the Moravian-Silesian region.

Students and staff regularly participate in volunteering activities, charity collections, and projects to help disadvantaged groups. Beyond academic education, the University promotes lifelong learning for the general public, including programmes for senior citizens.

The campus is designed as an open space that serves not only students and staffs but also the wider community. VSB-TUO organizes educational and cultural events for the wider community, reinforcing its role as a social hub of the region.

Economic Responsibility

The University is committed to transparent financial management, responsible public procurement, and sustainable investment. It collaborates with industry and regional authorities to promote innovation and entrepreneurship. VSB-TUO ensures an ethical approach towards

students, employees, and partners and regularly evaluates their satisfaction.

Environmental Responsibility

VSB-TUO focuses on reducing its carbon footprint, efficient use of resource, and biodiversity on campus. The university implements projects in circular economy, recycling, and energy and water savings. The campus serves as a living laboratory, testing not only innovative technologies for sustainable development, but also initiatives such as beekeeping. VSB-TUO has received prestigious awards both at the Moravian-Silesian regional level and nationally for its systematic application of social responsibility principles, confirming its leading role in this area. Moreover, the new building of Faculty of Economics was evaluated by National tool for building quality certification and has achieved the silver quality certificate for its high proportion of renewable energy produced, the use of certified and health-safe materials, high user comfort, especially indoor air quality, and the participation of the building's target users.

Through this strategy, VSB-TUO strengthens its position as a leader in social responsibility among universities and actively contributes to the sustainable development of the region and society as a whole.

A knowledge transfer system

Knowledge transfer at the University is the process of transferring research and innovation results from the academic environment to society, industry, and the public sector. The aim is to maximise the social and economic impact of scientific knowledge, support innovation, and increase the University's competitiveness. The key pillars of the knowledge transfer system include the [Technology Transfer Centre](#) (TTC – VSB-TUO), which specialises in assisting researchers with intellectual property protection, licensing, and commercialisation of research results. An integral part of the system is also collaboration with the application sector, including partnerships with companies and institutions on joint projects and research, organising and participating in conferences, workshops, and meetings that bring together scientists and entrepreneurs both in the Czech Republic and internationally. Open Science is also an important part of the system. **VSB-TUO promotes open access policies** to make scientific results accessible to the wider public, not just the academic community. As part of science popularisation, the University organizes numerous educational events (both expert and outreach activities for all age groups, from children to seniors), public lectures, and collaborates with the media. Knowledge transfer to the public sector is also common, through cooperation with government and institutions in the application of scientific knowledge to public policy.

Key indicators of success include the number of patents, licensing agreements, spin-off companies, the volume of contract research, and the number of joint publications with industry. This system creates a cohesive innovation environment that enables the university to effectively transfer research results into practice, support economic growth, and contribute to societal development. The knowledge and technology transfer system at VSB-TUO is developed and managed by the Technology Transfer Centre (TTC – VSB-TUO), together with the Commercialisation Board.

The activities of the Technology Transfer Centre (TTC – VSB-TUO) are divided into three main areas:

- Protection of Intellectual Property (IP) – [Protection of intellectual property - Technology Transfer Centre VSB-TUO](#)
- Support for the [commercialization of R&D results](#) (including [Proof of concept](#))
- Support for innovation and entrepreneurship (including [spin-off creation](#)).

These activities are carried out by the internal experts and staff of the Technology Transfer Centre (TTC). Collectively, TTC's activities form a system of interconnected services primarily designed for

academic and R&D&I staff.

The commercialisation process of R&D&I results is managed by the TTC from the identification of the commercial potential of the result to its practical application. Maximising the effective application of high-potential R&D results in the industry is ensured by an established technology transfer support process involving IP specialists, business development managers, and legal representatives. TTC closely collaborates with faculties and university institutes in the field of technology transfer. The most common way of commercialising R&D results is through licensing. However, the exploitation of results by university spin-off companies is also supported. TTC's activities include educating researchers on IP-related issues, providing consultations, organising workshops, and more.

Since 2019, the Georgius Agricola Patent Fund has been used to finance technology transfer activities, supporting several new R&D results in the intellectual property protection process.

The Commercialisation Board monitors and evaluates the commercialisation system. It acts as a supervisory, advisory, and decision-making body of VSB-TUO within the TTC on matters of technology transfer and industrial cooperation. The Board provides feedback to the TTC to improve commercialisation activities, in particular through its expert opinions, and decides on support for specific proof-of-concept activities.

VSB-TUO has also established the Industrial Board as an advisory body to the Rector to strengthen the university's links with the business community.

The TTC is a member of the [Transfera.cz](https://transfera.cz) platform, a unified functional network representing the interests of the technology transfer community in the Czech Republic and working to strengthen and develop technology transfer activities.

The third role, the transfer of R&D&I results to society and interaction with local actors

The third role primarily concerns the university's social responsibility. In recent years, VSB-TUO **has received several regional and national awards for its achievements in the area of social responsibility**. In the VSB-TUO [Strategic Plan for 2021–2027](#), Operational Objective 7.7 was set to strengthen the implementation of third-role activities towards the external environment.

This is achieved through lifelong learning programmes, public events, with a special focus on science popularisation, seminars, cultural programmes, summer schools, and active cooperation with the city and the region, among other activities. Examples include: Junior University, Researchers' Night, SciTea, TechnikaRun, and the University of the Third Age.

The transfer of R&D&I results to civil society takes place through the dissemination of the latest knowledge and technologies in the form of studies, analyses, patents or licenses, as well as through the provision of expert services, consultancy and research in key areas. University staff also disseminate knowledge through media appearances. The results of R&D&I are made available to civil society through the VSB-TUO institutional repository DSpace. Research data is made publicly accessible through the general repository Zenodo.

Interaction with local stakeholders takes place through cooperation between scientific teams and local industrial and business partners, as well as public administration. When it comes to interacting with the non-scientific public within the framework of Citizen Science, VSB-TUO is still in the early stages. The University is currently in the process of clarifying terminology and exploring opportunities (e.g. the Director of the Central Library shared his Citizen Science experience during an Erasmus stay in Spain). There is no official record of projects or activities in the field of Citizen Science at VSB-TUO yet. An example of interaction with regional institutions is the university's involvement in the Moravian-Silesian Region during the COVID-19 pandemic, when VSB-TUO produced disinfectants for critical infrastructure facilities (hospitals, retirement homes, police and fire departments) during a supply shortage. Despite the university being closed, VSB-TUO staff produced almost 30,000 litres of alcohol-based disinfectant on campus, which was distributed throughout the region. Similarly, a 3D print farm was set up to produce face shield

components during a market shortage.

The concept of research data management

A unified approach to research data management has not yet been centrally established at VSB-TUO. However, in the field of research data management, the university data steward (VSB-TUO Central Library) has prepared an initial methodology for researchers, which is available upon request. The second version of this methodology is currently being prepared and will be published on the library's website and in the DSpace repository once it has been updated. In addition, Faculty/Institute Data Stewards have begun to work within individual University units to provide support to researchers and academics in this area.

Currently, researchers store their data on their personal computers, portable media, or cloud storage, and they upload the data themselves to the selected repository, where it is assigned persistent identifiers and licenses upon submission.

Researchers are responsible for their own datasets, but before final publication, they have the option to request a data steward to review the data for compliance with the FAIR principles.

Ethics and personal data protection

Ethics and data protection are key to the sustainability and resilience of science and research at the university, ensuring transparency, credibility, and social responsibility in academic activities. Research at VSB-TUO is conducted with respect for human rights and in compliance with personal data protection regulations, such as GDPR, including anonymisation and secure storage of information. VSB-TUO promotes ethics through its ethics committees, researcher training (including courses offered by the PhD Academy), and internal codes of conduct. The sustainability of research at VSB-TUO also includes responsible data sharing, progressive implementation of open science principles, and efforts to minimise environmental impact.

Ethics and data protection are systematically integrated into the university's long-term research strategy to strengthen research excellence and its practical benefits for society and the environment.

Intellectual property protection

If an employee creates intellectual property in the course of his or her work, he or she is required to report it to the employer. If a student has an employment relationship with the University, this obligation to report also applies to the student. The registration of intellectual property created at VSB-TUO is handled by the Technology Transfer Centre (TTC) [Protection of intellectual property - Technology Transfer Centre VSB-TUO](#).

The Technology Transfer Centre (TTC) deals with all types of protection allowed by Czech law. It is possible to register a patent, utility model, industrial design, or trademark with the TTC. The TTC also registers intellectual property that is not subject to protection by intellectual property organisations, such as pilot plants, verified technologies, prototypes, functional samples, results incorporated into legislation and standards, software, and more. For these types of solutions, there is no obligation to conduct a prior search.

The University is the owner of the intellectual property created, not the employee or student. Registration is done by filling in the appropriate forms provided to employees by the Technology Transfer Centre (TTC). In the case of co-ownership, inventors are required to submit co-ownership agreements relating to the subject matter of the future protection. In the case of solutions intended for protection, due to the diversity of fields at the university, the inventors conduct the initial prior art search. Forms, searches, and agreements are stored at the Technology Transfer Centre (TTC).

When submitting the documents, the creators of the intellectual property choose whether to use

the services of internal TTC specialists or external experts for securing protection. The TTC can internally manage the entire protection process in the Czech Republic, including drafting patent or other applications and maintaining the protection. If external experts are used, the TTC can still manage communication throughout the entire protection and maintenance process.

The entire process of intellectual property protection at VSB-TUO is formally described in the University's internal regulations.

The Technology Transfer Centre (TTC) also provides consultations to university clients on the appropriate type and protection strategy, legal aspects of intellectual property protection, and practical guidance on filling in forms and other related activities.

Ensuring institutional resilience

The institutional resilience of a technical university is demonstrated across in a variety of areas and situations. Here are some examples:

- **Transition to online teaching:** For example, during the COVID-19 pandemic, to ensure the continuity of education, which involved not only technical infrastructure but also training for teachers and support for students in adapting to new forms of learning.
- **Supporting research and innovation:** Investing in modern research infrastructure and supporting interdisciplinary collaboration to ensure the ability to respond to new challenges and opportunities (e.g., artificial intelligence, quantum computing).
- **Health and safety:** The University implements measures to protect the health and safety of students, staff, and visitors (e.g., restricted access to certain areas for staff and students only). An essential part of institutional resilience is also cybersecurity, which is primarily regulated by the Act No. 181/2014 Coll., on Cybersecurity and the Amendment of Related Acts, as amended, and Decree No. 82/2018 Coll., on Security Measures, Cybersecurity Incidents, Reactive Measures, Requirements for Submissions in the Field of Cybersecurity, and Data Disposal.
- **Financial stability:** The University strives to ensure financial stability through the diversification of income sources (both public and private funding). This diversification helps to mitigate the impact of fluctuations in public funding.

Digitization and the use of smart technologies.

Digitalisation is primarily focused on automating processes for university operations management (digitisation of orders, travel orders, invoicing orders, automation of the approval process - matrix of delegations of authority, etc.) and research support (e.g., R&D Portal, see chapter 4.2; pilot implementation of the system for digitisation of habilitation procedures). The aim is to create "paperless" processes, enabling the majority of administrative activities to be carried out electronically, making maximum use of already collected data.

The institutional strategy for Open Science 2.0/Open Access

An institutional Open Science strategy at VSB-TUO has not yet been established. The issue of Open Access is currently covered by the directive TUO_LEG_15_004 - Open Access Policy to Scientific Information. In addition to the obligation to openly publish scientific results and research data - which may be required by funding bodies (such as the European Commission, Czech grant agencies, or operational programmes) - this internal directive also recommends that researchers store their research data in the institutional repository DSpace or in repositories designated for research data storage.

The Central Library collects information on APC (Article Processing Charges) payments and submits

this data to the OpenAPC database. <https://treemaps.openapc.net/apcdata/tu-ostrava/>
VSB-TUO operates an institutional repository, DSpace, which is managed by the Central Library. The repository stores:

- University theses and dissertations,
- articles from the VSB-TUO Proceedings of Scientific Papers,
- articles from journals published at VSB-TUO,
- VSB-TUO publications in journals indexed in Web of Science,
- documents from the European Documentation Centre,
- study materials for the e-learning portal,
- VSB-TUO annual reports.

A system for training undergraduate and postgraduate students as well as staff in the field of intellectual property protection and technology transfer

The [Technology Transfer Centre](#) (TTC) is responsible for delivering two [PhD Academy](#) courses in the field of science and research management. The course "Intellectual Property 360: Protecting Innovation Capital and Its Potential" focuses on the fundamentals of intellectual property protection and the process of securing protection at both national and international levels. The course "Innovation Compass: Discover the World of Technology Transfer and Scientific Entrepreneurship" provides participants with better insight into market analysis, choosing suitable commercialization strategies, and the key elements of presenting a scientific idea to investors or commercial partners.

In 2024, the Technology Transfer Centre (TTC) launched the pilot edition of the [Transfer Academy](#). This is an educational module consisting of five workshops designed for academic staff, researchers, and PhD students. The first edition focused on the following topics: Market Research (effective market analysis and identification of research opportunities), Commercial Potential Assessment (methods for evaluating the readiness of a product/technology for market entry), Marketing of R&D Results (approaches to marketing and promoting scientific findings), Presentation Skills (communication with investors, elevator pitch), Success/FuckUp Stories (basic forms of transferring results into practice - contract research, spin-offs, licensing - including real examples of both successes and failures in the field of technology transfer).

The Technology Transfer Centre (TTC) also regularly organises **expert seminars for staff and PhD students on topics such as:**

- **Artificial Intelligence and Intellectual Property** – legal challenges and questions about ownership of AI-generated works and how these technologies affect current legislation, including the EU AI Act.
- **Intellectual Property Infringement** – issues relating to copyright and patent infringement, enforcement of rights, and legal remedies.
- **Copyright Law** – student works and staff works – protection of creative works in the university environment.
- **Technology Transfer and Contracting** – contract types and key principles for drafting and signing agreements.
- **How to Successfully License Software** – legal protection of software and licensing aspects (proprietary vs. open licences).
- **Open Science and Commercialization of Research Results** – a systematic approach to the management of research results, with a particular focus on open access.

Examples:

Statistical Data on DSpace Repository Usage

The DSpace repository receives approximately 100,000 users per year (based on Google Analytics data), with the following geographic distribution: 75 % from the Czech Republic, 4.6 % from Slovakia, 3.45 % from the United States, 1.4% from Singapore, 1.4 % from the United Kingdom, 1.4 % from Canada, 1.3 % from Germany.

☐	Země	Aktivní uživatelé
☐	Celkem	100 396 100 % z celku
☐	1 Czechia	75 535
☐	2 Slovakia	4 563
☐	3 United States	3 480
☐	4 Singapore	1 442
☐	5 United Kingdom	1 380
☐	6 Canada	1 366
☐	7 Germany	1 362
☐	8 Ireland	1 247
☐	9 New Zealand	1 216
☐	10 Australia	1 215

The university repository contains approximately 130,000 records (primarily theses and dissertations). Number of records in specific communities (research publications):

- OpenAIRE: [5039]
- Journals Published at VSB-TUO: [2648]
- PhD Academy: [2]
- VSB-TUO Research Publications: [7924]
- Proceedings of Scientific Papers of VSB – Technical University of Ostrava: [5302]
- Study Materials in E-learning Collections: FE [22], FSE [13], FEECS [43], FMST [67], FME [26], FCE [26], FMG [24].

PERSONNEL POLICY

4.5 Structure of human resources

The HEI shall describe the current state, age structure, degree of internationalization and development trends of the staff involved in R&D&I, along with their distribution by a job title and gender for the period of 2020–2024 as detailed in annex tables (Tables 4.5.1 to 4.5.3) (including the provision of technical and economic facilities).

Maximum 1000 words.

Comparing the adjusted staff numbers for the years 2020 and 2024, there are no significant changes. Some categories show slight variations that can be attributed to organisational changes, such as the integration of the CPIT department into the Faculty of Materials Science and Technology (FMST) and the merging of university institutes (CNT, IET, ENET, VEC) into a single entity, CEET.

A more detailed analysis shows that since 2020, there has been an increase in the number of professors and research staff outside other categories. On the other hand, there has been a decrease in some categories, such as assistant professors and research, development and scientific staff involved in teaching. This decrease is partly due to the reclassification of staff into the researcher and lecturer categories, which contribute to a more efficient use of human resources.

The most significant increase was recorded in the number of international staff across all categories. This trend is driven by new opportunities, such as major R&D projects, which allow greater involvement of foreign experts. These employees include top scientists, who attract other prominent figures in their fields. This increase remains evident even after excluding staff from the Slovak Republic for the purposes of these analyses.

In terms of age groups, compared to 2020, there has been a slight increase in the proportion of women under 29 among research staff. The percentage of professors, including female professors, aged 40 to 49, and associate professors aged 50 to 59 has also increased. In 2024, the number of early-career researchers in the 20 to 29 age group rose, largely due to new opportunities within large international projects. On the other hand, the number of associate professors (docents) decreased, partly due to their academic advancement to higher positions (i.e. professors), but also due to natural retirements and team rejuvenation at some faculties. The number of assistant professors has also declined as these employees were reclassified into senior assistant professor or lecturer categories. There was a decrease in senior assistant professors, with greater use of the lecturer category.

4.5.1 Staff involved in R&D&I of the university (FTE) in the period under review

Academic/professional position	Total 2020	Of which women [%]	Of which foreign [%] ²⁹²	Total 2024	Of which women [%]	Of which foreign [%]
Professor	97,60	21,27	0,8	103,16	22	2
Associate Professor	217,17	25,1	0,6	180,41	25	0,7
Assistant Professor	477,08	41,13	0,3	435,37	37	0,5
Assistant	7,96	20,11	0	3,1	13	0
R&D Personnel ²⁹³	58,64	15,61	12	45,53	17	22
Researchers in other categories ²⁹⁴	303,86	24,63	10	310,02	25	18

²⁹² Researchers with Slovak citizenship are not considered foreign.

²⁹³ The category "Other scientific, research and development personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

Technical and economic staff²⁹⁵	1043,87	64	0,2	1047,24	64	0,4
Early career researcher²⁹⁶	113,19	33	4	104,07	23	7
Scientific, research and development staff involved in teaching activities	809,25	34	0,4	730,39	32	0,7
Total number of foreign nationals	84,44	28,97	49	124,02	28	63

Note: The categories professor, associate professor, assistant professor, assistant, other scientific, research and development staff, scientific staff not falling into other categories and technical and economic staff are mutually exclusive, i.e. one staff member is reported under one category only. Scientific, research and development staff involved in teaching activities, as well as early career researchers are reported collectively for all the above-mentioned categories.

Note: The average number of hours worked is calculated as the ratio of the total number of hours actually worked during the reference period, from 1 January to 31 December, by all staff (including agreement on work activity, excluding agreement on work performance) to the total annual working time pool per full-time employee. The full-time status of the worker in the evaluated unit is always reported. If an employee holds more than one type of full-time job within the evaluated unit, the total sum of the two shall be reported.

4.5.2 Percentage of HEI's staff involved in R&D&I, categorized by age structure, job title, and gender in the year 2020 (number of physical employees and staff)

Academic/ professional position	Under 29 years [%]		30-39 years [%]		40-49 years [%]		50-59 years [%]		60-69 years [%]		70 years and over [%]	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0	0	18	12	17	32	40	48	25	8
Associate Professor	0	0	11	1	37	41	27	34	22	20	4	3
Assistant Professor	5	3	35	30	36	39	17	21	7	6	0,2	0
Assistant	10	0	40	33	30	33	20	33	0	0	0	0
Early career researcher²⁹⁷	3	0,6	72	22	18	9	5	2	2	0,6	0	0
R&D Personnel²⁹⁸	58	60	17	20	21	0	0	0	4	20	0	0
Researchers in other categories²⁹⁹	32	28	39	51	16	11	5	6	3	3	5	1
Technical and economic staff³⁰⁰	5	3	18	18	32	35	32	34	12	9	1	1
Scientific, research and development staff involved in teaching activities	3	3	24	22	34	38	17	24	15	12	4	1

Note: The total number of employees/workers as of 31.12. of the calendar year in question is to be given, irrespective of the proportion of full-time equivalents, but only in an employment relationship, i.e. not including persons working parttime agreements. Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

²⁹⁴ The category "Researchers not falling under other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

²⁹⁵ Who participates in the management and support of R&D&I in the institution.

²⁹⁶ See Definition of Terms in Methodology HEI2025+.

²⁹⁷ See Definition of Terms in Methodology HEI2025+.

²⁹⁸ The category "Other scientific, research and development personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

²⁹⁹ The category "Researchers not falling under other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

³⁰⁰ Who participates in the management and support of R&D&I in the institution.

4.5.3 Percentage of HEI's staff involved in R&D&I, categorized by age structure, job title, and gender in the year 2024 (number of physical employees and staff)

Academic/ professional position	Under 29 years [%]		30-39 years [%]		40-49 years [%]		50-59 years [%]		60-69 years [%]		70 years and over [%]	
	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women	Total	Women
Professor	0	0	0,8	0	28	24	26	32	31	36	14	8
Associate Professor	0	0	9	6	35	25	29	42	21	25	6	2
Assistant Professor	2	2	32	24	37	37	17	23	10	12	0,8	0,6
Assistant	40	0	20	0	0	0	0	0	0	0	0	0
Early career researcher ³⁰¹	36	14	68	12	17	6	8	4	2	0,7	0,7	0
R&D personnel ³⁰²	72	82	16	18	6	0	3	0	0	0	3	0
Researchers in other categories ³⁰³	23	22	42	45	22	24	6	3	4	3	4	3
Technical and economic staff ³⁰⁴	5	4	16	13	31	35	33	35	14	13	1	0,1
Scientific, research and development staff involved in teaching activities	2	2	22	18	36	35	21	27	16	17	4	2

Note: The total number of employees/workers as of 31.12. of the calendar year in question is to be given, irrespective of the proportion of full-time equivalents, but only in an employment relationship, i.e. not including persons working parttime agreements. Other types of contractual relationships under the Civil Code that involve purchase of services are not included.

³⁰¹ See definitions in Methodology HEI2025+.

³⁰² The category "Other scientific, research and development personnel" includes technical and professional personnel who are not directly involved in R&D&I but are indispensable for the research activity (e.g. operators of research facilities).

³⁰³ The category "Researchers not falling under other categories" includes all other staff who cannot be classified under any of the above categories (e.g. independent researcher/scientist).

³⁰⁴ Who participates in the management and support of R&D&I in the institution.

4.6 Academic and Research Careers

The HEI will briefly describe the central system for HR recruitment, placing particular emphasis on recruitment from outside the HEI, especially from abroad, as well as system of career development of academic and research staff, if such system exists. Information will be provided on:

- Career development rules and legislation related to the recruitment and career development of domestic and foreign employees (e.g. Career Code, HR Award, OTMR policy, etc.).
- International tenders.
- The process of new employee adaptation and mentoring.
- Transparent distribution of institutional time, attitudes towards chaining of contracts and senior academic positions.
- Rules for filling senior positions in the context of R&D&I.
- The rules and support system of sabbaticals.
- Measures for the return of workers after a stay in an external workplace, including a foreign workplace.
- Arrangements for workers to return after maternity/parental leave or other career breaks (e.g. caring for family members).
- Other relevant information at HEI discretion.

The HEI shall provide a reference to an existing career code or similar document (if one exists). The HEI shall describe the effectiveness of the systems used with examples (e.g. a model example of the adaptation process, a specific anonymised example of an academic's career path, statistics on the return after maternity/parental leave or career breaks before and after the implementation of the measures, etc.). *Maximum 300 words per point.*

Career development rules and legislation related to the recruitment and career development of domestic and foreign employees

Employees are recruited in accordance with the [Selection Procedure Rules for Academic Staff and Designated Employees of VSB – Technical University of Ostrava](#). Calls for applications are published on the University's website in the [Job Opportunities](#) section. This section also provides information that the University is a holder of the HR Excellence in Research Award (HR Award) and applies the principles of the European Charter for Researchers. The [OTM-R](#) (Open, Transparent, and Merit-Based Recruitment) principles applied in recruitment are published in the document VSB-TUO OTM-R Policy. All information is also available in English. Selected positions are advertised in English on ResearchJobs, Euraxess, and jobRxiv.

In accordance with the Selection Rules, selection committees are appointed by the announcing authority, and a record of the selection process is prepared. Applicants are subsequently informed of the results.

International tenders

Selection procedures with international participation are conducted in English.

An employment contract is concluded with the selected candidates. In the case of international candidates, the preparation of the contract is handled by a specialized HR officer. Additionally, international employees can request assistance from the [International Contact Point](#) staff to help with arrangements related to living in the Czech Republic.

The process of new employee adaptation and mentoring

After the employee's arrival, an adaptation process follows, which is described in the document "Adaptation Process of VSB-TUO".

The rules for the career development of academic and research staff are defined in the [Career](#)

[Regulations for Academic and Research Staff of VSB-TUO](#), which outlines the career paths, opportunities for growth and development, as well as possible career changes. The Career Plan form is part of the performance evaluation system for academic and research employees.

Transparent distribution of institutional time, attitudes towards chaining of contracts and senior academic positions

Employees have a clear separation of institutional and project workload within their contracts and funding. Fixed-term contracts may only be extended in accordance with the exceptions laid down in the Collective Agreement.

Management positions are filled in accordance with the Selection Procedure Rules. The term of office for academic and research staff in leading positions roles at faculties and university institutes is determined by the statutes of the respective units.

The rules and support system of sabbaticals

The conditions for taking sabbatical leave are defined in the VSB-TUO Work Regulations, the Collective Agreement, and the [Internal Salary Regulations](#).

Arrangements for workers to return after maternity/parental leave or other career breaks

With respect to return of workers after maternity/parental leave of any other career breaks, there are at the moment no system arrangements set, however in 2025 the University has started with preparation of a system tool to provide financially support especially to researchers/academics after such a break.

4.7 Gender equality measures

The HEI will briefly describe the measures relating to the application of gender equality in the areas required for assessment criteria 4.5, 4.6, with an emphasis on:

- Gender equality in recruitment and career development.
- Legislation and documents regulating gender equality (e.g. Gender Equality Plan, Action Plans, strategic documents for equality, including links to overarching strategies, etc.).
- The filling of leadership positions (including gender balance in leadership positions, see Table 4.7.1).
- Nominations to professional bodies.
- Evaluation and remuneration.
- Measures to reconcile the work and family life of researchers (flexible working hours, flexible forms of work, maternity/parental leave management, facilitating child/dependent care, age management in relation to gender).
- Measures to eliminate negative workplace behaviour such as mobbing and sexual harassment.

The HEI shall provide evidence of the examples from practice (e.g. use of flexible working hours, dealing with cases of mobbing or sexual harassment, compliance with the principles of gender equality in HEI professional bodies, etc.).

Maximum 300 words per point.

The basic principles of gender equality applied at VSB-TUO are published on the university website in the [Equal Opportunities](#) section. The University has developed a [Gender Equality Plan](#) for the period 2022–2026, which is evaluated annually. Equal treatment is applied in all processes, including recruitment, career development, appointment to leadership positions and university bodies, employee evaluation, and remuneration. All procedures are based on clear criteria that

take into account qualifications, experience, and job performance, regardless of gender.

The University supports the work-life balance of its staff in a number of ways, with more detailed information available in the [Promoting Equal Opportunities](#) section of the website. These include options such as part-time contracts, flexible working hours, extended vacation for non-academic staff, access to the University kindergarten, and the organization of leisure activities for employees' children.

Negative behaviour will not be tolerated at the University. The key characteristics of inappropriate behaviour, together with information on prevention and how to address potential cases, can be found in the [Discrimination and Inappropriate Behaviour](#) section of the website. In 2023, a series of training sessions on inappropriate behaviour was held. Employees can also provide feedback on this issue during the annual employee satisfaction survey and have access to the e-learning course "Social Safety".

The University has established the position of an ombudsperson, with basic information available to both staff and students on the University's [website](#).

4.7.1 Gender balance in management positions

Senior staff	2020		2024	
	Men	Women	Men	Women
Rector	1	0	1	0
Vice-Chancellor	2	2	2	2
Dean ³⁰⁵	6	1	5	2
Academic Senate	30	8	26	12
Scientific/Artistic/Academic Council	33	7	38	7
Quaestor (Bursar)	0	1	0	1
Board of Directors	10	1	11	1

Note: If one person holds more than one of these positions within the HEI, he/she will be counted in each.

4.8 Mobility of academic and research staff (including sectoral and inter-sectoral mobility)

The HEI shall describe in a concise and structured manner its strategies and objectives for the mobility of academic and research staff (including PhD students), with particular emphasis on mobility related to the development of excellent science and interdisciplinary (intersectoral) mobility. The HEI shall identify potential barriers to mobility, including gender-based barriers. The HEI shall provide information on long-term stays abroad by its own academic staff or, conversely, by foreign staff at the HEI being evaluated.³⁰⁶

The achievement of the set objectives will be demonstrated by the HEI by describing specific examples of mobility or by brief statistics on mobility during the period of 2020–2024.

Maximum 500 words plus 200 words for each example given (max. five examples with a specific description of the relevance of mobility to the stated objectives).

VSB-TUO supports the professional development of both academic and non-academic staff. The mobility of academic and research staff can take place in any field or academic discipline. VSB-TUO promotes mobility not only within Europe but also with third countries. Employees have the

³⁰⁵ or other head of a relevant work unit of a higher education institution under Section 22(1) of the Higher Education Act performing R&D&I activities, regardless of the designation.

³⁰⁶ Long-term mobility means an uninterrupted period of more than three months.

opportunity to develop existing partnerships, establish new collaborations, submit joint research projects, and share best practice with colleagues around the world. This strengthens the university's international reach and creates new opportunities for cooperation in science and education. VSB-TUO also supports the development of other forms of international mobility, including virtual and blended mobility, and strives for efficient administration with a focus on process digitalisation. In addition to sending its own staff abroad, VSB-TUO supports an increase in the number of international PhD students, academics, and researchers, who bring new perspectives and knowledge, thereby enhancing the university's scientific, research, and teaching capacities. This process also contributes to regional development, as some international experts and students choose to stay in the region on a long-term basis. The University is also a member of the [UIREKA](#) European University Alliance, which promotes international cooperation in education, research, and innovation. Membership in this alliance allows for experience and best practice sharing among partner institutions, support for joint projects, and the creation of new opportunities for students and academic staff. The main barriers to staff mobility (regardless of gender) within or outside the EU are typically insufficient foreign language skills or financial constraints at the departmental level if the mobility is not fully funded by the programmes mentioned above.

Examples:

1. Erasmus+

VSB-TUO staff have the opportunity to receive funding for mobility to Erasmus+ programme countries. Participation is based on the results of a selection procedure. VSB-TUO enables non-academic staff to gain international experience through training at a partner university or another relevant organisation abroad (excluding conferences) or by job shadowing staff at the host institution. Academic staff can teach at a partner university abroad. PhD students can also use the Erasmus+ programme to fund an international mobility. The University provides scholarships for stays of 5-30 days or 2-12 months. Selection is based on the outcome of the selection process.

2. Staff Mobility Outside the EU - Internationalisation Programme

Staff trips outside the EU (to countries such as Japan, Taiwan, India, Colombia, Peru, etc.) have contributed significantly to the development of cooperation and the signing of new partnership agreements. One of the funding options for such trips at the University is the Internationalisation Programme, which has been in place since 2018. Staff members are selected through a competitive selection process.

3. PhD Students

PhD students can use the VSB-TUO Scholarship Program for study stays, internships, or summer schools outside the EU. The stay must last at least 1 month and up to 12 months. Students are selected on a competitive basis. In these cases, students may also receive an additional faculty scholarship to help cover costs.

4. [International Contact Point](#)

VSB-TUO recognises the challenges of the adaptation process and, therefore, through the International Contact Point Office, faculty International Offices, and collaboration with student organizations (such as ESN), creates a welcoming and supportive environment for students. The International Contact Point serves as a central contact point for international students, academics, and researchers, providing them with comprehensive support during their stay in a new country. Key areas of assistance include:

- Completion of arrival-related formalities
- Assistance with visa and residence permit processes

- Guidance on healthcare, including registration with doctors and health insurance
- Assistance in dealing with various institutions

In addition to administrative support, the International Contact Point also helps with academic and social integration. It assists students and academics in understanding local regulations and cultural norms, organises information sessions, workshops, and social events to facilitate networking and community integration.

RESEARCH INFRASTRUCTURE

4.9 Research infrastructure

The HEI will describe the system for acquiring/optimizing expensive instruments and equipment, as well as refurbishing outdated expensive instruments. The HEI will also briefly present the internal organisation of the research infrastructure (including technology, expensive instruments, and instrumentation)³⁰⁷. The HEI will describe the system of sharing (including external research entities) of instruments and instrumentation, including expensive instruments and instrumentation units, referred to as 'core facilities' (if such a system exists). The HEI will demonstrate the effectiveness of the systems with examples (e.g., specific instruments acquired/optimised and their relevance to the achievement of research objectives, examples of sharing of expensive instruments and instrumentation, statistics on sharing of expensive instruments and instrumentation, etc.). The HEI will briefly comment on the data in Table 4.9.1.

The HEI shall also indicate whether it hosts large research infrastructure projects. The name and a brief description will be provided.

Maximum 500 words plus 200 words for each example given (max. five examples).

VSB-TUO applies a systematic approach to the acquisition, renewal, and sharing of research infrastructure with the aim of maximising investment efficiency and supporting high quality scientific work. An investment plan is prepared annually and updated several times during the year. This procedure is described in the process Z4.1 Investment Management. The foundation of the investment plan is based on requests from individual faculties and research institutes, where team leaders, faculty management, and departments set priorities, identify funding sources, and schedule purchases. At the same time, alignment with the University's research priorities and Strategic Plan is evaluated. The Investment Activities Plan is discussed and approved by the University management and then presented to the [Academic Senate](#) and the [Administrative Board](#). As part of the [Implementation Plan of the VSB-TUO Strategic Plan](#), the University prepares an Outline of the Investment Activities Plan for the calendar year, which includes and describes the major investment projects, including plans for the acquisition of machinery and equipment. This plan is also subject to discussion and approval by the university management, [Academic Senate](#), and [Administrative Board](#).

All procurement of instruments and equipment is carried out in accordance with the Public Procurement Act and the University's Public Procurement Directive. Funding is provided through a combination of internal resources and national and European grant programmes (e.g., OP ST, OP JAK, TACR, GACR, Horizon Europe). When renewing equipment, emphasis is placed on modularity and compatibility with existing technologies in order to extend its lifespan and broaden its applicability.

The research infrastructure includes specialised centres, laboratories, and technological platforms that group equipment according to their disciplinary focus. Selected research infrastructures

³⁰⁷ The definition of research infrastructure is set out in the Framework for State Aid for Research, Development and Innovation (2014/C 198/01) and Commission Regulation (EU) No 651/2014 of 17 June 2014 declaring certain categories of aid compatible with the internal market in accordance with Articles 107 and 108 of the Treaty.

include, for example: Mobility Lab, Signal Lab, Home Care, Smart Factory, Protolab, Materials-Envi Lab, Advanced Nanomaterials Laboratory, Thermochemical and Hydrogen Conversion, EBEAM, and the Simulation Technology Centre. Each centre has a designated manager who is responsible for the operation, maintenance, and optimisation of equipment usage. Access for external research entities (both academic and industrial partners) is provided through contract or collaborative research agreements.

In relation to the Table 4.9.1. there were several milestones in the acquisition of specific expensive instruments/equipment/laboratories for R&D&I at VSB-TUO which are reflected in the table:

- [Testbed CPIT TL3](#) including [Smart Factory Lab](#), Mobility Lab, Health Lab (in the Table in 2020-2021)
- [Karolina Supercomputer](#) in 2021
- [Energy Polygon – CEETe](#) (2022-2023)
- [Quantum Computer](#) (2024-2025)

VSB-TUO hosts the following Large Research Infrastructures of the Czech Republic:

1. [ENREGAT](#) – Energy Waste Recovery and Gas Treatment, LM2018098 (2019-2022), LM2023056 (2023-2026),

The research infrastructure ENREGAT is located at the IET research centre, part of CEET VSB-TUO, and has been included in the Roadmap of Large Research Infrastructures of the Czech Republic (Energy area) since January 2019. ENREGAT is available free of charge in open access for the broader scientific community. Commercial customers can utilize ENREGAT under a collaborative or contractual research framework.

The ENREGAT research infrastructure represents a unique basis for conducting comprehensive research on waste incineration processes, energy and material recovery from waste by pyrolysis, anaerobic digestion, and gas treatment technologies based on catalysis, adsorption, and photocatalysis principles, including related areas and complex analytical services. The uniqueness of ENREGAT lies in providing facilities for both basic and applied research, supporting projects from laboratory experiments to pilot plant scale.

Between 2019 and 2023, services in open-access mode were provided to 413 users, including 92 international researchers. In addition, 78 students completed their theses using ENREGAT. Users and operators produced 112 high-impact articles in journals ranked Q1 and Q2 (WoS), 5 patents, 8 pilot plants and verified technologies, and 8 functional samples. The infrastructure was used for 160 contract research projects and 55 collaborative research projects.

2. [E-INFRA CZ](#), 2020-2026

The CAPEX, OPEX, and related research and development are financed by:

1. e-Infrastructure CZ (LM2018140), 2020-2022
2. e-Infrastructure CZ II (LM2023054), 2023-2026
3. e-INFRA CZ: Modernisation (CZ.02.1.01/0.0/0.0/18_072/0015659), 2020-2022
4. Modernisation-INFRA_CZ_II (CZ.02.01.01/00/23_016/0008329), 2023-2026
5. IT4Innovations – Path to Exascale (CZ.02.1.01/0.0/0.0/16_013/0001791), 2017-2022

The **e-INFRA CZ** is a unique e-infrastructure for research and development in the Czech Republic, providing capacities and resources for the transmission, storage, and processing of scientific and research data. It provides a transparent environment with a comprehensive portfolio of ICT services essential for modern research. The e-INFRA CZ consortium comprises three main partners: CESNET, CERIT-SC, and IT4Innovations. These entities collaborate to build and modernize the national research e-infrastructure, ensuring that it meets the evolving needs of the research

community.

IT4Innovations provides supercomputing resources of the supercomputers LUMI (531,5 PFlop/s), Karolina (15.7 PFlop/s), and Barbora (849 TFlop/s) for academia and industry, **CESNET** provides data transmission, storage, and processing services while ensuring secure communication and data protection supporting distributed collaborations, and **CERIT-SC** manages national computing and data infrastructure. The e-INFRA CZ also contributes to **training events** (about 40 courses and workshops per year) and the development of advanced computing technologies and methodologies, thus enhancing the overall capabilities of the e-infrastructure.

4.9.1 Summary of expenditure/costs on research infrastructure and equipment for the period under review (including related non-investment and personnel costs).

Costs/expenses in thous. CZK/EUR/year	2020	2021	2022	2023	2024	Total value of assets ³⁰⁸
Costs/expenses related to the acquisition of small fixed assets for R&D&I	7 424/ 292 852	22 106/ 872 015	17 899/ 706 064	12 965/ 511 422	14 921/ 579 012	75 314/ 2 970 963
Cost of repairs and maintenance of equipment	24 549/ 968 392	11 954/ 471 573	8 916/ 351 703	8 020/ 316 354	12 251/ 483 261	65 689/ 2 591 282
Acquisition of tangible (DH) and intangible (DN) assets for R&D&I (investments)						
Of which software	5 880/ 231 971	3 210/ 126 627	3 173/ 125 162	4 768/ 188 091	2 248/ 88 671	19 279/ 760 521
Of which other intangible fixed assets	2 586/ 102 022	1 693/ 66 798	1 796/ 70 831	2 916/ 115 020	0/0	8 991/ 354 671
Of which land, buildings and structures	231 337/ 9 125 712	174 859/ 6 897 777	221/ 8 711	269 811/ 10 643 448	5 797/ 228 684	682 025/ 26 904 322
Other intangible fixed assets (machinery, apparatus, equipment, etc.)	173 909/ 6 860 315	341 075/ 13 454 635	54 911/ 2 166 130	152 260/ 6 006 328	166 360/ 6 562 525	888 516/ 35 045 933
Total infrastructure spending in years³⁰⁹	413 712/ 16 320 019	520 837/ 20 545 837	60 101/ 2 370 834	429 755/ 16 952 877	174 405/ 6 879 880	1 598 810/ 63 069 447

³⁰⁸ Enter the sum of the row.

³⁰⁹ Enter the sum of the column.

FINANCES

4.10 Budget and structure of financial resources

The HEI shall provide and comment on an overview of the total R&D&I budget in the period of 2020–2024, broken down by organisational units of the evaluated HEI and by source of funds (Table 4.10.1). The HEI shall also comment on the shares of total costs/outputs covered by public and non-public sources by type of R&D&I for the period under evaluation as shown in Table 4.10.2.

As complementary data, the university will provide an overview of prestigious research projects obtained during the period of 2020–2024 (ERC³¹⁰, MSCA³¹¹, HHMI³¹², HFSP³¹³, NSF³¹⁴, Horizon Europe³¹⁵, NIH³¹⁶, Wellcome Trust³¹⁷, EDF³¹⁸, OP JAK³¹⁹, OP TAK³²⁰, NPO³²¹, GA ČR³²², TA ČR³²³ etc.). Include information on the amount of funding received and whether the HEI were principal investigator or co-investigator in Tables 4.10.3, 4.10.4 and 4.10.5.³²⁴

In addition, the HEI will describe in more detail up to five of the most important projects from the list of prestigious individual projects abroad (ERC, MSCA, HHMI, HFSP, NSF, etc.), providing basic information at the HEI's discretion and regardless of the funder: title, field of expertise, agency, amount of funding, other project participants, and other relevant information as appropriate.

A maximum of 500 words plus 200 for each example of a prestigious international individual project given.

In the past period, VSB-TUO managed a science and research budget of over CZK 8.4 billion. These funds were efficiently used for both operational and investment expenses, including the funding of scientific infrastructure.

Funding Structure:

- Public sources: 90,2 % of the total R&D budget, of which 84,36 % comes from national programs of the Czech Republic and 5,85% from international sources.

³¹⁰ The European Research Council (ERC) is part of the 'Excellent Science' pillar of Horizon Europe. The ERC funds cutting-edge research by supporting individual Principal Investigators and their research teams.

³¹¹ Marie Skłodowska-Curie Action (MSCA) is part of the "Excellent Science" pillar of Horizon Europe and is also aimed at supporting young researchers, including PhD students.

³¹² Howard Hughes Medical Institute - a non-profit organization in the USA significantly supporting international biomedical research.

³¹³ Human Frontier Science Program - an international programme to support research, particularly in the natural sciences and computer science.

³¹⁴ National Science Foundation (USA).

³¹⁵ Horizon Europe - the EU's 9th Framework Programme for research and innovation, running from 2021-2027.

³¹⁶ National Institutes of Health (NIH) - an agency under the United States Department of Health and Human Services. NHI is a major player in project support for biomedical research.

³¹⁷ major UK private foundation supporting mainly biomedical research.

³¹⁸ European Defence Fund.

³¹⁹ Operational Programme Jan Ámos Komenský - Priority 1 - Research and Development - multiannual programme under the Ministry of Education, Youth and Sports. Within the framework of the OP JAK it is possible to draw financial resources from the European Structural and Investment Funds (ESIF) in the period 2021-2027.

³²⁰ Operational Programme Technologies and Applications for Competitiveness. The European Regional Development Fund (ERDF) is available in the period 2021-2027 to co-finance business projects in the areas of research, development and innovation, digitalisation and digital infrastructure, business development, smart and sustainable energy and the circular economy.

³²¹ National Recovery Plan - under Pillar 5 - Research, Development and Innovation of the National Recovery Plan, the Recovery and Resilience Facility (RRF) is available for the period 2022-2026.

³²² Grant Agency of the Czech Republic.

³²³ Technology Agency of the Czech Republic.

³²⁴ The military and the police HEIs, as parts of the organisational unit of the state, are treated specifically in terms of the possibility to participate in the projects.

- Non-public sources: 9,8 % of the total budget, dominated by contract research revenues and received donations, reflecting active collaboration with industrial partners.

The overall financial structure highlights a strong reliance on public funding, with contract research also playing a significant role. This confirms the University's strategy of diversifying funding sources and encouraging collaboration with external partners.

Main Recipients of Funding:

1. Centre for Energy and Environmental Technologies (CEET) – CZK 2,6 billion
 - 79,31% from public sources in the Czech Republic, 3,05% from foreign sources, 17,65% from non-public sources
 - Strong collaboration with industrial partners and focus on applied research
2. National Supercomputing Center IT4Innovations (IT4I) – CZK 1,62 billion
 - 21,04 % of funding from international public sources – the highest share among all units, 0,86 % from non-public sources
 - Focus on national and international grant programs
3. Faculty of Electrical Engineering and Computer Science (FEECS) – CZK 1,04 billion
 - 89,72 % from public sources in the Czech Republic, 3,13 % from foreign sources, 7,15 % from other sources
 - Involved in contract research and commercial cooperation
4. Faculty of Mechanical Engineering (FME) – CZK 663 million
 - 85,49 % from Czech public funds, 0,18 % from foreign sources, 14,33 % from non-public sources
 - Active collaboration with industry
5. Faculty of Materials Science and Technology (FMST) – CZK 635 million
 - 89,41 % from Czech public sources, 10,10 % from non-public sources
6. Faculty of Mining and Geology (FMG) – CZK 286 million
 - 8,81 % from international public funding, 12,73 % from non-public sources
 - Significant involvement in commercial projects

CEET and IT4I are among the most significant funding recipients, reflecting their strategic role in the fields of energy, environmental technologies, and supercomputing. FME, FMG, and CEET have the highest share of non-public funding (above 10%), reflecting their strong involvement in contract research and industrial collaboration. International public funding is crucial for IT4I and FMG, demonstrating their active participation in international research. The balanced distribution of funding between faculties and research centres supports the diversification of research activities at VSB-TUO.

Five of the most important projects

1. Electron Beam Emergent Additive Manufacturing ([EBEAM](#))

Provider: European Commission

Programme: Horizon Europe ERA Chairs

Budget: € 2 499 500

Duration: 01.01.2024 - 31.12.2028

Principal Investigator: Prof. Dr. Mark H. Rummeli

Partners: Project without additional participants

The main objective of project is establishment of a new excellent Centre for Electron Beam Precision Manufacturing (EBEAM Centre) with international research team led by ERA Chair to help exploit the research potential of the use of electron-beams to fabricate and structure new materials at the atomistic level, This innovative approach will enable precise control of material properties, enhance their functionality, and facilitate the development of new devices, including sensors, energy storage systems, and high-performance electronic devices.

The project is aiming to achieve excellence in science and education while enhancing research potential. It is focussed also on implementation of structural changes in research environment and science management at VSB-TUO initiated by ERA Chair, on support of young researchers and on the increase the international competitiveness of the Institute of Environmental Technology (IET), the Centre for Nanotechnology (CNT), the Faculty of Materials Science and Technology, and VSB-TUO as a whole.

2. EXtreme Analytics for MINing Data spaces (EXA4MIND)

Provider: European Commission

Programme: Horizon Europe

Budget: € 998 392

Duration: 01.01.2023 - 31.12.2025

Principal Investigator: Jan Martinovič, Ph.D.

Partners: Bayerische Akademie Der Wissenschaften, Middle East Technical University, Australo Interinnov Marketing Lab SI, Derquennes Marc Paul Georges, Ceske Vysoke Ucení Technické V Praze, Valeo Autoklimatizace K.S., Sas Alternativ Com

EXA4MIND is building an Extreme Data platform that will integrate large-scale data storage systems with high-performance computing infrastructure through the implementation of new automated data management and efficient data storage solutions. This will enable seamless integration with extreme data sources and support complex and advanced data analysis pipelines for knowledge extraction. The EXA4MIND project, involving three major universities, a research center, SMEs, and the industrial sector, leverages interdisciplinary top-level expertise to develop a modular analytical environment called the Extreme Data Database (EDD). Driven by four representative extreme data application use cases—molecular dynamics, autonomous driving, smart agriculture/viticulture, and health/social big data—the project will support data ingestion and versatile pre-processing. It will develop an “advanced querying and indexing system” with user-friendly interfaces, leveraging high-performance storage and computing infrastructure. Big data from heterogeneous storage systems and database management systems will be made uniformly accessible for processing on European pre-Exascale supercomputers, cloud platforms, and AI-processing systems.

3. AI MAnufacturing Testing and experimenTation network For EuRopean industrieS (AI-MATTERS)

Provider: European Commission

Programme: Digital Europe

Budget: € 789 000

Duration: 01.01.2023 - 31.12.2027

Principal Investigator: Assoc. Prof. Petr Šimoník

Partners: Arena2036 E.V., Alexandra Instituttet A/S, Asociacion De Investigacion Metalurgica Del Noroeste, Brainport Industries Cooperatie Ua, Ceske Vysoke Ucení Technické V Praze, Commissariat A L Energie Atomique Et Aux Energies Alternatives, Engineering - Ingegneria

Informatica Spa, Fondazione Bruno Kessler, Force Technology, Foreningen Odense Robotics, Fraunhofer Gesellschaft Zur Forderung Der Angewandten Forschung Ev, Fundacion Tecnalia Research & Innovation, Instituto Tecnológico De Aragon, Made Scarl, Nederlandse Organisatie Voor Toegepast Natuurwetenschappelijk Onderzoek Tno, Panepistimio Patron, Physikalisch-Technische Bundesanstalt, Teaching Factory Competence Center Upskilling And Training Development And Implementation Of Advanced Technologies For The Manufacturing Industry, Technische Universiteit Eindhoven, Teknologisk Institut, University Of Stuttgart, VSB - Technical University Of Ostrava, Vysoke Ucení Technické V Brně

AI-MATTERS is a network of seven hubs and one satellite, aiming to enhance the resilience and flexibility of the European manufacturing sector by deploying the latest advancements in artificial intelligence (AI), robotics, and intelligent autonomous systems for flexible production. The project's goal is to increase the resilience and flexibility of Europe's manufacturing sector by implementing cutting-edge AI and robotics technologies, along with intelligent, autonomous production systems. Europe requires world-class reference facilities that enable SMEs and larger industries to test their concepts and innovative AI-powered technologies under representative conditions. This initiative, funded under the DIGITAL Europe programme, will support the deployment of innovations in European manufacturing and sectors that suffered during the pandemic crises. AI-MATTERS brings together a consortium of leading organizations from eight European countries: Czech Republic, Denmark, France, Germany, Greece, Italy, the Netherlands, and Spain.

4. Single-Atom Photocatalysts Enhanced by a Self-Powered Photonic Glass Reactor to Produce Advanced Biofuels ([GlaS-A-Fuels](#))

Provider: European Commission

Programme: Horizon Europe

Budget: € 777 500

Duration: 01.03.2024 - 30.09.2027

Principal Investigator: Prof. Radek Zbořil

Partners: Idryma Technologias Kai Erevnas, Leibniz-Institut Fur Polymerforschung Dresden EV, Core Kentro Kainotomias Make, Universita Degli Studi Di Trieste

The growing demand for energy and the depletion of fossil fuel reserves - threatening both our energy security and the environment - have raised serious global concerns. To address this, the EU aims to achieve climate neutrality by 2050, focusing on the next generation of biofuels produced from non-food biological waste. Butanol (BuOH), heavier alcohols, and hydrogen, when produced from bioethanol, are considered promising advanced biofuels due to their high energy content, long storage stability, and particularly in the case of BuOH - compatibility with existing engines and fuel distribution infrastructure. However, their production faces challenges such as low yields and poor selectivity during ethanol reforming. The GlaS-A-Fuels project proposes a holistic approach to converting bioethanol into advanced biofuels using recyclable and cooperative catalysts made from earth-abundant elements. The concept is based on developing a light-capturing photonic glass reactor designed to tune light and powered by a thermoelectric module. This reactor is specifically adapted to enhance the efficiency of photo-amplified single-atom catalysts. GlaS-A-Fuels aims to fully harness the power of light-activated supports by directing energy toward surface-exposed, single-atom transition metal cation sites, maximising catalytic performance for the production of sustainable advanced biofuels.

5. Scalable Parallel and distributed Astrophysical Codes for Exascale ([SPACE](#))

Provider: European Commission

Programme: Horizon Europe

Budget: € 623 750

Duration: 01.01.2023 - 31.12.2026

Principal Investigator: Assoc. Prof. Lubomír Říha

Partners: Università Degli Studi Di Torino, Barcelona Supercomputing Center Centro Nacional De Supercomputacion, Bull Sas, Centre National De La Recherche Scientifique Cnrs, Cineca Consorzio Interuniversitario, E 4 Computer Engineering Spa, Enginsoft Spa, Hits Ggmbh, Idryma Technologias Kai Erevnas, Istituto Nazionale Di Astrofisica, Johann Wolfgang Goethe-Universitaet Frankfurt Am Main, Katholieke Universiteit Leuven, Ludwig-Maximilians-Universitaet Muenchen, Universitetet I Oslo

In modern astrophysics and cosmology (A&C), numerical simulations based on High-Performance Computing (HPC) are essential tools for scientific discovery. They serve as fundamental instruments and theoretical laboratories capable of exploring, interpreting, and understanding the physical processes beyond the observable sky. Efficient use of exascale computing capabilities is crucial for these laboratories. However, exascale systems are expected to feature unprecedented architectural complexity and heterogeneity, which will significantly impact simulation codes. Therefore, the goal of the SPACE project is to extensively refactor target codes to embrace new computing architectures, adopt innovative programming paradigms, software solutions, and new libraries. The SPACE project aims to enable the re-use and sharing of algorithms and software components within the A&C application domain. The project will tackle this challenge through joint design activities, bringing together scientists, code developers, HPC experts, hardware and software vendors, as well as advanced applications, codes, services, and exascale A&C expertise. Additionally, SPACE will address the high-performance data analysis of the data torrent produced by exascale A&C simulation applications, incorporating machine learning tools and advanced visualisation techniques.

4.10.1 Total budget of the HEI

Name of the HEI unit	Total budget in thous. CZK/EUR	Percentage of public funding in the Czech Republic	Share of public funding from abroad in %	Percentage of funding from other sources
FCE	199 383/ 7 865 214,44	86,05%	3,75%	10,20%
FSE	260 474/ 10 275 088,86	98,32%	0,39%	1,29%
FME	663 815/ 26 185 986,45	85,49%	0,18%	14,33%
FEECS	1 040 191/ 41 033 181,01	89,72%	3,13%	7,15%
FMG	286 664/ 11 308 259,35	78,46%	8,81%	12,73%
FMST	635 863/ 25 083 365,37	89,41%	0,49%	10,10%
FE	257 468/ 10 156 543,18	97,09%	0,09%	2,83%
ACS*	1 754/ 69 196,37	82,09%	0,00%	17,91%
CEET	2 599 966/ 102 562 764,88	79,31%	3,05%	17,65%
IT4I	1 621 868/ 63 979 000,18	78,11%	21,04%	0,86%
Rectorate	838 867/ 33 091 391,23	94,08%	0,01%	5,91%
TOTAL HEI	8 406 313/ 331 609 991,32	84,36%	5,85%	9,80%

*Accommodation and Catering Services

4.10.2 Share [%] of total costs/outputs by type of R&D&I paid from public and non-public sources

	2020	2021	2022	2023	2024	Total
Basic research	35%	33%	38%	22%	17%	29%
Applied Research	64%	67%	62%	78%	83%	70,8%
Experimental development and innovation	1%	0	0	0	0	0,2%
Total	100	100	100	100	100	100

Note: For definitions see Definition of Terms in Methodology HEI2025+.

4.10.3 Projects supported by a foreign provider

In the role of beneficiary							
Provider/ Investor	Programme/ Grant Scheme	Project name	Support (in thousands CZK/EUR)				
			2020	2021	2022	2023	2024
EU	Visegrad Fund	Exchange of Smart Solutions between V4 and EU in Energy and Environment (Be Smart)	106/ 4 181	214/ 8 442	273/ 10 769	0/0	0/0
		Visegrad Scholarship Programme 2024	0/0	0/0	0/0	0/0	52/ 2 051
	Interreg	Practical program for training personnel developing a low-carbon economy at the border II	51/ 2 012	90/ 3 550	0/0	0/0	0/0
		TERDUMP Cooperation of VSB-TUO/GIG Katowice for research of thermic active dumps on both sides of common border.	1 101/ 43 432	0/0	0/0	0/0	0/0
		Common Czech - Polish measurement of cross-border transmission of air pollutants in the air (AIR BORDER)	1 065/ 42 012	88/ 3 471	463/ 18 264	0/0	0/0
		SUWAT: Cross-border cooperation in the monitoring of chemical and radiation contamination of surface waters by mine waters.	1 216/ 47 968	1 481/ 58 422	876/ 34 556	0/0	0/0
		Scientific - research cooperation on development of eco-transport in Czech-Polish cross border area	113/ 4 458	118/ 4 655	0/0	0/0	0/0
		Uniform Approach to the Air Pollution Management System for Functional Urban Areas in Tritia Region	13 726/ 541 420	2 153/ 84 931	0/0	0/0	0/0
		Cross-border cooperation of medical emergency service systems	0/0	0/0	0/0	0/0	50/ 1 972
		Biotechnological Innovations for Sustainable Flat Panel Displays Recycling	0/0	0/0	0/0	0/0	114/ 4 497
	EU Programme	RURES – Promote the Sustainable Use of Renewable Resources and Energy Efficiency in Rural Regions	1 025/ 40 434	102/ 4 024	0/0	0/0	0/0
	Digital Europe	EDIH Ostrava	0/0	0/0	0/0	8 015/ 316 174	4 843/ 191 045
	Horizon Europe	EXA4MIND	0/0	0/0	68 612/ 2 706 588	6 471/ 255 266	19 625/ 774 162
		GeoUS	8 494/ 335 069	2 630/ 103 748	2 124/ 83 787	1 502/ 59 250	3 091/ 121 933

		Electron Beam Emergent Additive Manufacturing – EBEAM	0/0	0/0	0/0	0/0	7 240/ 285 602
		Electrochemical interfacial engineering of metal organic frame work towards aluminium solid-state batteries	0/0	0/0	0/0	0/0	287/ 11 321
		Hardware Abstraction Layer for a European Software Defined Vehicle approach (HAL4SDV)	0/0	0/0	0/0	0/0	955/ 37 673
		Bio2SAF	0/0	0/0	0/0	0/0	639/ 25 207
		Twinning excellence in management and research for green energy and chemicals using single-atom catalysis (MERGE)	0/0	0/0	0/0	0/0	15 800/ 623 274
	Horizon 2020	LEXIS	38 943/ 1 536 213	14 746/ 581 696	37 404/ 1 475 503	0/0	0/0
		Management of Environmental Risks During and After mine closure (MERIDA)	12/ 473	0/0	0/0	0/0	0/0
	International Grants	Supercomputing for environmental modelling.	0/0	158/ 6 233	0/0	0/0	0/0
		Development of data processing and analysis techniques for moss sample data analysis	51/ 2 012	21/ 828	0/0	0/0	0/0
		Investigation of using INAA for the receptor modelling of air pollution	35/ 1 381	65/ 2 564	55/ 2 170	0/0	0/0
		Air pollution characterization in industrial urbanized regions using nuclear analytical techniques, mathematical modelling and GIS technology	68/ 2 682	180/ 7 101	0/0	0/0	0/0
		Resource and Risk Assessment associated with invasive plant species in the border area	391/ 15 424	0/0	0/0	0/0	0/0
		Neutron Activation Analysis and Atomic Absorption Spectrometry and other analytical methods for soil and vegetation contamination studies in post - mining landscape in the Moravian-Silesian Region in the Czech Republic	0/0	68/ 2 682	0/0	0/0	0/0
		Neutron Activation Analysis and Atomic Absorption Spectrometry for Soil and Vegetation Pollution Studies in post - mining landscape in the Moravian-Silesian Region in the Czech Republic	85/ 3 353	0/0	0/0	0/0	0/0
		Instrumental neutron activation analysis and other analytical methods for determination of the influence of saline mine water on the vegetation (Phragmites australis)	25/ 986	27/ 1 065	0/0	0/0	0/0
		COST Action CA22138 - Recovery of Mining District Network	0/0	0/0	0/0	0/0	2 550/ 100 592
NATO	NATO	Application of Quantum Cybersecurity in 5G Networks	0/0	0/0	2 597/ 102 446	1 085/ 42 801	65/ 2 564
Norway	FM EHP/ Norway	Education and Collaborative Knowledge Sharing in Mining Industry and Processing	0/0	0/0	0/0	0/0	407/ 16 055
Total			66 506/ 2 623 511	21 965/ 866 469	112 404/ 4 434 083	17 073/ 673 491	55 718/ 2 197 949

In the role of another participant							
Provider / Investor	Programme/ Grant Scheme	Project name	Support (in thousands CZK/EUR)				
			2020	2021	2022	2023	2024
EU	Interreg	Supporting knowledge capacity in ICT among SME to engage in growth and innovation	0/0	0/0	402/ 15 858	0/0	0/0
		Fiber Optics sensors with photonics components for innovation applications	0/0	0/0	2 227/ 87 850	206/ 8 126	0/0
		VODAMIN II	4 136/ 163 156	75/ 2 959	0/0	0/0	0/0
		GeoMAP Geologische, hydrogeologische und geomechanische Modellierungs-, Visualisierungs- und Prognosewerkzeuge zur Darstellung von Bergbaufolgen und Nachnutzungspotenzialen	1 017/ 40 118	491/ 19 369	0/0	0/0	0/0
		Impact of air pollution on the health status of the population in the Czech-Polish border area	181/ 7 140	3/ 118	0/0	0/0	0/0
		i-AIR REGION	412/ 16 252	0/0	0/0	0/0	0/0
		Implementation of the issue of traffic seismicity affecting historical buildings into the cross-border educational process	0/0	0/0	0/0	0/0	39/ 1 538
		Circular solutions for keeping food waste out of Central Europe's schools	0/0	0/0	0/0	0/0	293/ 11 558
	Digital Europe	AI-MATTERS (AI MANufacturing Testing and experimenTation network For EuROpean industrieS)	0/0	0/0	0/0	4/ 158	24/ 947
		EPICURE	0/0	0/0	0/0	0/0	789/ 31 124
	EuroHPC	SPACE	0/0	0/0	0/0	1 684/ 66 430	1 295/ 51 085
		MaX	0/0	0/0	0/0	1 123/ 44 300	1 257/ 49 586
		EUPEX	0/0	0/0	870/ 34 320	1 303/ 51 400	792/ 31 243
		SCALABLE	0/0	841/ 33 176	1 993/ 78 619	2 024/ 79 842	241/ 9 507
		ACROSS	0/0	933/ 36 805	2 328/ 91 834	2 832/ 111 716	1 444/ 56 963
		IO-SEA	0/0	814/ 32 110	1 794/ 70 769	2 003/ 79 014	680/ 26 824
		LIGATE	0/0	1 204/ 47 495	2 056/ 81 105	1 427/ 56 292	1 310/ 51 677
		EUROCC 2	0/0	0/0	0/0	7 876/ 310 690	7 018/ 276 844
		EUROCC	461/ 18 185	11 321/ 446 588	12 194/ 481 026	51/ 2 012	0/0
	Horizon Europe	DTO-BioFlow	0/0	0/0	0/0	192/ 7 574	997/ 39 329
		OpenWebSearch.EU	0/0	0/0	331/ 13 057	2 493/ 98 343	2 584/ 101 933
		BioDT	0/0	0/0	592/ 23 353	3 130/ 123 471	4 725/ 186 391
		Single Atom-Based Nanohybrid	0/0	0/0	132/ 73 294	1 858/ 73 294	1 535/ 60 552

		Photocatalysts for Green Fuels - SAN4fuel			5 207		
		s-NEBULA	1 624/ 64 063	1 780/ 70 217	1 602/ 63 195	3 080/ 121 499	161/ 6 351
		CovErIng the trAining Gap in digital skills for European SMEs manpowEr	0/0	0/0	0/0	522/ 20 592	537/ 21 183
		Skilled to be a Fire Expert	0/0	302/ 11 915	355/ 14 004	1/ 39	0/0
		Boosting Resilience In five industrial ecosystems through adoption and Deployment of advanced technoloGiEs among SMEs (BRIDGESMEs)	0/0	0/0	0/0	0/0	152/ 5 996
		Indo-Pacific-European Hub for Digital Partnerships: Trusted Digital Technologies for Sustainable Well-Being	0/0	0/0	0/0	0/0	146/ 5 759
		CIRCULIGHT	0/0	0/0	0/0	0/0	884/ 34 872
		Single-Atom Photocatalysts Enhanced by a Self-Powered Photonic Glass Reactor to Produce Advanced	0/0	0/0	0/0	0/0	1840/ 72 584
		ExPEDite: Enabling Positive Energy Districts through a Planning and Management Digital Twin	0/0	0/0	0/0	0/0	808/ 31 874
		TWIN Synergies	0/0	0/0	0/0	0/0	1 212/ 47 811
		EOSC ENTRUST	0/0	0/0	0/0	0/0	110/ 4 339
		POP3	0/0	0/0	0/0	0/0	2446/ 96 489
		FALCON	0/0	0/0	0/0	0/0	2569/ 101 341
		AVITHRAPID	0/0	0/0	0/0	0/0	389/ 15 345
	Horizon 2020	Data Infrastructure Capacity for EOSC	0/0	0/0	99/ 3 905	118/ 4 655	703/ 27 732
		OPENQKD	1 481/ 58 422	1 240/ 48 915	1 656/ 65 325	1 359/ 53 609	0/0
		ExaQUte	2 691/ 106 154	1 544/ 60 907	342/ 13 491	0/0	0/0
		CloudiFacturing	2 559/ 100 947	355/ 14 004	0/0	0/0	0/0
		EXPERTISE	1 320/ 52 071	0/0	1 059/ 41 775	0/0	0 0
		POP2	3 348/ 132 071	4 063/ 160 276	638/ 25 168	0/0	0/0
		EVEREST	74/ 2 919	2 203/ 86 903	4 331/ 170 848	3 596/ 141 854	1 277/ 50 375
		PRACE-6IP	3 005/ 118 540	3 864/ 152 426	958/ 37 791	57/ 2 249	507/ 20 000
		PRACE-5IP	15/ 592	0/0	0/0	0/0	0/0
		TETRAMAX	511/ 20 158	240/ 9 467	24/ 947	0/0	0/0
		Smart Spaces Safety and Security for All Cities (S4AllCities)	0/0	218/ 8 600	146/ 5 759	0/0	0/0
	ECRP Programme	RECOVERY of degraded and transformed ecosystems in coal mining-affected areas	894/ 35 266	1 348/ 53 176	673/ 26 548	225/ 8 876	358/ 14 122
	EU Programme	PRACE-1IP	434/ 17 120	0/0	0/0	0/0	0/0

		Methane recovery and harnessing for energy and chemical uses at coal mine sites	422/ 16 647	0/0	0/0	0/0	0/0
		Harmonizing reliable test procedures representing real-LIFE air pollution from solid fuel heating appliances	0/0	8/ 316	637/ 25 128	1 032/ 40 710	163/ 6430
		ProSkill Development of a Skill Ecosystem in the Visegrád Four countries	718/ 28 323	764/ 30 138	674/ 26 588	0/0	0/0
		LIMBRA: Decreasing the Negative Outcomes of Brain Drain in the Raw Material Sector	667/ 26 312	802/ 31 637	0/0	0/0	0/0
		REsilient WATER Innovation for Smart Economy	142/ 5 602	599/ 23 629	1 232/ 48 600	1 382/ 54 517	1 136/ 44 813
		Prognostics And Computer Aided Maintenance — PACMAN	1 342/ 52 939	0/0	0/0	0/0	0/0
		Utilization of secondary raw material in geopolymers production	413/ 16 292	221/ 8 718	339/ 13 373	0/0	0/0
	RFCs	New technology for hydrogen and geopolymer composites production from post-mining waste	0/0	0/0	0/0	363/ 14 320	1 653/ 65 207
		Hybrid energy storage system using post-mining infrastructure	0/0	0/0	0/0	104/ 4 103	625/ 24 655
	International Grants	CLear AIR and Climate Adaptation in Ostrava and other cities	2 258/ 89 073	0/0	1 101/ 43 432	0/0	0/0
		Supporting knowledge capacity of ICT among SME to engage in growth and innovation	162/ 6 391	163/ 6 430	67/ 2 643	0/0	0/0
		Impact of environmental burden on the condition of bridge structures of the cross-border transport network	0/0	1 691/ 66 706	3 267/ 128 876	23/ 907	0/0
		International Centre of Research Excellence in Transition of Coal Regions	0/0	0/0	44/ 1 736	114/ 4 497	68/ 2682
Total			30 287/ 1 194 753	37 081/ 1 462 761	44 163/ 1 742 130	40 182/ 1 585 089	42 767/ 1 687 061

Note: For co-sponsorship projects, please only indicate the amount of funding for the evaluated HEI.

4.10.4 Projects supported by the Czech provider

In the role of beneficiary							
Provider/ Investor	Programme/ Grant Scheme	Project name	Support (in thousands CZK/EUR)				
			2020	2021	2022	2023	2024
Ministry of Education, Youth and Sports	Institutional support		307 256/ 12 120 552	311 469/ 12 286 746	337 249/ 13 303 708	337 249/ 13 303 708	351 906/ 13 881 893
	Targeted support	National Sustainability Program	59 597/ 2 350 966	0/0	0/0	0/0	0/0
		Mobilities	99/ 3 905	83/ 3 274	1 374/ 54 201	1 227/ 48 402	1 013/ 39 961
		INTER-EXCELLENCE	9 640/ 380 276	8 167/ 322 170	6 959/ 274 517	3 636/ 143 432	2 897/ 114 280
		EuroHPC	0/0	15 856/ 625 483	21 213/ 836 805	23 831/ 940 079	16 058/ 633 452
		Specific university research	52 612/ 2 075 424	54 293/ 2 250 736	55 994/ 2 208 836	55 805/ 2 201 381	48 850/ 1 927 022
		Large research infrastructures	10 554/ 380 276	9 874/ 322 170	9 842/ 274 517	11 013/ 143 432	11 297/ 114 280

			416 331	389 507	388 245	434 438	445 641
	Operational Programme Science, Research and Education	Research infrastructures	36 096/ 1 423 905	293 207/ 5 250 351	38 393/ 1 514 517	446/ 17 594	0/0
		Excellent research	68 909/ 2 718 304	62 982/ 2 250 497	75 039/ 2 960 118	11 009/ 434 280	0/0
		Pre-application research for ITI	13 020/ 513 609	7 591/ 299 448	7 713/ 304 260	2/ 79	204/ 8 047
		Long-term cross-sectoral cooperation for ITI	95 920/ 3 783 826	97 418/ 2 250 919	96 953/ 3 824 576	24 419/ 963 274	6 366/ 251 124
		Pre-application research for ITI - II	8 366/ 330 020	9 041/ 356 647	2 269/ 89 507	0/0	0/0
		International mobile research and technical workers	2 740/ 108 087	0/0	0/0	0/0	0/0
		International mobility of researchers MSCA IF II	1 401/ 55 266	467/ 18 422	0/0	0/0	0/0
		International mobility of researchers, technicians and admin. workers	687/ 27 101	7 622/ 300 671	10 710/ 422 485	1 875/ 73 964	0/0
		Building expert capacities for technology transfer	6 697/ 264 181	0/0	0/0	0/0	0/0
	Operational programme Jan Amos Comenius	MSCA - fellowship-CZ	0 0	0/0	0/0	1 539/ 60 710	4 855/ 191 519
		MSCA Fellowships CZ 2.0	0/0	0/0	0/0	0/0	2 156/ 85 053
		Cutting-edge research	0/0	0/0	0/0	27 606/ 1 088 994	109 013/ 4 300 316
		Advanced materials for energy and environmental technologies	0/0	0/0	0/0	0/0	3 984/ 157 151
		The social dimension of new technologies in energy in the Ostrava metropolitan area	0/0	0/0	0/0	0/0	73/ 2 881
		ENREGAT Infrastructure Modernisation	0/0	0/0	0/0	0/0	13 858/ 546 649
Czech Science Foundation (GA CR)			30 841/ 1 216 607	31 702/ 1 250 572	33 979/ 1 340 394	29 944/ 1 181 223	22 000 867 850
Czech Technology Agency (TA CR)			251 293/ 9 912 939	208 970/ 8 243 393	155 655/ 6 140 237	235 939/ 9 307 258	234 113/ 9 235 227
Ministry of Industry and Trade			0/0	4 277/ 168 718	3 625/ 142 998	8 098/ 319 448	4 861/ 191 755
	Operational Programme Entrepreneurship and Innovation for Competitiveness	AD TECH Centrum 0.3	908/ 35 819	0/0	1 946/ 76 765	0/0	0/0

		Building research infrastructure	0/0	0/0	59 654/ 2 353 215	178 347/ 7 035 385	0/0
Ministry of the Interior			31 126/ 1 227 850	45 861/ 1 809 112	46 874/ 1 849 073	49 943/ 1 970 138	52 822/ 2 083 708
Ministry of the Environment			250/ 9 862	4 340/ 171 203	7 870/ 310 454	78 821/ 3 109 310	395 970/ 15 620 118
	OP Environment		5 499/ 216 923	0/0	0/0	0/0	0/0
Ministry of Agriculture			0/0	0/0	0/0	3 487/ 137 554	3 394/ 113 886
Ministry of Culture			621/ 24 497	623/ 24 576	556/ 21 933	0/0	347/ 13 688
Ministry of Regional Development			1 440/ 56 805	0/0	0/0	0/0	2 768/ 109 191
Ministry of Health							2 765/ 109 073
State Environmental Fund			0/0	2 545/ 100 394	12 259/ 483 590	24 979/ 985 365	16 270/ 641 815
Moravian-Silesian Region		5th International Scientific Conference	50/ 1 972	0/0	0/0	0/0	0/0
		Intelligent identification system for air pollution sources	700/ 27 613	0/0	0/0	0/0	0/0
		Building a research infrastructure - CEET - explorer	1 400/ 55 227	0/0	4 200/ 165 680	1 400/ 55 227	0/0
		Digital Innovation Hub Ostrava	229/ 9 034	84/ 3 314	587/ 23 156	0/0	0/0
		Supporting talented students in their scientific activities	1 383/ 54 556	0/0	0/0	0/0	0/0
		Industry 4.0	1 464/ 57 751	0/0	0/0	0/0	0/0
		Operation of IIS - Intelligent Identification System for Air Pollution Sources	0/0	700/ 27 613	0/0	0/0	0/0
		6th International Scientific Conference ICEI 2022	0/0	0/0	75/ 2 959	0/0	0/0
		IP LIFE for Coal Mining	0/0	0/0	611/ 24 103	888/ 35 030	1 284/ 50 651
		Intelligent Air Pollution Source Identification System II	0/0	0/0	700/ 27 613	0/0	0/0
		Energy and Environment Conference 2022	0/0	0/0	60/ 2 367	0/0	0/0
		Building research infrastructure - CEET II	0/0	0/0	16 662/ 657 278	80 318/ 3 168 363	20/ 789
		Rainwater storage VSH	0/0	0/0	3 359/ 132 505	0/0	0/0
		Energy and Environment Conference 2022	0/0	0/0	0/0	60/ 2 367	0/0
		Experimental and theoretical studies of near-infrared-emitting and chiral carbon dot luminophores	0/0	0/0	0/0	1 069/ 42 170	1 796/ 70 836
		7th International Scientific	0/0	0/0	0/0	0/0	33/

		Conference on European Integration - ICEI 2024 - Technical Background					1 304
		International expert conference Energy and Environment 2024	0/0	0/0	0/0	0/0	80/ 3 156
Total			989 800/ 39 045 365	1 177 172/ 46 436 765	1 012 380/ 39 936 095	1 192 950/ 47 059 172	1 311 163/ 51 722 389
In the role of another participant							
Provider/ Investor	Programme/ Grant Scheme	Project name	Support (in thousands CZK/EUR)				
			2020	2021	2022	2023	2024
CESNET, interest group		Research projects	932/ 36 765	144/ 5 680	534/ 21 065	1 097/ 43 274	1 381/ 54 477
CESNET, interest group		E-infrastructure CZ	74 109/ 2 923 432	69 396/ 2 737 515	111 826/ 4 411 282	106 062/ 4 183 905	120 997/ 4 773 057
Czech Science Foundation (GA CR)			5 908/ 233 057	10 962/ 432 426	13 911/ 548 757	18 162/ 716 450	12 584/ 496 410
Czech Technology Agency (TA CR)			63 704/ 2 512 978	76 806/ 3 029 822	64 933/ 2 561 460	84 524/ 3 334 280	104 061/ 4 104 970
Ministry of Regional Development	INTERREG V-A	Fiber Optics sensors with photonics components for innovation applications	0/0	2 357/ 92 978	22/ 868	0/0	0/0
Ministry of Education, Youth and Sports	INTER- EXCELLENCE	Involvement of Czech research organizations in EERA (EERA-CZ 2)	613/ 24 181	613/ 24 181	0/0	0/0	0/0
	INTER- EUREKA	E-Town - Development of super-light, long-range small electric vehicles for intergenerational, urban e-mobility concepts powered by smart infrastructure	0/0	2 001/ 78 935	1 780/ 70 217	0/0	0/0
	INTER- EUREKA	AI-Driven Smart Safety Management System for Industrial Environments	0/0	0/0	0/0	0/0	1 350/ 53 254
	INTER- EUREKA	BRake pArtiCles Emission Reduction	0/0	0/0	0/0	0/0	1 199/ 47 298
	EUREKA	Auto-ID technology and the Internet of Things to enhance the quality of health services	529/ 20 868	0/0	0/0	0/0	0/0
	INTER-COST	Pump in turbine mode: improvement of design and operating parameters through digitization	0/0	0/0	0/0	406/ 16 016	1 125/ 44 379
	COST	Mining the European Anthroposphere	143/ 5 641	0/0	0/0	0/0	0/0
	Operational Program	Bioinformatics and Computational Biology	456/ 17 988	724/ 28 560	599/ 23 629	98/ 3 866	0/0
		Utilization of epidemiological data drawn from social science research studies on healthy lifestyle by entities in the area	2 934/ 115 740	3 301/ 130 217	1 502/ 9 250	0/0	0/0

		of application					
		Research centre for low-carbon energy technologies	9 584/ 378 067	9 473/ 373 688	11 013/ 434 438	6 426/ 253 491	0/0
		AI & Reasoning	2 058/ 81 183	1 759/ 69 389	1 603/ 63 235	1 163/ 45 878	0/0
		e-INFRA CZ: Modernization	995/ 39 250	260/ 10 256	7 188/ 283 550	27 000/ 1 065 089	0/0
	Operational program Jan Amos Comenius	European Open Science Cloud Czech Republic	0/0	0/0	0/0	4 923/ 194 201	10 075/ 397 436
		Robotics and advanced industrial production	0/0	0/0	0/0	0/0	1 051/ 41 460
		National repository platform for research data	0/0	0/0	0/0	0/0	2 447/ 96 529
Ministry of Industry and Trade			53 284/ 2 101 933	56 265/ 2 219 527	99 484/ 3 924 418	59 920/ 2 363 708	24 095/ 950 493
	Operational Programme Entrepreneurship and Innovation for Competitiveness	Torrification	0/0	23/ 907	0/0	0/0	0/0
		Modular Camera TQC Tester with Artificial Intelligence Elements	490/ 19 329	1 081/ 42 643	1 758/ 69 349	160/ 6 312	0/0
Ministry of Labour and Social Affairs	OP_2011	Hazard assessment of nanoparticles in the workplaces and the possibility of prevention	762/ 30 059	0/0	0/0	0/0	0/0
	OP_2011	Development of tools for assessing occupational risks using the OiRA web platform for the purposes of small businesses, micro-enterprises and self-employed persons in the Czech Republic	1 796/ 70 848	0/0	0/0	0/0	0/0
Ministry of the Interior			1 929/ 76 095	3 450/ 136 095	3 113/ 122 801	5 224/ 206 075	8 280/ 326 627
Ministry of the Environment			0/0	0/0	0/0	5 639/ 222 446	23 348/ 921 026
State Environmental Fund			0/0	0/0	0/0	3 967/ 156 489	3 142/ 123 945
Ministry of Health			956/ 37 712	1 520/ 59 961	1 581/ 62 367	2 452/ 96 726	2 179/ 85 957
INDRC		CLARA - Center for Artificial Intelligence and Quantum Computing in System Brain Research	0/0	0/0	0/0	0/0	120/ 4 734
CyberSecurity Hub ^{CZ}		CZQCI -Czech National Quantum Communication Infrastructure	0/0	0/0	0/0	0/0	279/ 11 006

Technology Platform Energy Security of the CR		Holistic capability and technology evaluation and co-creation framework for upskilled first responders and enhanced CBRN-response	0/0	0/0	0/0	0/0	46/ 1 815
DigInnoCent Ltd.		Nature-Based Solutions for Demonstrating Climate-Resilient Critical Infrastructure	0/0	0/0	0/0	0/0	1 251/ 49 349
VŠCHT		Metamorphosis	0/0	0/0	0/0	0/0	295/ 11 637
Total			221 182/ 8 725 128	240 135/ 9 472 781	320 803/ 12 654 951	327 223/ 12 908 205	319 305/ 12 595 858

Note: Please summary list GA CR, TA CR and other departmental projects. For co-sponsor projects, please indicate the financial volumes for the HEI. Projects financed from EU structural funds and focused exclusively on R&D&I (e.g. OP JAK, OP TAK, NPO) and projects financed from regional sources focused exclusively on R&D&I list individually. For co-sponsoring projects, please indicate the financial volumes for the evaluated HEI only.

4.10.5 Projects supported from non-public sources

In the role of beneficiary						
Provider / Investor	Project name	Support (in thousands CZK/EUR)				
		2020	2021	2022	2023	2024
Veolia Energy CZ,Plc.	Contract research	5 063/ 199 724	6 750/ 226 272	6 418/ 253 176	10 379/ 409 428	11 816/ 466 114
Bosch Powertrain Ltd.	Contract research	8 466/ 333 964	5 661/ 223 314	4 894/ 193 057	12 536/ 494 517	8 844/ 348 876
Armádní Servisní, Pbc.	Contract research	7 777/ 306 785	398/ 15 700	3 365/ 132 742	3 454/ 136 252	5 364/ 211 598
ČEZ, Plc.	Contract research	3 177/ 125 325	1 102/ 43 471	2 040/ 80 473	3 715/ 146 548	8 737/ 344 655
Faculty Hospital Ostrava	Contract research	0/0	1 771/ 69 862	12 658/ 499 329	145/ 5 720	371/ 14 635
DIAMO, state enterprise	Contract research	673/ 26 548	2 608/ 102 880	2 380/ 93 886	6 895/ 271 992	1 484/ 58 540
T-Mobile Czech Republic Plc.	Contract research	1 996/ 78 738	2 906/ 114 635	7 300/ 287 968	0/0	0/0
Sev.en Engineering Ltd.	Contract research	0/0	0/0	0/0	9 672/ 381 538	1 720/ 67 850
ENVEZ, Plc.	Contract research	0/0	0/0	0/0	0/0	11 000/ 433 925
ŠKODA AUTO Plc.	Contract research	634/ 25 010	1 854/ 73 136	2 139/ 84 379	3 305/ 130 375	2 997/ 118 225
VALEO AUTOKLIMATIZACE	Contract research	974/ 38 422	628/ 24 773	2 190/ 86 391	6 471/ 255 266	598/ 23 590
Czech Welding Institute, ltd.	Contract research	720/ 28 402	39/ 1 538	2 469/ 97 396	2 611/ 103 998	4 331/ 170 848
Vyncke Ltd.	Contract research	1 808/ 71 321	2 892/ 114 083	2 193/ 86 509	2 673/ 105 444	326/ 12 860
ČEZ ESL, Ltd.	Contract research	2 394/ 94 438	2 554/ 100 750	1 566/ 61 775	1 460/ 57 594	434/ 17 120
Garrett Motion Czech Republic Ltd.	Contract research	496/ 19 566	0/0	6 029/ 237 830	1 972/ 77 791	719/ 28 363
The National Development Bank, Plc.	Contract research	0/0	0/0	2 030/ 80 079	1 093/ 43 116	5 252/ 207 179
ORGREZ,Plc.	Contract research	1 614/ 63 669	1 668/ 65 799	3 035/ 119 724	1 634/ 64 458	229/ 9 034

Edwards, Ltd.	Contract research	140/ 5 523	62/ 2 446	41/ 1 617	32/ 1 262	7 518/ 296 568
TŘINECKÉ ŽELEZÁRNY, Plc.	Contract research	908/ 35 819	748/ 29 507	1 918/ 75 661	1 585/ 62 525	1 733/ 68 363
Rada Building Ltd.	Contract research	0/0	1 161/ 45 799	1 573/ 62 051	1 580/ 62 327	2 276/ 89 783
WHIRLPOOL SLOVAKIA Ltd.	Contract research	6 283/ 247 850	0/0	0/0	0/0	0/0
The City of Prague	Contract research	0/0	6 207/ 244 852	0/0	0/0	0/0
Energotrans, Plc.	Contract research	266/ 10 493	259/ 10 217	142/ 5 602	3 248/ 128 126	2 170/ 85 602
CÍSAŘ, ČEŠKA, SMUTNÝ Ltd., Ltd.	Contract research	0/0	0/0	0/0	5 600/ 220 907	0/0
Honeywell, Ltd.	Contract research	4 559/ 179 842	983/ 38 777	0/0	0/0	0/0
National Wood Processing Cluster	Contract research	5 509/ 217 318	0/0	0/0	0/0	0/0
Metrostav, Plc.	Contract research	806/ 31 795	738/ 29 112	2 258/ 89 073	729/ 28 757	856/ 33 767
Moravian-Silesian Automotive Cluster	Contract research	4 100/ 161 736	340/ 13 412	860/ 33 925	0/0	0 0
NATIONAL ENERGY CLUSTER	Contract research	4 010/ 158 185	0/0	0/0	458/ 18 067	497/ 19 606
Porsche Immobilien CZ Ltd.	Contract research	363/ 14 320	252/ 9 941	387/ 15 266	3 782/ 149 191	180/ 7 101
Visteon Electronics Slovakia Ltd.	Contract research	0/0	4 894/ 193 057	0/0	46/ 1 815	0/0
Statutory City of Ostrava	Contract research	2 336/ 92 150	48/ 1 893	580/ 22 880	871/ 34 359	899/ 35 464
ITS - Intelligent Transport Systems	Contract research	0/0	0/0	0/0	0/0	4 626/ 182 485
MORAVIAN-SILESIA ENERGY CENTRE, a state-funded organization	Contract research	0/0	1 080/ 42 604	0/0	250/ 9 862	3 058/ 120 631
Amper Savings, Plc.	Contract research	0/0	110/ 4 339	3 291/ 129 822	360/ 14 201	540/ 21 302
KPMG CZE, Ltd.	Contract research	0/0	0/0	4 247/ 167 535	0/0	0/0
DEZA, Plc.	Contract research	0/0	6/237	2 801/ 110 493	1 385/ 54 635	0/0
LOYD GROUP Ltd.	Contract research	0/0	2 278/ 89 862	766/ 30 217	667/ 26 312	470/ 18 540
ČEZ ESCO, Plc.	Contract research	3 121/ 123 116	359/ 14 162	584/ 23 037	0/0	0/0
Lenzing Biocel Paskov Plc.	Contract research	435/ 17 160	627/ 24 734	617/ 24 339	1 039/ 40 986	1 340/ 52 860
National Cyber and Information Security Agency	Contract research	3 244/ 127 968	350/ 13 807	162/ 6 391	243/ 9 586	0/0
Other	Contract research	63 603/ 2 508 994	88 944/ 3 508 639	86 620/ 3 416 963	89 439/ 3 528 166	85 487/ 3 372 268
BRANO Plc.	Donation contract	0/0	0/0	0/0	199/ 7 850	0/0
Fischer Vyškov Ltd.	Donation contract	1 747/ 68 915	0/0	0/0	0/0	0/0
INTOZA Ltd.	Donation contract	0/0	0/0	0/0	0/0	100/

						3 945
Metrostav Plc.	Donation contract	128/ 5 049	100/ 3 945	100/ 3 945	100/ 3 945	150/ 5 917
MUBEA - HZP Ltd.	Donation contract	75/ 2 959	125/ 4 931	175/ 6 903	125/ 4 931	100/ 3 945
NORTECH Ltd.	Donation contract	140/ 5 523	236/ 9 349	149/ 5 878	0/0	0/0
SATUM CZECH Ltd.	Donation contract	50/ 1 972	50/ 1 972	50/ 1 972	50/ 1 972	0/0
SG GEOTECHNIKA Plc.	Donation contract	0/0	0/0	10/ 394	50/ 1 972	0/0
ŠKODA AUTO Plc.	Donation contract	550/ 21 696	598/ 23 590	522/ 20 592	1106/ 43 629	137/ 5 404
other	Donation contract	3 179/ 125 404	3 280/ 129 389	3 956/ 156 055	4 338/ 171 124	3 553/ 140 158
Total		141 344/ 5 575 700	144 666/ 5 706 746	172 515/ 6 805 325	185 297/ 7 309 546	179 912/ 7 097 120
In the role of another participant						
Provider / Investor	Project name	Support (in thousands CZK/EUR)				
		2020	2021	2022	2023	2024
Total						

Note: Indicate, for example, sponsorship donations, resources generated from other own economic activities, foreign subsidy programmes of private entities.

4.11 Rules for the use of institutional support for the LCDRO

The HEI will describe the strategy and rules for the use of institutional support for the LCDRO in the management of institutionally supported research activities (e.g., prioritisation of research topics by the HEI according to individual needs, internal grant agencies, incentive tools, support for excellent science) and the method for distribution of institutional support to individual departments/research teams for the period of 2020–2024. The impact on the management of institutionally supported research activities will be described by the HEI using specific examples (e.g. distribution of institutional support in the period of 2020–2024 depending on the evaluation results, examples of supported excellent science projects, etc.).

Maximum 500 words plus 200 words for each example given (max. five examples).

Process of Allocating the Institutional Support for Long-term Conceptual Development of a Research Organization (LCDRO)

The allocation of the LCDRO funding follows strictly defined internal rules that take into account scientific performance and the quality of R&D&I outputs.

1. Evaluation Period and Input Data

- The evaluation period is four years (for 2025) and five years (from 2026 onwards).
- Input data is exported from the OBD database as of October 1st of the preceding year.
- Only published journal articles (types Jimp and Jsc) with the status "Published" are included in the calculation.
- For publications with multiple authors and affiliations, the financial share is distributed among the respective departments according to predefined rules.

2. Structure of the LCDRO Funding Allocation

The LCDRO funding allocation consists of three components:

- Publication Activities (70%) – evaluated based on journal quality, determined by the decile ranking according to Impact Factor (IF) and Article Influence Score (AIS).
- Citations (20%) – calculated using data from Scopus as of September of the previous year.
- Module 1 according to Methodology 17+ (10%) – evaluates results classified as 1, 2, or 3.

3. Calculation of Funding Shares

- Publication Activity: Each article receives a score based on the average decile ranking of the journal (WoS, Scopus) according to IF and AIS. The funding amount is determined by the total points of all publications from a given department.
- Citations: Citations of articles from the last four years (according to Scopus) are counted. Departments with higher citation counts receive a larger share of the funding.
- Module 1: Research outputs are scored based on Methodology 17+, with better ratings earning higher financial support.

This process ensures transparent and objective allocation of funds based on scientific performance and motivates departments to increase their research output.

All data and analysis results related to the budget components above are published on the R&D Portal on the VSB-TUO Intranet (Innet) and are accessible to all university staff.

NATIONAL AND INTERNATIONAL COOPERATION

4.12 Important collaborations in R&D&I

The HEI will describe specific cases of R&D&I collaboration at the national level (maximum five examples) and the international level (maximum five examples), including examples of concrete results and impacts in the field of R&D&I beneficial for the HEI during the period of 2020–2024.

Maximum 300 words per example.

National projects

Collaboration with VALEO R&D Center Prague and Škoda Auto in the Field of Autonomous Mobility

Since 2019, the Faculty of Electrical Engineering and Computer Science (FEECS) at VSB-TUO has been collaborating with the VALEO R&D Center in Prague on cutting-edge development, research, and innovation projects focused on Connected, Cooperative, and Autonomous Mobility (C-CAM). Between 2020 and 2023, a total of 10 contract research projects were completed, with a total value of CZK 10,751,447 (EUR 424,120). In 2023, two major results were pre-finalized: the second-generation Drive-by-Wire system prototype and the system software for Drive-by-Wire. Both underwent a series of tests conducted by VALEO and Škoda Auto, including implementation in the new driver assistance system "[Follow the Vehicle](#)" – animation, [Follow the Vehicle](#) - video, also developed by VSB-TUO. After successful testing, both results were finalized and are scheduled for official registration in the first quarter of 2024. Building on the excellent results of the FEECS VSB-TUO R&D team, VALEO expressed interest in purchasing units of the Drive-by-Wire technology to support the development of automated vehicle control systems. As a result, in September 2022, the spin-off company [Autinno Ltd.](#) was established. The spin-off's mission is to manufacture, distribute, and service the commercialised outputs of both contract and collaborative research. The University's financial interest is contractually secured, with Autinno s.r.o. paying a fee based on its total turnover back to the university.

Video of the spin-off company launch event: [Spin-off company VSB-TUO](#)

Collaboration between the Faculty of Materials Science and Technology (FMST) and Industrial Partner Bonatrans Group Plc.

This collaboration is built on a long-standing relationship in research and development (R&D) as well as educational activities. FMST departments are actively involved in mechanical analyses of structurally innovative railway wheelsets, wheels, and axles, solving optimisation tasks for new technological solutions and systematically monitoring the mechanical properties of production. FMST serves as the exclusive partner performing residual stress measurements on railway wheels for Bonatrans Group, a.s., a crucial service for extending the wheels' operational lifespan. FMST departments are also actively engaged in joint TA ČR research projects, focusing on reducing acoustic emissions from wheelsets and enhancing their durability. The joint project between Bonatrans Group, a.s. and FMST entitled "Reduction of Noise Emissions from Railway Vehicles" was recognized with the prestigious TA ČR Award in the Business category in 2024. Bonatrans Group R&D employees actively collaborate with FMST teams, participate in joint workshops and conferences, and contribute valuable input for further development of the partnership.

Collaboration with DEKONTA Plc.

DEKONTA is a major Czech company specializing in environmental services, operating both in domestic and international markets. During the evaluated period, the IET (CEET) collaborated with DEKONTA on the treatment of waste gases and water using advanced oxidation and catalytic processes, supported by the following projects:

- OP VVV DMS for ITI, COLLABORATION (2018-2023)

- MPO Innovative Technology for Ammonia Emission Elimination from Waste Air Using Photochemical Oxidation (2024-2026)

In 2024, another joint project, OP JAK Innovative Technologies for Cleaner Ostrava!!!, was prepared and is set to begin this year.

The achieved results were published in four joint scientific papers, and an international patent was filed:

- Prostějovský, T. et al. *Journal of Photochemistry and Photobiology A: Chemistry* 407 (2021).
- Górecka, S. et al. *Applied Surface Science* 573 (2022) 15154.
- Vráblová, M. et al. *Chemosphere* 312 (2023) 1.
- Zápotocký, L., Žebrák, R., Reli, M., Prostějovský, T., Kočí, K. PCT/CZ2021/050057

DEKONTA employees consulted on three master's theses (N. Veverková, T. Motúzová, A. Nováková), and three contract research projects focused on waste material pyrolysis were conducted.

Collaboration with DEKONTA plc. contributed to the advancement of environmental technologies, with scientific publications and an international patent strengthening research excellence and knowledge transfer into practice. Joint projects connected academic research with industrial applications and supported the development of contract research in waste material pyrolysis. The involvement of DEKONTA employees in student thesis consultations enhanced their professional skills and employability.

Collaboration between the Faculty of Safety Engineering (FSE) and the Fire Rescue Service of the Czech Republic (FRS CZ)

Between 2020 and 2024, cooperation between the Faculty and the Fire Rescue Service of the Czech Republic (FRS CZ) was significantly deepened and expanded in several key areas, including education, professional training, research and development (R&D), and analytical activities. During this period, FRS officials actively participated in teaching as lecturers and expert guarantors, supervised theses, and took part in state final exams. Several joint projects and conferences were implemented, addressing current challenges such as improving methodologies for fire brigade coverage, risk assessment of alternative energy sources, and optimising intervention procedures in connection with forest fires. Technological cooperation also played an important role, including the use of simulation technologies for crisis management, the analysis of intervention data, and experimental evaluation of firefighting equipment. As part of this collaboration, the Center for Simulation Technologies (CESIT) was utilized, enabling the modelling of real-life intervention scenarios and their evaluation. The development of joint activities over the past four years has enhanced the operational efficiency of FRS and strengthened the professional preparedness of faculty's graduates for careers in fire protection and crisis management.

IT4Innovations, CESNET, and CERIT-SC

collaboratively established a strategic research infrastructure, e-INFRA CZ, in the Czech Republic in 2019. This unified platform integrates their respective resources to offer comprehensive services for data transmission, storage, and processing, thereby enhancing the national research and development capabilities. This platform is supported by 4 joint projects: e-Infrastructure CZ, e-Infrastructure CZ II, e-INFRA CZ: Modernisation, and Modernisation_e-INFRA_CZ_II.

IT4Innovations provides supercomputing resources of the supercomputers LUMI (531.5 PFlop/s), Karolina (15.7 PFlop/s) and Barbora (849 TFlop/s) for academia and industry, CESNET provides data transmission, storage, and processing services while ensuring secure communication and data protection supporting distributed collaborations, and CERIT-SC manages national computing and data infrastructure.

By combining their infrastructures, e-INFRA CZ provides a seamless environment for scientific data management. This integration ensures that researchers from different disciplines have access to

HPC resources, advanced data storage solutions, and a robust national communication network. The collaboration facilitates efficient data handling and computational support, which are essential for modern scientific endeavors.

A notable outcome of this collaboration is the successful implementation of inter-city quantum key distribution between Ostrava and Cieszyn within the HE OpenQKD project. This achievement marks a significant advancement in secure communication technologies within the region.

The e-INFRA CZ consortium has received the highest possible score in an international evaluation of large research infrastructures in the Czech Republic. The evaluation highlighted the consortium's progress in merging infrastructures and the resulting benefits of streamlined services for the research community.

The e-INFRA CZ consortium also implements EOSC CZ, which is the Czech national initiative aligning with the broader European Open Science Cloud. EOSC CZ aims to establish a National Data Infrastructure that facilitates the sharing, management, and accessibility of research data across various disciplines.

International projects

State Capitalism Returns: The Impact of Government Ownership on Markets, Indebtedness, and the Environment

The Faculty of Economics cooperates in a diversified international team, which brings several advantages to the project. First, the close association of the Czech research team with researchers from the World Bank and other policy institutions, as well as the cooperation with Oxford University and the IESEG School of Management (where both institutions are leaders in promoting and advising on the global energy transition), increases the likelihood of broad policy implications of the research results. Second, it also increases the likelihood of high-impact publications. Third, the team is diversified in terms of expertise and methodological skills. Specifically, the team consists of researchers specialising in financial economics (Oxford University, Czech research team), political economy (Czech research team), financial shocks (IESEG School of Management and Kozminski University), banking sector (IESEG School of Management, Polish research team and Oxford University), energy transition (IESEG School of Management) and fiscal debt (Czech research team with World Bank researchers). The cooperation allows us to exchange and transfer intellectual capital among all project researchers.

International Collaboration of the Faculty of Electrical Engineering and Computer Science (FEECS), VSB-TUO with Texas Universities

The Faculty of Electrical Engineering and Computer Science (FEECS) at VSB-TUO has developed a strategic international partnership with leading research institutions in the USA, particularly the [University of Texas at El Paso](#) and the [University of Texas at Arlington](#). This collaboration has resulted in significant joint scientific outputs, academic exchanges, and prestigious awards. The long-term cooperation with the team of Prof. Homer Nazeran focuses on computer modelling of physiological systems, intelligent biomedical devices, and advanced signal processing methods. Their joint research activities have led to numerous publications in high-impact international journals. A major milestone was Prof. Nazeran's sabbatical stay at FEECS VSB-TUO, where he significantly contributed to strengthening the faculty's research base and led joint projects on non-invasive fetal ECG monitoring techniques.

Further collaboration with the team of Prof. Khosrow Behbehani and Dr. Michael Douglas Nelson from the University of Texas at Arlington focuses on bioengineering, advanced bioelectrical signal processing, and the development of wireless wearable sensors. This cooperation has resulted in multiple high-impact publications on topics such as cardiac and brain activity, non-invasive monitoring, and synchronisation of cardiac and respiratory signals during MRI.

Assoc. Prof. Radana Vilímková Kahánková completed a long-term research stay at the University of Texas at Arlington, where she contributed to the development of new algorithms for biomedical data analysis. The collaboration has resulted in the publication of more than 30 articles in prestigious journals, including:

- IEEE Reviews in Biomedical Engineering (IF 10.231)
- Applied Soft Computing (IF 6.725)
- Frontiers in Physiology (IF 4.755)
- IEEE Transactions on Instrumentation and Measurement (IF 4.016)

This collaboration demonstrates the long-term excellence of FEECS VSB-TUO in the field of biomedical engineering and highlights promising future developments in international scientific research.

Collaboration between the Faculty of Materials Science and Technology (FMST) and Yokohama National University (YNU) in Science, Research, and Education

The cooperation between FMST VSB-TUO and Yokohama National University (YNU) has a long-standing tradition, dating back to the year 2000. Initially focused on short-term research exchange visits, the collaboration gradually expanded to include joint scientific research projects. In recent years, FMST has participated in two Japan-funded projects focused on "green materials" and the development of materials for high-temperature applications. A total of five Japanese researchers were involved in two Czech OP VVV projects under the "Pre-application Research" and "Long-term Cross-sectoral Cooperation" calls. One of the major outcomes of the project "Innovative Treatment Methods for the Musculoskeletal System in Trauma Surgery" was awarded the prestigious Japan Institute of Metals and Materials prize for the best result of 2021. A joint team of authors from VSB-TUO, YNU, Tokyo Institute of Technology, and Ibaraki University clarified the texture development mechanisms at elevated temperatures in Al-Mg alloys designed for medical applications. YNU and VSB-TUO also co-organize Czech-Japanese workshops on the damage of structural materials, held biennially. Furthermore, FMST VSB-TUO and the Faculty of Engineering at YNU are partners in a Master's Double Degree Program in Materials Engineering.

Collaboration with Institute of Polymer Science and Technology (ICTP-CSIC) in Madrid, Spain

The collaboration focuses on joint research in the field of polymers and their modifications, hydrogels, and materials with antimicrobial properties. During the evaluated period, it was supported by a project funded by the Spanish government:

- iLINK A20364 Design of novel antimicrobial bio-based materials using supercritical fluids processes, State Agency of the Higher Council for Scientific Research (2021-2022),

preceded by the project iLINK 1191 Graphene-based hybrid materials as antimicrobial systems effective against antibiotic-resistant bacteria (2018-2019).

Further collaboration continues within the projects OP VVV Doctoral Grant Competition, REFRESH (EL1), MEET, and OP JAK MES-ITI, where Dr. Marta Fernandez-Garcia's team participates as a non-financial partner.

Selected joint publications:

- Škrlová, K. et al. *Polymer Testing* 116 (2022) 107760.
- Chiloeches, A. et al. *ACS Applied Bio Materials* (2023) 6, 11, 4805.
- Muñoz-Núñez, C. et al. *Journal of Polymers and the Environment* (2024) 1-16.
- Muñoz-Núñez, C. et al. *Carbohydrate Polymer Technologies and Applications* (2024) 8, 100559.

The collaboration with the ICTP-CSIC has strengthened the international visibility of the VSB-TUO through publications in prestigious scientific journals on polymeric materials and antimicrobial systems and integrating the Spanish partner into projects. Research stays for PhD students and researchers have facilitated knowledge transfer and enhanced the quality of education within the

Nanotechnology study program. This partnership has expanded the scientific network and supported future funding opportunities, contributing to the university's strategic development.

IT4Innovations and the Leibniz Supercomputing Centre (LRZ)

have engaged in multiple collaborative efforts to advance high-performance computing (HPC) and related technologies. Their joint initiatives encompass various projects and partnerships aimed at enhancing computational capabilities and addressing complex scientific challenges.

Both institutions are integral partners in the HE OpenWebSearch.eu project, which aspires to develop an open European infrastructure for web search. In this collaboration, LRZ contributes its extensive IT infrastructure and management expertise, while IT4Innovations offers its proficiency in workflow and data platform development. This synergy aims to set new standards for web search, emphasizing openness and transparency as fundamental European values.

The H2020 LEXIS (Large-scale EXecution for Industry & Society) project is another notable collaboration between IT4Innovations and LRZ. This initiative focused on creating an advanced engineering platform that integrates HPC, cloud services, and big data analytics. The platform facilitates complex simulations and data analysis across various industrial and societal sectors, enhancing the efficiency and scalability of computational tasks.

Both centres have been selected by EuroHPC JU (the European High Performance Computing Joint Undertaking) to host quantum computers, marking a significant step in Europe's quantum computing infrastructure. IT4Innovations will host the VLQ quantum computer in Ostrava, Czech Republic, while LRZ in Germany is set to host the Euro-Q-Exa quantum system. These developments are expected to bolster Europe's research capabilities in quantum computing, providing researchers and industries with access to cutting-edge quantum technologies.

In a multidisciplinary endeavour, IT4Innovations and LRZ are collaborating on the CLARA (HE Teaming for Excellence Center for Artificial Intelligence and Quantum Computing in System Brain Research) project. This center aims to revolutionize research into neurodegenerative diseases, such as Alzheimer's, by leveraging artificial intelligence, quantum computing methods, and supercomputers. The integration of these technologies is anticipated to yield new insights into disease mechanisms and potential treatments.

STUDIES

4.13 Doctoral studies

The HEI will briefly describe the organisation of the doctoral studies (if there are any doctoral study programmes³²⁵). HEI will comment on:

- Structure and organization of studies.
- A system of cooperation between PhD students and their supervisors.
- Basic statistics (including drop-out rate, student workload, etc.).
- Information on promotion and recruitment schemes.
- Cooperation within doctoral studies (e.g., Czech Academy of Sciences, application sphere, building open study programmes for foreign nationals and creating international networks of study programmes, "joint degree", "cotutelle", etc.).
- Student care system (e.g. counselling, wellbeing care, career guidance).
- A system for tracking the future careers of graduates³²⁶.
- Other relevant data, such as the existence of a doctoral school, basic soft skills courses, etc. at the discretion of the HEI.

The HEI shall support this with appropriate examples (e.g. a model example of doctoral student cooperation with their supervisor, statistics on collaboration within doctoral studies, specific examples within doctoral studies, statistics on the use of student care systems, etc.).

Maximum 300 words per point.

Structure and organization of studies

The organization of doctoral studies is governed by the internal regulation of VSB-TUO: [Study and Examination Regulations for Studies in Doctoral Degree Programmes](#)

A system of cooperation between PhD students and their supervisors

The success of the doctoral studies is significantly influenced by the cooperation between the supervisor and the doctoral student. The supervisor and the doctoral student prepare the individual study plan, with the supervisor providing both organisational and professional guidance, including supervision of the dissertation work. The supervisor monitors the student's academic progress and submits an annual evaluation of the student's studies to the subject-area committee. The supervisor has the right to attend the doctoral student's examinations within the study programme. Furthermore, the supervisor is responsible for the doctoral student's dissertation seminar activities, defines the focus of the student's work, and evaluates the results achieved.

Basic statistics

- As of October 31, 2024, there were 874 students enrolled in 76 doctoral study programs.
- Out of the total number of programs, 33 are taught in English.
- The development of the number of first-year doctoral students over the past 5 years is shown in Table 1.
- The development of the total number of doctoral students over the past 5 years is presented in Table 2.
- The number of doctoral graduates over the past 5 years is summarized in Table 3.
- The drop-out rate over the past 5 years is around 58 %.
- The university implements a credit system ensuring stable annual workload for doctoral students (60 credits per year). Students earn credits not only for completed courses but

³²⁵ If the HEI does not organise any doctoral programme, it will explicitly state this information in the self-evaluation report.

³²⁶ The HEI will list the top five highest ranked graduates in academia, the private sector, and public administration over the past five years.

also for dissertation seminar activities, the list of which is specified in the Study and Examination Regulations for Doctoral Study Programs.

Table 1: Number of Enrolled Students in the 1st Year of Doctoral Study

AY/Faculty	FE	FCE	FSE	FEECS	FMST	FME	FMG	USP	VSB-TUO
20/21	26	5	36	61	62	56	61	0	307
21/22	25	15	17	56	56	66	47	0	282
22/23	30	11	22	56	34	54	48	0	255
23/24	27	15	29	56	24	46	53	0	250
24/25	30	10	18	61	32	47	27	0	225

Table 2: Total Number of Doctoral Students

AY/Faculty	FE	FCE	FSE	FEECS	FMST	FME	FMG	USP	VSB-TUO
20/21	81	75	104	238	169	191	260	23	1141
21/22	84	72	95	229	183	177	213	15	1068
22/23	81	72	70	213	156	180	189	11	972
23/24	79	74	69	199	138	175	179	9	922
24/25	82	72	72	213	131	170	128	6	874

Table 3: Number of Doctoral Study Graduates

AY/Faculty	FE	FCE	FSE	FEECS	FMST	FME	FMG	USP	VSB-TUO
2020	8	6	3	5	4	12	11	3	52
2021	4	9	4	24	21	23	21	3	109
2022	3	8	5	27	14	18	19	4	98
2023	6	8	12	22	9	15	27	3	102
2024	12	11	17	29	28	36	52	8	193

Information on promotion and recruitment schemes

Doctoral studies are promoted at study fairs. The guarantors of doctoral programs actively promote doctoral studies within their faculties. During international trips of academic staff — either to universities or conferences — within the framework of research projects, cooperation is established, which may lead to the signing of partnership agreements, Double Degree agreements, Joint Degree agreements, and similar collaborations.

Cooperation within doctoral studies

Establishing Cooperation with:

- **Czech Academy of Sciences (AV CR):** Faculties, within certain doctoral study programs, primarily cooperate with the Institute of Geonics of the Czech Academy of Sciences. Within the framework of GACR projects, faculties also collaborate with individual members of various institutes of the Czech Academy of Sciences.
- **Application Sector:** Collaboration with the application sector is primarily established through dissertation projects, for example with Třinecké železářny, CzechInvest, ČEZ, the Ostrava Labour Office, Trexima, and others. The faculties also develop practical internships for doctoral students, for instance at the Czech National Bank (ČNB) or in international companies such as Felss Systems GmbH, imk Industrial Intelligence GmbH, Forvia – Hella

GmbH & Co., Onsemi, and others. These professional internships enable doctoral students to engage in real research and development projects where they apply their academic knowledge in an industrial environment. This cooperation strengthens the transfer of knowledge from university research to companies and supports the implementation of innovative material and technological solutions in practice. At the same time, it brings valuable feedback to the academic environment in the form of new ideas and challenges stemming directly from the current needs of industrial partners.

- **Educational Testbed CPIT TL3 for Project-Based Learning** - Since 2021, the industrial testbed has been operating, consisting of several key areas: Smart Factory (industrial automation and robotics, digitisation of production and logistics processes with digital twins), AIM Lab (AI in manufacturing and logistics, AI/ML applications for process optimization), Mobility Lab (C-ITS and CCAM – cooperative, connected, and autonomous mobility), Health Lab (assistive technologies, biomedicine).

Within the testbed, project-based learning is implemented through bachelor's, master's, and semester projects, where PhD students play a key role as team leaders of professional tasks. PhD students are also actively involved in discussions with representatives of dozens of companies from the application sector as well as research and public institutions.

The CPIT TL3 testbed is part of Living Lab Ostrava, a group of specialised living labs managed by PhD supervisors or heads of expert groups.

- **ČEPS 2020-2023 (2025)** – Since 2020, the ČEPS Scholarship Programme has been financially supported by ČEPS with regular annual grants of 1.5 million CZK. The programme is designed to provide scholarship support to exceptionally talented and active students. Students with outstanding academic results and experience in solving complex semester projects, particularly in the fields of electrical engineering and related areas such as information and communication technologies (hardware/software, theoretical analyses), or segments of e-mobility (energy storage, monitoring transmission and usage, charging infrastructure, e-drive, etc.), are selected through a competitive process. Activities that support and develop cutting-edge laboratory/experimental teaching and collaboration with the application sector are highly prioritised.

Although the programme primarily targets master's students, it is also seen as a preparation for doctoral studies, including identifying potential dissertation topics.

- **Join degree, Double degree, cotutelle:** The University actively develops international cooperation in doctoral studies, particularly through the cotutell program in the following areas: nanotechnology, experimental laser physics and photonics, computational science, and cybernetics. This allows our students to obtain dual doctoral degrees through joint supervision of their dissertations between our faculties and renowned foreign universities such as Institut Polytechnique de Paris, Université de Lille, Université Toulouse III Paul Sabatier, and LUT Lappeenranta.

A Double Degree agreement has been signed with one Italian university — University of Perugia, and two Vietnamese universities — Ton Duc Thang University and Dong Nai Technology University.

Student care system

Support Services:

Doctoral students at our University have access to a wide range of support services, including academic, psychological, and career counselling, as well as psychosocial support and coaching. The

University also offers training in soft skills, financial literacy, and crisis intervention. Students with specific needs can benefit from modified study conditions, as well as additional services such as registration and interpretation services, electronic learning aids, digital support technology, and compensatory tools. To enhance mental health, resilience, and general well-being, specialised seminars and activities are organized by the Counselling Centre and other student and staff support centres.

Utilisation of Support:

Approximately 30-35% of doctoral students who seek support from the Counselling Centre use its services. Doctoral students primarily seek support in psychological and psychosocial areas, where they address personal issues, relationships (both personal and professional), time-management, personal development, and issues such as burnout syndrome. The wide range of care provided meets the definition of well-being, contributing to the development and prosperity of scientific and academic staff, enhancing the overall atmosphere, and supporting successful management of both personal and professional life.

One of the University's key pillars is the Student Support System, which provides support for both academic and personal development. This system primarily focuses on career and psychosocial counselling, practical experience training, and well-being support. It is designed to help students during their studies and their transition to their professional careers. Throughout the year, the [Career Centre](#) offers students self-development services, events, and year-round programs. In 2024, students visited 3,482 services, which has been consistent in recent years. Among the services, the most sought-after are individual consultations, whether in the form of career or personality coaching, practical interview preparation, or psychological consultations. In 2024, 268 individual consultations were provided, with the highest demand annually for personal coaching and psychological counselling. Individual counselling supports students during challenging periods, when they may face stress or personal challenges. It helps with setting up professional careers, bringing balance and efficiency.

Students could gain practical experience and contacts through development workshops and lectures with industry experts, with more than 25 events held annually. For example, in 2024, 1,211 students participated in these events. The activities are focused on the development of professional skills, AI training, entrepreneurship support, and more. In previous years, the Career Centre launched programmes like the Talent Programme, the Start-up Business Course, and the Start Your Career course. A key area of student care is well-being, including programmes aimed at enhancing resilience, adaptability, self-regulation, and self-actualization. These programmes help students perceive the world in its complexity and be a creative force within it.

One of the most important roles in the system is career counselling, which acts as a bridge between the academic world and the workforce. It helps students profile themselves and find sustainable employment. Every year, the Career+ job fair is held, attracting nearly 3,000 students, along with the [K+ portal](#) (available in Czech only), where nearly 3,900 students were registered in 2024.

Thanks to this system, our students are supported not only in the academic field but also in their personal development and career preparation. This comprehensive approach forms the foundation for their success both at the university and in life.

A system for tracking the future careers of graduates

The university tracks alumni from bachelor's and master's programmes through its Alumni system, but it does not have a system for tracking doctoral graduates. However, most doctoral graduates maintain contact with their alma mater through subsequent collaborations, or they stay in touch with individual academics, researchers, and former colleagues via professional social networks such as LinkedIn.

Collaboration with alumni in the areas of research and practice involves monitoring alumni engagement with the academic environment, including participation in research projects, conferences, and publications. Some alumni collaborate with faculties as external experts from practice, are proposed as opponents for theses (or dissertations), serve as members of state examination committees, or as members of faculty scientific councils. A great contribution is also made through lectures within the specialised courses of the faculties.

Academic staff – many Ph.D. graduates remain in the academic environment after completing their studies, being employed at the faculties as assistant professors or scientific and research staff, continuing to develop their professional (scientific-pedagogical) careers. Many of them go on to successfully complete their habilitation (to qualify as an associate professor).

Collaboration with external organizations – faculties collaborate with companies and research institutions where their graduates work, and these external organisations provide valuable information on how graduates contribute to their teams or research projects. Graduates who have found employment in research and development roles, technological specialists, or as leaders of development teams in industrial companies actively contribute by formulating new industrial needs that drive the modernization of education.

Publications and citations – The scientific career development of graduates can also be tracked through published articles, citations, and participation in research projects, helping to form an image of their career growth.

The [Career Centre](#) of VSB-TUO facilitates the connection between employers and recent graduates, including doctoral students, where employers offer full-time or part-time positions, trainee programs, etc., through their profiles. This collaboration also generates valuable feedback for the university/faculties.

[The PhD Academy](#) has been focusing on supporting doctoral students and young researchers since 2021, with the goal of kickstarting their scientific careers and ensuring the successful completion of their studies. This contributes to the overall development of participants, with an emphasis on acquiring transferable skills that can be applied outside of the academic environment.

The PhD Academy offers university-wide courses led by top instructors from VSB-TUO, as well as Czech and international institutions. In terms of content focus, the courses are divided into four areas (according to a Research Cycle). The first area is the *Development of Scientific Thinking*, which focuses on information and data literacy and the development of critical thinking (Data Literacy, LibGuide: Academic Writing Guide, Statistics, etc.). The second area is the *Management of Science and Research*, which addresses project management and issues related to ethics and intellectual property (Project Planning and Preparation, Project and Financial Management, Research Ethics, Data Stewardship, etc.). The next area is *Communication and Presentation of Science*, where students learn not only to write about science but also to speak about it (English for Scientific and Academic Discussion, Presenting Research Results, Principles of Effective Reading and Writing, LaTeX for Technicians, Writing a Research Paper, etc.). The last area is *Personal Growth and Career Development* (Time Management, Effective and Efficient Teaching, etc.).

The courses are offered in Czech and/or English. Many of the courses are available both in-person and online. In addition to regular courses, the PhD Academy organizes student competitions, Info Days, and unique events such as the *Scientific Writing Camp*, which allows participants to network with colleagues from other institutions, plan, and conduct interdisciplinary research.

The PhD Academy has long focused on supporting PhD students, but in 2024, it launched an extensive support program for doctoral program supervisors, based on three pillars: the Development Program for Future Supervisors (a year-long blended-learning program), Doctoral Supervisor Training (an intensive program for current supervisors), and an advanced feature in the form of the Mastermind Group. The comprehensive support provided by the PhD Academy contributes not only to the development of individuals but also to the overall growth of the university's scientific and research performance.

IMPLEMENTATION OF RECOMMENDATIONS

4.14 Implementation of the recommendations in Module 4

The HEI will briefly describe how it has implemented the recommendations for Module 4 from the previous evaluation period, if applicable.

Maximum 1000 words

The following recommendations (R) were implemented:

ORGANISATION, MANAGEMENT AND SUPPORT OF R&D&I

- **R:** *“High-level support by international experts missing so far”* – several activities i.e. Global Experts Project, Refresh and Matur projects (see 4.2. point 5 for more details) have already resulted in foreign experts being hired.
- **R:** *“Online manual/information pages on intellectual property protection, technology transfer, setting up spin-offs, etc. can be established.”* - A completely new initiative is the establishment of the Transfer Academy, with the first session taking place in the fall of 2024, and it is planned to be repeated. It consists of a series of five practical workshops that help participants acquire key skills for successful technology transfer: [Transfer Academy - Technology Transfer Centre VSB-TUO](#).
 - The information pages are here: [Technology Transfer Centre - VSB-TUO](#)
 - Several online educational courses are available, and new for 2024 are these two courses: Artificial Intelligence and Law, Business Competencies in Science, which complement the already existing Guide to Industrial Property Protection at VSB-TUO and Guide to Copyright Law. All of these and many other educational materials are available on the website: [Protection of intellectual property - Technology Transfer Centre VSB-TUO](#) In the "Education" section
- **R:** *“The RIV point system may be expanded to include citations, grants (national, European, industrial, ...), awards, etc.”* - The current methodology for budget allocation includes a weight of 70% for publications, 20% for citations, and 10% for applied research results. We cannot speak about the methodology at the national level.
- **R:** *“In managing R&D&I, it would be good if there can be an additional committee to gather feedback independent of the Rector's office”* – VSB-TUO has underwent international evaluation performed by EUA.

DOCTORAL STUDIES

- **R:** *“Consider establishing a Doctoral School to handle all issues related to the doctoral programmes”* – PhD Academy has been established and is offering courses for PhD students since 2021 and for supervisors since 2024, see point 4.2.
- **R:** *“It was stated that the doctoral programme generally takes 4 years, but it is considered important to reduce the minimum duration to 3 years for top performing students with high achievements.”* - The new Study and Examination Regulations also allow for a faster progression through the doctoral program.
- **R:** *“It would be good to increase English language based PhD programmes to facilitate*

international collaboration and publication in top journals.” - The admission process for doctoral programs includes an English language examination. Currently, we have 69 accredited doctoral programs, of which 38 are in English.

- **R:** *“Online technical seminars by world leaders can be arranged in areas with a significant number of Faculties, researchers and doctoral students.”* - FEECS organizes seminars for doctoral students, where international lecturers are also invited (Journal Club, PhD Academy within the entire university).
- **R:** *“Annual or 6 monthly research progress evaluation and renewal/termination of scholarship/doctoral candidature.”* - The new Study and Examination Rules now include an annual review of progress for dissertation work. Previously, there was a state doctoral exam followed by the defense of the dissertation.

NATIONAL AND INTERNATIONAL COOPERATION AND MOBILITY IN R&D&I

- **R:** *“It should also be taken into account that students and young employees might prefer domestic work experience over foreign opportunities. The benefits of foreign visits can be highlighted”* - The university has its own tools for supporting internationalization, in addition to Erasmus, such as the VSB-TUO scholarship, the Internationalization program, BIPs, and involvement in U!REKA. Promotion of all opportunities mainly takes place at the beginning of the semester, but throughout the year as well – through teaching inputs, Mobility Days, Open Days, etc. As part of the U!REKA project, all students will be offered the option to either complete a task or take an entire course in English on the topic of Sustainability. Students will also have the opportunity to take courses from our partners on the Open Campus, for which they will receive ECTS credits and micro-certificates. Furthermore, cooperation with partners in R&D&I has significantly deepened. PhD students and staff participate in a large number of projects with our U!REKA partners.
- **R:** *“Consider establishing a department in charge of handling the mobility of researchers”* - The aim of the organizational change – transferring the Department of International Relations (DIR) directly under the Rector – is to enhance the importance of DIR as a place that will provide support to foreign researchers and their families in legislative, administrative, and organizational logistical matters related to their long-term stay in the Czech Republic, in Ostrava, and at VSB-TUO.

FORMATIVE EVALUATION OF R&D&I AND THE START-UP STRATEGY (WITH POTENTIAL FOR APPLICATION)

- **R:** *“Maintain the International Scientific Council/Advisory Board at University level to regularly revise the R&D&I strategy.”* - See point 4.1

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 4

Document name	No. criteria	Location (link in HTML)
Academic Senate	4.1, 4.9	https://www.vsb.cz/en/university/organizational-structure/academic-senate/
Scientific Board	4.1	https://www.vsb.cz/en/university/organizational-structure/scientific-board/
International Scientific Advisory Board	4.1, 4.3	https://www.vsb.cz/en/university/organizational-structure/international-scientific-advisory-board/
Internal Evaluation Council	4.1	https://www.vsb.cz/en/university/organizational-structure/internal-evaluation-council/
Pedagogical Board	4.1	https://www.vsb.cz/en/university/organizational-structure/pedagogical-board/
Industrial Board	4.1	https://www.vsb.cz/en/university/organizational-structure/industrial-board/
Ethics Commission	4.1, 4.3	https://www.vsb.cz/en/university/organizational-structure/ethics-commission/
Rules of Procedure of The Ethics Commission	4.1, 4.3	https://dokumenty.vsb.cz/docs/files/en/0243408c-fe0e-4409-8653-723423e411d3?prevPage=true
Code of Ethics of VSB – Technical University of Ostrava	4.1, 4.3	https://dokumenty.vsb.cz/docs/files/en/1ac673fe-bf88-41d5-b03a-2cd6f92c8ae7?prevPage=true
Administrative Board	4.1, 4.9	https://www.vsb.cz/en/university/organizational-structure/administrative-board/
Project Support Centre	4.2	https://www.vsb.cz/cpp/en
U!REKA	4.2, 4.8	https://ureka.eu/
PhD Academy	4.2, 4.4, 4.13	https://www.vsb.cz/phdakademie/en
Science and Research	4.2	https://www.vsb.cz/veda/en
Writing Support Centre	4.2	https://www.vsb.cz/wsc/en
Career Centre	4.2, 4.13	https://kariernicentrum.vsb.cz/en
Kariéra+	4.2	https://karieraplus.vsb.cz/cs
Green Light	4.2, 4.4	https://greenlight.vsb.cz/en/
Technology Transfer Centre	4.2, 4.4	https://www.vsb.cz/ctt/en
Fraunhofer Innovation Platform for Applied Artificial Intelligence for Materials & Manufacturing at VSB–TUO	4.2	https://www.vsb.cz/fip-ai/en
Refresh project	4.2	https://www.smaragdova.cz/en/refresh/
CirkArena project	4.2	https://cirkarena.cz/en/homepage/
MATUR project	4.2	https://www.fmt.vsb.cz/matur/en

Protection of intellectual property	4.2, 4.4, 4.14	https://www.vsb.cz/ctt/en/services/for-inventors/intellectual-property-protection/
Proof of concept	4.2, 4.4	https://www.vsb.cz/ctt/en/services/for-inventors/proof-of-concept/
Internal regulations and other regulations of VSB-TUO	4.3	https://www.vsb.cz/en/university/official-notice-board/internal-regulations-and-other-regulations-of-vsb-tuo/
Strategic plans and Annual reports of VSB-TUO - VSB-TUO	4.3	https://www.vsb.cz/en/university/official-notice-board/strategic-plans-of-vsb-tuo/
European University Association	4.3	https://www.eua.eu/
Institutional Evaluation Programme	4.3	https://www.iep-gaa.org/
VSB-TUO_IEP_Initial Evaluation Report	4.3	https://www.iep-gaa.org/downloads/publications/technical%20university%20of%20ost-rava%20vsb_final.pdf
VSB-TUO_IEP_Follow-up Evaluation Report	4.3	https://www.iep-gaa.org/downloads/publications/iep%20report%20vsb-tuo%20follow-up%20final.pdf
Internal regulations and other regulations of VSB-TUO	4.3	https://www.vsb.cz/en/university/official-notice-board/internal-regulations-and-other-regulations-of-vsb-tuo/
Strategic plans and Annual reports of VSB-TUO	4.3	https://www.vsb.cz/en/university/official-notice-board/strategic-plans-of-vsb-tuo/
Ombudsperson	4.3	https://www.vsb.cz/en/university/equal-opportunities/ombudsperson
Sustainable Development Strategy	4.4	https://www.vsb.cz/udrzitelnost/en/SDS-2024/
Sustainable University	4.4	https://www.vsb.cz/udrzitelnost/en
Technology Transfer Centre	4.4, 4.14	https://www.vsb.cz/ctt/en
Strategic Plan of VSB-TUO 2021 — 2027	4.4	https://dokumenty.vsb.cz/docs/files/en/4ed3b229-bf6a-4c4e-85fb-36a897a0ce78
Commercialization - Technology Transfer Centre VSB-TUO	4.4	https://www.vsb.cz/ctt/en/services/for-inventors/commercialization/
Cooperation with industry	4.4	https://www.vsb.cz/en/partnership
Support for innovative entrepreneurship	4.4	https://www.vsb.cz/ctt/en/services/for-inventors/commercialization/
Transfera.cz	4.4	https://www.transfera.cz/en/
Transfer Academy	4.4, 4.14	https://www.vsb.cz/ctt/en/services/for-inventors/transfer-academy/
Selection Procedure Rules for Filling The Positions of Academic Staff and Designated	4.6	https://dokumenty.vsb.cz/docs/files/en/847a4a24-1c7e-48c1-ad4f-4e92ef368010

Other University Staff at VSB – Technical University of Ostrava		
Job opportunities	4.6	https://www.vsb.cz/en/university/informational-board/job-opportunities/
OTM-R policy VSB-TUO	4.6	https://www.vsb.cz/export/sites/vsb/en/.content/files/OTM-R-policy-VSB-TUO.pdf
International Contact Point - VSB-TUO	4.6, 4.7	https://www.vsb.cz/en/study/international-contact-point/
Internal Salary Regulation	4.6	https://dokumenty.vsb.cz/docs/files/en/44153bf9-a705-4cc4-8bb8-de8c314133f7?prevPage=true
Equal opportunities	4.7	https://www.vsb.cz/en/university/equal-opportunities/
Gender Equality Plan	4.7	https://www.vsb.cz/export/sites/vsb/en/.content/files/GEP_VSB-TUO_ENG.pdf
Promoting equal opportunities	4.7	https://www.vsb.cz/en/university/equal-opportunities/promoting-equal-opportunities/
Discrimination and inappropriate behavior	4.7	https://www.vsb.cz/en/university/equal-opportunities/discrimination-and-inappropriate-behaviour/
Promoting equal opportunities	4.7	https://www.vsb.cz/en/university/equal-opportunities/promoting-equal-opportunities/
Ombudsperson	4.7	https://www.vsb.cz/en/university/equal-opportunities/ombudsperson/
The University International Office	4.8	https://www.vsb.cz/mobility/en
Degree students	4.8	https://www.vsb.cz/en/study/degree-students/
Doctoral degree	4.8	https://www.vsb.cz/en/study/degree-students/degree-studies/doctoral-degree/
Brochure for foreign applicants	4.8	https://www.vsb.cz/export/sites/vsb/en/.content/files/MEZINARODNI-BROZURA-2024_final.pdf
International Contact Point	4.8	https://www.vsb.cz/en/study/international-contact-point/
Guide for International Academics and Researchers	4.8	https://www.vsb.cz/export/sites/vsb/en/.content/files/GUIDE-FOR-international-ACADEMICS-AND-RESEARCHERS-2.pdf
Guide for International Students	4.8	https://www.vsb.cz/export/sites/vsb/en/.content/files/ICP-Brochure.pdf
Testbed CPIT TL3	4.9	https://www.fei.vsb.cz/cs/fakulta/nase-zazemi-a-vybaveni/platforma-novych-technologii-fei-cpit-tl3/
Smart Factory Lab	4.9	http://smartfactory.vsb.cz/
Karolina Supercomputer	4.9	https://www.it4i.cz/en/infrastructure/karolina
Energy Polygon – CEETe	4.9	https://ceet.vsb.cz/en/CEETe/
Quantum Computer	4.9	https://www.it4i.cz/en/infrastructure/lumi-q-consortium-quantum-computer
ENREGAT	4.9	https://ceet.vsb.cz/iet/en/enregat

E-INFRA CZ	4.9	https://www.e-infra.cz/en
EBEAM project	4.10	https://ebeam.vsb.cz/
EXA4MIND project	4.10	https://exa4mind.eu/
AI-MATTERS project	4.10	https://ai-matters.eu/
GlaS-A-Fuels project	4.10	https://www.glas-a-fuels-project.eu/
SPACE project	4.10	https://www.space-coe.eu/
Follow the Vehicle - animation	4.12	https://www.youtube.com/watch?v=7J3lIR1oHm8
Follow the Vehicle - video	4.12	https://www.youtube.com/watch?v=7Eu1QoQSI3M&t=9s
Autinno Ltd.	4.12	www.autinno.eu
Study and Examination Regulations for Studies in Doctoral Degree Programmes	4.13	https://dokumenty.vsb.cz/docs/files/en/dd0741c8-ecee-4f05-8862-b8437b744f62?prevPage=true
Career Center	4.13	https://kariernicentrum.vsb.cz/en
K+ portal	4.13	https://kportal.vsb.cz/

MODULE 5 - STRATEGY AND POLICIES

5.1 Mission and vision of the evaluated institution in R&D&I

The HEI will briefly describe its mission and vision with emphasis on R&D&I in general and its R&D&I capacities in the implemented R&D&I fields³²⁷ (Tables 5.1.1 and 5.1.2). In particular, the HEI's vision covers the following five-year period and must relate to the strategic objectives of the Provider, the National Policy on Research, Development, and Innovation of the Czech Republic 2021+, the Gender Equality Strategy 2021-2030, and other higher national and supranational strategic documents in the field of R&D&I (Table 5.1.3). The HEI shall complement the description with active references to its Strategic plan for the teaching, scholarly, scientific, research, development, artistic, and other creative activities of the higher education institution (regarding the results and recommendations from the previous evaluation period, if the evaluated HEI participated in it). The HEI shall describe how the vision and mission were implemented during the period of 2020–2024.

Maximum 2000 words.

The vision of the University is to be an institution respected by industry, that successfully develops the individual professional knowledge and skills, and personal attributes of future graduates, as well as its staff. We are a unique living laboratory with a focused and internationally recognised research agenda that addresses future societal challenges in real time. Everyone at the University contributes to the future success of individuals, the University itself, and society.

Our mission is to be a part of the higher education system as the highest level of the educational structure in the Czech Republic. We aim to pass on knowledge, develop skills, and create opportunities that lead to the professional growth of individuals and the development of society in the field of technical and economic focus. We collaborate with governmental organisations, local authorities, national and international universities, research institutions, organisations, and individuals. Our core tasks are: to provide higher education, to develop research and development, and to promote collaboration with practice.

From an R&D&I perspective, VSB-TUO is a university where a significant part of its research activities is conducted in **collaboration with industrial partners**, focusing on addressing specific issues within industry and society. High quality and recognised applied research is a priority, and serves as a fundamental pillar for the ongoing functioning and development of the institution. This is not only in terms of contributing to knowledge in various technical and economic fields but also in terms of societal relevance. The University plays a key role in the transformation process and development of the region.

We believe that the human resources play a crucial role in the performance of the University, distribution of research capacities among single FORD categories is also affected by the strategic whole-university projects (such as Refresh, Matur, CirkArena, Lerco, Cesar etc.). R&D&I capacities may be slightly changed in time according to future projects especially in terms of distribution of researchers among the FORD categories. In general, it can be stated that **the strategic projects cover the following categories: computer science** (including HPC, AI, quantum computing), **energy** (where several categories are involved – such as electrical, mechanical, materials, and environmental engineering), **materials engineering in interconnection with HPC, nanotechnology, environmental engineering, etc.** and also safety and security (which in fact belongs to “other engineering” among the FORD categories, and cover the topics such as safety of hydrogen storage technologies, resilience of critical infrastructure, etc.).

The goal is **to become a respected centre for applied research**. This can be achieved if the

³²⁷ For so-called R&D&I capacities, see Definition of Terms in Methodology HEI2025+.

University focuses its efforts primarily on areas where it can excel. The key areas of applied research include energy, materials science, safety and security and digital technologies – topics that are highly relevant and needed for both the region and the country. These efforts will also lead to an increase in the quality of publication outputs and applied research results, as well as their impact in both academic and practical spheres. VSB-TUO aims to achieve this, for example, by developing motivational and support tools for publishing researchers and creators of valuable intellectual property, as outlined in the University's [Strategy for the period 2021-2027](#).

- One of the key success indicators in this strategy is the **increase in the total number of publications** above the median for their respective fields and the citation impact of publications affiliated with VSB-TUO by 15 %. The total number of publications recorded in the Web of Science database grew by 39 % between 2020 and 2024 (from 833 Jimp to 1,157). In the case of publications above the field median (i.e., Q1+Q2), the number increased from 504 Jimp in 2020 to 967 in 2024, representing a growth of 92 %.
- Other indicators related to the **development of the University's business potential** include:
 - i) Increase in the average annual income from applied licenses by 10% – as reported in the Annual Report - in the field the annual income has decreased from 2 mil CZK to 0.99 mil CZK. 999 000 CZK (2024).
 - ii) The annual increase in total income from business contracts is 5 %. When comparing the years 2020 and 2024, the income was expected to grow by 20 %, but in reality, it increased by 30 % (from 135 million CZK to 175 million CZK).
- The operational goal focused on **supporting the development of the research and development (R&D) potential of the university's staff** includes the following indicators:
 - i) Successful completion of courses offered by the PhD Academy by at least 90 % of internal PhD students (by 2027) – Out of the total number of 874 PhD students in the academic year 2024/2025, 588 students attended the PhD Academy courses across both semesters.
 - ii) Increase in the publication output of PhD students by 25 %: In the comparison between 2020 and 2024, the quality of publications (measured by the average journal percentile across all fields in WoS and Scopus) has increased. Compared to 2020, prior to the establishment of the PhD Academy, there was a significant rise in publications in excellent journals (1st and 2nd deciles). In the D1 category, the number of publications increased from 4 to 33, and in the D2 category, it has increased from 20 to 37. The average number of publications per student also rose from 0.355 to 0.51 per year. Additionally, the number of non-publishing students decreased by 29 %.

5.1.1 R&D&I capacities of HEI in the year 2025

Field of Research	FORD	FORD share [%]	Predominant type of research	Total share of field of research [%]
1. Natural Sciences	1.1 Mathematics	3,7	Balanced basic and applied research	32,8
	1.2 Computer and information sciences	13,3	Balanced basic and applied research	
	1.3 Physical sciences	7,3	Balanced basic and applied	

			research	
	1.4 Chemical sciences	3,9	Balanced basic and applied research	
	1.5 Earth and related environmental sciences	3,7	Balanced basic and applied research	
	1.6 Biological sciences	0,2	Balanced basic and applied research	
	1.7 Other natural sciences	0,6	Balanced basic and applied research	
2. Engineering and Technology	2.1 Civil engineering	2,7	Balanced basic and applied research	56,1
	2.2 Electrical engineering, Electronic engineering, Information engineering	10,1	Applied research	
	2.3 Mechanical engineering	14,3	Applied research	
	2.4 Chemical engineering	4,2	Balanced basic and applied research	
	2.5 Materials engineering	7,9	Applied research	
	2.6 Medical engineering	1,4	Balanced basic and applied research	
	2.7 Environmental engineering	10,8	Balanced basic and applied research	
	2.8 Environmental biotechnology	0,0		
	2.9 Industrial biotechnology	0,0		
	2.10 Nanotechnology	2,2	Balanced basic and applied research	
	2.11 Other engineering and technologies	2,6	Balanced basic and applied research	
3. Medical and Health Sciences	3.1 Basic medicine	0,0		0,8
	3.2 Clinical medicine	0,2	Balanced basic and applied research	
	3.3 Health sciences	0,6	Balanced basic and applied research	
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries	0,0		0
	4.2 Animal and Dairy science	0,0		
	4.3 Veterinary science	0,0		
	4.4 Other agricultural sciences	0,0		
5. Social Sciences	5.1 Psychology and cognitive sciences	0,0		9,7
	5.2 Economics and Business	7,2	Balanced basic and applied research	
	5.3 Education	0,5	Balanced basic and applied research	
	5.4 Sociology	0,2	Balanced basic and applied	

			research	
	5.5 Law	0,0		
	5.6 Political science	0,1	Balanced basic and applied research	
	5.7 Social and economic geography	0,9	Balanced basic and applied research	
	5.8 Media and communications	0,2	Balanced basic and applied research	
	5.9 Other social sciences	0,7	Balanced basic and applied research	
6. Humanities and the Arts	6.1 History and Archaeology	0,0		0,5
	6.2 Languages and Literature	0,0		
	6.3 Philosophy, Ethics and Religion	0,0		
	6.4 Arts (arts, history of arts, performing arts, music)	0,4	Balanced basic and applied research	
	6.5 Other Humanities and the Arts	0,1	Balanced basic and applied research	
Total		100 %	-	100 %

5.1.2 Target R&D&I capacities of HEI for the next five-year period

Field of Research	FORD	FORD share [%]	Predominant type of research	Total share of field of research [%]
1. Natural Sciences	1.1 Mathematics	2	Balanced basic and applied research	45
	1.2 Computer and information sciences	18	Balanced basic and applied research	
	1.3 Physical sciences	10	Balanced basic and applied research	
	1.4 Chemical sciences	5	Balanced basic and applied research	
	1.5 Earth and related environmental sciences	10	Balanced basic and applied research	
	1.6 Biological sciences			
	1.7 Other natural sciences			
2. Engineering and Technology	2.1 Civil engineering	3	Balanced basic and applied research	45
	2.2 Electrical engineering, Electronic engineering, Information engineering	9	Applied research	
	2.3 Mechanical engineering	9	Applied research	
	2.4 Chemical engineering	2	Balanced basic and applied research	
	2.5 Materials engineering	9	Applied research	
	2.6 Medical engineering			

	2.7 Environmental engineering	7	Balanced basic and applied research	
	2.8 Environmental biotechnology			
	2.9 Industrial biotechnology			
	2.10 Nanotechnology	3	Balanced basic and applied research	
	2.11 Other engineering and technologies	3	Applied research	
3. Medical and Health Sciences	3.1 Basic medicine			
	3.2 Clinical medicine			
	3.3 Health sciences			
4. Agricultural and veterinary sciences	4.1 Agriculture, Forestry, and Fisheries			
	4.2 Animal and Dairy science			
	4.3 Veterinary science			
	4.4 Other agricultural sciences			
5. Social Sciences	5.1 Psychology and cognitive sciences			10
	5.2 Economics and Business	8	Basic research	
	5.3 Education			
	5.4 Sociology			
	5.5 Law			
	5.6 Political science			
	5.7 Social and economic geography			
	5.8 Media and communications			
	5.9 Other social sciences	2	Balanced basic and applied research	
6. Humanities and the Arts	6.1 History and Archaeology			
	6.2 Languages and Literature			
	6.3 Philosophy, Ethics and Religion			
	6.4 Arts (arts, history of arts, performing arts, music)			
	6.5 Other Humanities and the Arts			
Total		100 %	-	100 %

5.1.3 Relation to the strategic objectives of the provider and strategic documents in the field of R&D&I

Strategic document	Follow-up
The Strategic plan of VSB-TUO 2021–2027	https://www.vsb.cz/en/university/strategic-plan
Sustainable Development Strategy VSB-TUO 2024+	https://www.vsb.cz/udrzitelnost/en/SDS-2024
HR Award	https://www.vsb.cz/en/university/hr-award/
Gender Equality Plan for the years 2022-2026	https://www.vsb.cz/en/university/equal-opportunities/gender-equality-plan/ https://www.vsb.cz/export/sites/vsb/en/.content/files/GEP_VSB-TUO_ENG.pdf
Quality Management	https://www.vsb.cz/en/university/quality-management/
Code of Ethics	https://dokumenty.vsb.cz/docs/files/en/1ac673fe-bf88-41d5-b03a-

[2cd6f92c8ae7](#)

5.2 Research and development objectives

The HEI will describe its intentions and goals for the next five-year period. The objectives in the field of research development, innovation, and knowledge transfer as well as the objectives in the field of cooperation with public administration, entrepreneurs, and non-profit organisations will be described in relation to the mission, vision and disciplinary capacities of the HEI. Furthermore, the objectives for the development of the HEI as a research organisation will be described, in the areas of human potential development, institutional resilience, the implementation of open science and adherence to the principles of ethics, scientific integrity, and good practice, and their interrelationship with R&D&I objectives. The objectives described must be consistent with the Strategic plan for the teaching, scholarly, scientific, research, development, artistic and other creative activities of the higher education institution.

Maximum 2000 words.

According to the [Strategic Plan of VSB-TUO 2021–2027](#) in the field of research, development, innovation, and knowledge transfer the objectives are:

- **Enhancing research capabilities** by ongoing investing in state-of-the-art facilities, recruiting top researchers, and fostering an environment that encourages innovative thinking and cutting-edge research (see Chpt 4.2. Strategy/opportunities for establishing new research teams) (Strategic Priority of the University: “Recognized research”).
- **Promoting innovation**: The university aims to transfer more results of R&D into practical applications, which includes patenting new technologies, supporting start-ups, and collaborating with industry partners to bring innovations to market (see Chpt. 4.2. Science management).
- **Facilitating knowledge transfer** by focusing on ensuring that the knowledge generated within the VSB-TUO is effectively shared with industry partners and society. This can be achieved through partnerships, joint research projects with industry partners, and commercialisation of research results. However, the knowledge transfer is a key aspect of higher education, where the ultimate objective is to prepare students to apply themselves in practice, employment, or entrepreneurship, and thus significantly affect the development and transformation of the region (Strategic Priority of the University: “Education for practice”).
- **Fostering interdisciplinary collaboration** by promoting collaboration across different fields of R&D and supporting research teams addressing complex problems and generating their solutions (e.g. strategic projects such as Refresh, Matur, CirkArena).

In the field of cooperation with public administration, entrepreneurs, and non-profit organizations, the objectives of VSB-TUO are:

- **Building Strategic Partnerships**: Establishing strong relationships with public administration, businesses, and non-profits to leverage their expertise, resources, and networks (e.g. Industrial and Pedagogical Boards).
- **Enhancing Public Services**: Collaborating with public administration to improve public services through research and innovation. Engaging with citizens and other stakeholders to co-create public services. This can involve organizing workshops and events, such as [Researchers' Night](#), talk of our experts at the Melting Pot Forum, etc.
- **Supporting Economic Development**: Via [Smaragd Strategy](#) of the region, in which our University is a key driving force and we aim to transform the innovation ecosystem of the Moravian-Silesian region. By linking cutting-edge research, development, and innovative

entrepreneurship, it will bring new energy and opportunities to the region, attracting experts, students, companies, and technologies that respond to today's global challenges.

- Promoting Social Impact: By ongoing partnerships with non-profit organizations (e.g. a fundraising for Mobile Hospice Ondrasek or Doctors Without Borders/Médecins Sans Frontières is organized through our events such as Technika Run or University Auctions) to address societal challenges and improve the quality of life for communities (see chpt 4.4. Social responsibility strategy).
- Ensuring Sustainable Development: Aligning research and innovation efforts with sustainable development goals to create long-term positive impacts (see Chpt 4.4. Sustainable development concept). (Strategic Priority of the University: "Efficient functioning").

In the field of human potential development, the objectives are:

- Providing high-quality education and training to equip students, young researchers and staff with the necessary theoretical knowledge and practical and transferable skills for their future careers (e.g. via PhD Academy, several Support Centres (Language, Mathematics, Chemistry, Physics, Writing Support Centres), Leadership Academy (info in Czech only) and the Master of Business Administration).
- Fostering leadership and innovation by encouraging students and staff to take on leadership roles and engage in innovative projects via our comprehensive accelerator program [Green Light](#) for students, staff and public.
- Promoting lifelong learning to ensure that individuals continue to grow and adapt to new challenges throughout their careers and also make the University open to other generations via our [Junior University](#) (available only in Czech) or the University of the Third Age offering lectures at 5 faculties of VSB-TUO.

In the field of institutional resilience, open science and science integrity the objectives are:

- Ensuring financial stability through diversified funding sources and efficient resource management involving e.g. funding from contract research with industry.
- Enhancing the university's reputation and influence by maintaining high standards of academic and research excellence via [internal regulations](#) including Rules of the Quality Assurance System for Educational, Creative and Related Activities and Internal Evaluation of the Quality of Educational, Creative and Related Activities at VSB-TUO.
- Promoting open access to research outputs such as publications, data, and software (e.g. via [DSpace University Repository](#), and ongoing definition and implementation of open science strategy at VSB-TUO. Open science will enhance the impact and reach of our R&D by making research findings widely accessible and facilitating new collaboration.
- Adherence to Principles of Ethics, Scientific Integrity, and Good Practice via ensuring compliance with ethical guidelines such as [Code of Ethics of VSB-TUO](#) in all research activities. Providing training (e.g. courses of PhD Academy) and resources to support good research practices and prevent misconduct.

These objectives listed above are designed to create a dynamic and collaborative environment at VSB-TUO that drives progress and benefits both the university and society as a whole.

5.3 Institutional tools and measures for the implementation of the research and development strategy

The HEI will describe its institutional and strategic tools (e.g., strategic management tools, tools created to support the implementation of research objectives, legal and organisational norms in relation to R&D&I support, etc.) that are designed to fulfil the research and development objectives for the next five-year period (Table 5.3.1), with an emphasis on:

- Supporting quality R&D&I.
- Excellent science.
- Innovative environment and increasing the international or disciplinary competitiveness of the HEI's research activities.
- Development of human potential.
- Institutional resilience.
- Adherence to ethical principles, scientific integrity and good practice in R&D&I.

Maximum 2000 words.

In accordance with the [Strategic Plan of VSB-TUO 2021–2027](#) in the field of research, development, innovation, and knowledge transfer the objectives and corresponding tools and measures have been implemented:

Supporting quality R&D&I:

Objective: Enhancing research capabilities

Tools: ongoing investing in state-of-the-art facilities and creation of new research teams thanks to strategic R&D&I projects such as:

- [Refresh](#) - the project is designed as a system of four interconnected living laboratories (Energy Lab, Materials & Environment Lab, Industry 4.0 & Automotive Lab, Social Lab) providing open platforms for multifaceted collaboration between top experts and researchers, PhD students, companies and public administration representatives.
- [Matur](#) - the project aims at creating a centre of excellence in materials and technologies for sustainable development.
- [Cesar](#) – the project is focused on critical safety issues related to hydrogen technologies.

Objective: Promoting innovation

Tools: The university has a complex support system focused on single stages of the technology transfer into practical applications, which includes patenting new technologies (financial support of patenting by the University Patent Account), supporting start-ups, and collaborating with industry partners to bring innovations to the market. All the above-mentioned activities are supported by the complex support system of the [Technology Transfer Centre](#).

Objective: Fostering interdisciplinary collaboration by promoting collaboration across different fields of R&D and supporting research teams addressing complex problems and generating their solutions (e.g. strategic projects as Refresh, Matur, CirkArena). Moreover, events such as [Scientific Writing Camp](#) for PhD students, which is a two-day activity focused on networking, interdisciplinary collaboration by creating diverse teams from young researchers with different background in order to find a research gap, design and present a theoretical concept of an interdisciplinary study. Interdisciplinary collaboration is also manifested in the field of safety and security where [Centre of Excellence for Safety Research](#), (established 2025) which will work on

critical issues related to the safety of hydrogen technologies, which are becoming an increasingly vital part of the transition to sustainable energy sources.

Excellent science:

Excellent science is produced by excellent researchers who can mentor other team members to achieve excellence. Therefore, we focus on attracting several excellent researchers to join our teams and allowing them establish their teams in our research facilities (e.g. at IT4I - National Supercomputing Center, Center for Energy and Environmental Technologies and several Faculties of VSB-TUO) and encourage them to collaborate with other teams across the University.

Tools:

- attracting excellent researchers by using several sources of funding (e.g. funding from the Moravian-Silesian Region entitled Global Experts, or Global PostDocs for younger researchers to join these teams). The excellent scientists who has already joined research centres at VSB-TUO are: [prof. Pavel Hobza](#), [prof. Radek Zboril](#), [prof. Michal Otyepka](#), [prof. Mark Hermann Rümelli](#).
- [The Fraunhofer Innovation Platform for Applied Artificial Intelligence for Materials & Manufacturing at VSB – TUO](#) is the first and only Czech branch of the prestigious German applied research institution Fraunhofer-Gesellschaft which closely interconnects VSB-TUO with two Fraunhofer Institutes (Fraunhofer Institute for Chemical Technology and Fraunhofer Institute for Machine Tools and Forming Technology). This joint innovation platform enables the sharing of expertise, facilities and personnel, leading to joint activities such as European projects and events with industry (e.g. Czech-German Business Meetings).
- [New collaboration with Max Planck Institute](#) for Plasma Physics on the development of breakthrough technologies will help address global energy and environmental challenges.

Development of human potential:

Objective: [Providing high-quality education and training](#) to equip young researchers (PhD students), postdocs and staff with the necessary theoretical knowledge and transferable skills for their future careers via:

- [PhD Academy for young researchers](#) – providing courses corresponding to single stages of the research cycle focused on *i)* Research Design (data literacy and management, information literacy, critical thinking), *ii)* Research Management (intellectual property rights, project management, research ethics), *iii)* Research Communication (communication skills, science popularization, writing for publication), and *iv)* Research Career (self-management, career development, personal development),
- [PhD Academy for supervisors](#) – providing Doctoral Supervisor Training to new supervisors about their new role and to current supervisors especially on giving feedback, situation leadership, time and stress management, etc.
- Leadership Academy (info only in Czech) and Master of Business Administration.

Objective: [Fostering leadership and innovation](#) by encouraging students and staff to take on leadership roles and engage in innovative projects

Tool:

- a comprehensive acceleration programme [Green Light](#) for students, staff and public. GREEN LIGHT is a business support programme provided in two forms – the Green Light Start (six months of individual consultations with our mentors, focused on the talent identification, team formation, motivation and vision, target definition, verification with customers) and the Green Light Accelerator (three intensive months full of seminars and workshops, work, counting, thinking, but also fun, new knowledge, contacts and a big final [Start-up show](#) for those who already have a project with specific outlines).

Institutional resilience:

Resilience of the university includes the following aspects:

Crisis Management and Preparedness: VSB-TUO has plans to handle crises such as pandemics, or other emergencies. This includes having clear protocols, trained personnel, and necessary resources to respond effectively. As part of public health protection, health and safety at the workplace is ensured in accordance with legislation, with an emphasis on prevention. All persons in the employment relationship are regularly trained, and the specific conditions and safety risks arising in connection with the performance of work or practical training are taken into account at individual workplaces. In 2020 as a response to the pandemics the Crisis Staff of VSB-TUO was established. In 2024, training on the topic of soft target protection was conducted by representatives of the Police of the Czech Republic, which was sponsored by the VSB-TUO Security Support Project; the University also developed security guidelines.

Community and Support Systems: The university provides support among students, faculty, and staff, which involves fostering a culture providing mental health resources, and ensuring that everyone feels supported in case of need. An [ombudsperson](#) can help staff resolve conflicts and problems at the university. An individual [coaching](#) is provided to the staff by the Career Centre.

Infrastructure and Technology: Investing in resilient infrastructure and technology that can withstand disruptions and support the University's operations. This includes having reliable IT systems, secure data storage (the 3-2-1 backup rule), and modern facilities.

Adherence to ethical principles, scientific integrity and good practice in R&D&I:

- via ensuring compliance with ethical guidelines such as Code of Ethics of VSB-TUO in all research activities and by Ethical Commission of VSB-TUO in case of need. Providing training (e.g. courses of PhD Academy on research ethics) and resources to support good research practices and prevent misconduct.

5.3.1 Institutional tools and measures for the implementation of the research and development strategy

Name of instrument/measure	Description of the tool/measure	Implementation status	Year
HR Award: "European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers"	Improvement of research working conditions, Support for researcher career development, Alignment with European standards in HR practices, Implementation of the Charter and Code principles, Strengthening ethical and professional aspects of research, creation of	Implemented	Since 2021

	Action plan for HR development in research		
Support for interdisciplinary R&D&I	Support for interdisciplinary research and development, e.g. Interdisciplinary strategic projects at university level (REFRESH, MATUR, CESAR).	Implemented	Since 2023
Support for interdisciplinary collaboration in PhD studies	The Scientific Writing Camp as a joint activity for PhD students from all faculties, and in 2025, it will also involve the participation of two additional universities from the region.	Implemented	Since 2022
Promoting student/staff/public entrepreneurship	Green Light (4.2 Support system for students and early career researchers)	Implemented	Since 2015
Professional development of young researchers	PhD Academy	Implemented	Since 2022
Contribution to society	IT4I – National Supercomputing Centre– High-performance computing resources are utilized for traffic situation monitoring, flood simulations, and the development of novel pharmaceutical formulations.	Implemented partially	Since 2013
Contribution to society	FSE – The Simulation Technology Centre serves as a training facility for both students and professionals, with a focus on emergency and crisis scenarios such as floods and fires. It enhances preparedness and response capabilities by simulating real-life emergency situations.	Implemented	Since 2019
Sustainability of R&D&I	Sustainable Development Strategy	Implemented partially	Since 2024
Internationalisation of R&D&I	UIREKA – European University Consortium	Implemented	Since 2020
Internationalisation of R&D&I	FIP – Fraunhofer Innovation Platform for Applied Artificial Intelligence for Materials & Manufacturing at VSB–TUO	Implemented	Since 2021
Technology transfer support	Georgia Agricola Patent Account (see chpt 4.2. Science Management)	Implemented	Since 2019

5.4 Implementation of the recommendations in Module 5

The HEI will briefly describe how it has implemented the recommendations for Module 5 from the previous evaluation period, if applicable.

Maximum 1000 words

VSB-TUO was requested by MEP to consider the following suggestions (S):

- **S:** “Enhance research cooperation with renowned research institutes around the world with or without formal agreements.” - Since the previous evaluation, the Fraunhofer Innovation Platform has been established and is successfully developing (e.g. in terms of numbers of joint research project proposals).

R&D&I OBJECTIVES AND STRATEGIES

- **S:** *“Identify clear indicators for each objective to facilitate annual evaluations and drive the objectives via these annual evaluations.”* - were defined in the [Strategic Plan \(2021-2027\)](#)
- **S:** *“Continuing from #4, new technologies taught and researched at VSB-TUO will attract students and increase the citation rate of publications.”* - study programmes involving supercomputing, artificial intelligence, additive manufacturing were created and accredited.
- **S:** *“International scientific advisory boards will provide support and advice on internationalisation and research strategy.”* - established
- **S:** *“In addition to formal international collaborations, informal international collaborations with reputable researchers can be considered/established by faculty/professors.”* - prof. Hobza, prof. Zboril, prof. Otyepka, prof. Rümmeli, prof. Andrey Rogach (Global Expert) are involved in R&D&I at VSB-TUO (see 5.4. Excellent Science).
- **S:** *“Units can consider organising online talks by top international researchers in areas interesting to a high number of professors, research staff and research students. Attending several technical seminars can be a requirement for research students. These activities can lead to (in)formal collaborations with world leading experts.”* - FEI Journal Club – <https://www.fei.vsb.cz/en/research/journal-club>

R&D&I NATIONAL AND INTERNATIONAL CONTEXT

- **S:** *“The main problem of technical universities in our part of the world is they only have local influence, while to maintain the current position and competitiveness in motivating students in the conditions of globalisation of science, it is necessary to be more visible on a global scale. Therefore, it is necessary to increase the number of foreign students and PhD-students as well as postdoctoral researchers from abroad.”* - activities such as „Global Post Docs“ is contributing to increase in numbers of foreign researchers. Also Refresh and Matur project have hired several researchers from abroad.
- **S:** *“VSB-TUO can consider introducing more English language subjects/courses so that non-Czech speakers can also be hired. Restricting the faculty search to Czech speakers reduces the talent pool of potential faculty candidates.”* – The number of subjects taught in English has increased, also number of study programmes in English is higher.
- **S:** *“Internationalisation on all levels is advised, for example by establishing international advisory boards for all 13 units and for the University as a whole.”* - At the moment there is such a board on the whole university level (ISAB VSB-TUO) and the Matur Project has its own Scientific Board.
- **S:** *“Possibilities of appointing world research leaders as research consultants, visiting professors, etc. can be considered.”* - Prof Rümmeli has created his team at VSB-TUO.

TOOLS FOR IMPLEMENTING THE RESEARCH STRATEGY

- **S:** *“In addition to the tools presented in Section 5.5, IEP proposes to introduce tools to promote VSB-TUO abroad.”* - The University is promoted for instance at [THE having it's profile](#) where research fields and study programmes at VSB-TUO are promoted.
- **S:** *“It should be also taken into account that the international promotion of VSB-TUO will also promote Czech industry. Therefore, one should try to find Czech companies that export their products and include them in cooperation and mutual promotion in the target countries of this export.”* - This is already involved in activities of FIP.
- **S:** *“Transparency in the annual evaluation of academic and research staff so that all staff know the important contributions expected of them and how these factors yield the final assessment grade.”* - This is a part of each employee's annual evaluation.
- **S:** *“Transparent connection between annual assessment grade/score and salary adjustments/bonus payments/promotions, etc.”* - The processes of budget creation based on data driven decisions and also annual evaluation of employees have been implemented.

A LIST OF SUPPORTING DOCUMENTS/LINKS FOR MODULE 5

Document name	No. criteria	Location (link in HTML)
The Strategic plan of VSB-TUO 2021–2027 - document	5.1, 5.2	https://dokumenty.vsb.cz/docs/files/en/4ed3b229-bf6a-4c4e-85fb-36a897a0ce78
The Strategic plan of VSB-TUO 2021–2027 - web	5.2	https://www.vsb.cz/en/university/strategic-plan
Researcher's night	5.2	https://www.nocvedcu.cz/en/organization/vsb-technical-university-of-ostava
SMARAGD mission	5.2	https://www.smaragdova.cz/en/our-mission/
Green Light	5.2	https://greenlight.vsb.cz/en/
Junior University	5.2	https://www.zlepsisitechniku.vsb.cz/junior-univerzita/
DSpace University Repository	5.2	https://dspace.vsb.cz/?locale-attribute=en
Code of ethics	5.2	https://dokumenty.vsb.cz/docs/files/en/1ac673fe-bf88-41d5-b03a-2cd6f92c8ae7?prevPage=true
Internal regulations and other regulations of VSB-TUO	5.2	https://www.vsb.cz/en/university/official-notice-board/internal-regulations-and-other-regulations-of-vsb-tuo/
REFRESH	5.3	https://www.smaragdova.cz/en/refresh/
MATUR	5.3	https://www.fmt.vsb.cz/matur/en
CESAR	5.3	https://www.fbi.vsb.cz/en/news-detail/?reportId=48751&linkBack=%2Fen%2Findex.html
Technology Transfer Centre	5.3	https://www.vsb.cz/ctt/en/
Scientific Writing Camp	5.3	https://www.vsb.cz/phdakademie/en/news-detail/?reportId=47211&linkBack=%2Fphdakademie%2Fen%2Fnews%2Findex.html
Prof. Pavel Hobza	5.3	https://orcid.org/0000-0001-5292-6719
Prof. Radek Zbořil	5.3	https://orcid.org/0000-0002-3147-2196
Prof. Michal Otyepka	5.3	https://orcid.org/0000-0002-1066-5677
Prof. Mark Hermann Rümelli	5.3	https://www.scopus.com/authid/detail.uri?authorId=8377135100&origin=resultslist
The Fraunhofer Innovation Platform for Applied Artificial Intelligence for	5.3	https://www.vsb.cz/fip-ai/en/

Materials & Manufacturing at VSB – TUO		
Max Planck Institute for Plasma Physics - memorandum	5.3	https://www.vsb.cz/veda/en/news-detail/?reportId=49046&linkBack=%2Fveda%2Fen%2Findex.html
PhD Academy for young researchers	5.3	https://www.vsb.cz/phdakademie/en/menu/courses-for-students/
PhD Academy for supervisors	5.3	https://www.vsb.cz/phdakademie/en/menu/courses-for-supervisors/
Start-up show	5.3	https://startupshow.vsb.cz/
Crisis Management and Preparedness	5.3	https://www.vsb.cz/en/university/safe-university/
Ombudsperson	5.3	https://www.vsb.cz/en/university/equal-opportunities/ombudsperson/
Career Centre - coaching	5.3	https://kariernicentrum.vsb.cz/en/our-services/coaching/
Journal Club	5.4	https://www.fei.vsb.cz/en/research/journal-club
Times Higher Education – profile of VSB-TUO	5.4	https://www.timeshighereducation.com/world-university-rankings/vsb-technical-university-ostava

