



ROSATOM



PERFORMANCE
OF THE FUEL DIVISION
IN 2020

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Message From the Head of the Division

Dear colleagues, friends and partners,

Despite the restrictions of 2020, ROSATOM's Fuel Division continued not only to operate during the pandemic but also to develop in all strategic areas. The Division fulfilled its production plan for 2020 and all contractual obligations to partners in full.

In 2020, the Fuel Division's revenue increased by 7.3% to RUB 208.7 billion. And, by the end of 2020, its ten-year portfolio of overseas nuclear orders grew by 13% to USD 15.7 billion.

JSC TVEL's reactor fleet was expanded in 2020 with two more VVER-1200 modern power units at the Belarusian NPP and Leningrad NPP now using the Company's nuclear fuel. The first batch of the VVER-440 advanced fuel for Paks NPP was loaded into the reactor. The new fuel will improve fuel efficiency and economics of operations at the power units. With Indian partners, the Division launched a project to transition two operating power units at Kudankulam NPP equipped with VVER-1000 reactors to the new advanced fuel and to extend the fuel cycle up to 18 months. In the research reactor market, contracts were signed for the supply of nuclear fuel and its components to research facilities in the Czech Republic and Egypt.

In 2020, significant progress was made in closing the nuclear fuel cycle. The first batch of MOX fuel was loaded into the BN-800 'fast' reactor. At the Siberian

Chemical Plant (JSC SCP) in the Seversk PSEDA, the Fuel Division started a project to launch the fabrication of REMIX fuel for VVER-1000 reactors and initiated the installation of main equipment at the fabrication module for mixed nitride uranium/plutonium (MNUP) fuel for a BREST-OD-300 reactor.

As an industry business integrator responsible for projects on the decommissioning of facilities posing nuclear and radiation hazards, TVEL Fuel Company makes a significant contribution to the sustainable development of its regions of operation. In 2020, the Company also prepared for the decommissioning of nuclear facilities at JSC SCP, JSC Chepetsk Mechanical Plant, JSC VNIINM, PJSC NCCP, JSC AECP and implemented related projects. Besides environmental benefits, these initiatives bring additional revenue to our enterprises and, hence, more tax payments to federal, regional and local budgets.

2020 saw the dynamic development of non-nuclear businesses. Revenue from non-nuclear products increased by 35.4% year-on-year (to RUB 24.2 billion), and revenue from new products grew by 50.1% (to RUB 19.3 billion). Another highlight of 2020 is LLC RusAT's Additive Manufacturing Centre opened in Moscow. The establishment of LLC RENERA, an industry integrator responsible for energy storage systems, was completed. The company already has a portfolio of contracts and projects implemented. In 2020, the integrator opened a new facility producing energy storage sys-

tems at Moscow Polymetal Plant (JSC MZP). In the metals industry, the Fuel Division continued to develop a range of R&D-intensive and innovative product areas. One of the new products of 2020 is permanent magnets for wind power plant generators. The Company's portfolio of new chemical products increased by more than 100% and exceeded RUB 14 billion.

These results were achieved in unprecedented conditions caused by the COVID-19 pandemic, which paralysed many projects and industries worldwide. To fulfill production plans at all enterprises, the Fuel Division took the following measures: remote work for some employees, regular disinfection of premises and the provision of personal protective equipment for employees, the application of non-contact thermometers, mass COVID-19 testing of personnel, and changes in work schedules to ensure social distancing.

To fight against the coronavirus in 'nuclear' towns and cities, ROSATOM and the Fuel Division allocated more than RUB 700 million. These funds were spent on PCR test centres and laboratory equipment, medical equip-

ment, ambulance vehicles and PPE for local institutions of Russia's Federal Medical-Biological Agency, sanitizers and expendable supplies for medical treatment, as well as air recirculation units for social facilities.

Despite the changes, we have the same strategic priorities: rapid development of nuclear fuel cycle technologies, dynamic growth of non-nuclear businesses related to high-tech R&D-intensive industries, commitment to sustainable development principles, as well as building effective scientific, commercial and social partnerships¹⁰

Natalia Nikipelova
CEO of the Fuel Division,
President of JSC TVEL, the holding company
of the Fuel Division

Response to the Pandemic

In 2020, during the coronavirus pandemic, JSC TVEL provided every assistance to organisations and residents in the regions of operation, purchasing medical equipment, PPE, sanitisers, and expendable supplies for treatment. As part of the #ROSATOMWeAreTogether charity project, the Company gave food baskets to 1,500 families who were in a difficult situation due to the spread of COVID-19 and related restrictions in Seversk, Zelenogorsk, Novouralsk, and Glazov.

The Fuel Company allocated RUB 700 million to fight against coronavirus and support enterprises and residents.

For details on activities conducted during the pandemic in host towns and cities, see Chapter 8. Developing the Regions of Operation.

To protect personnel amid the pandemic, the Fuel Division provided all employees with PPE and disinfection supplies, transferred as many office workers as possible to remote work, and converted meetings to online formats.

In addition, since the pandemic began, all enterprises of the Fuel Division have been taking the following measures to prevent the spread of coronavirus:

- Using non-contact thermometers;
- Ensuring social distancing by setting a maximum number of employees on premises and making sure that employees follow these rules;
- Changing work start and end times to prevent personnel from crowding at front gates;
- Introducing staggered lunch hours;
- Disinfecting facilities;
- Regularly informing employees of the need to follow sanitary rules;
- Restricting business trips;
- Employee COVID-19 testing;
- COVID-19 vaccination among employees.

To ensure business continuity and smooth supply chains during the pandemic, the Company also introduced special procurement conditions:

- When preparing for procurement, it did not set a qualification requirement on an audit conducted to confirm the credibility of information contained in the application in terms of HR, materials and equipment;
- When preparing for and conducting procurement procedures, documents were signed electronically, including via the unified industry-wide electronic document flow system;
- Complaints against actions (inaction) of procurement participants were handled by correspondence.

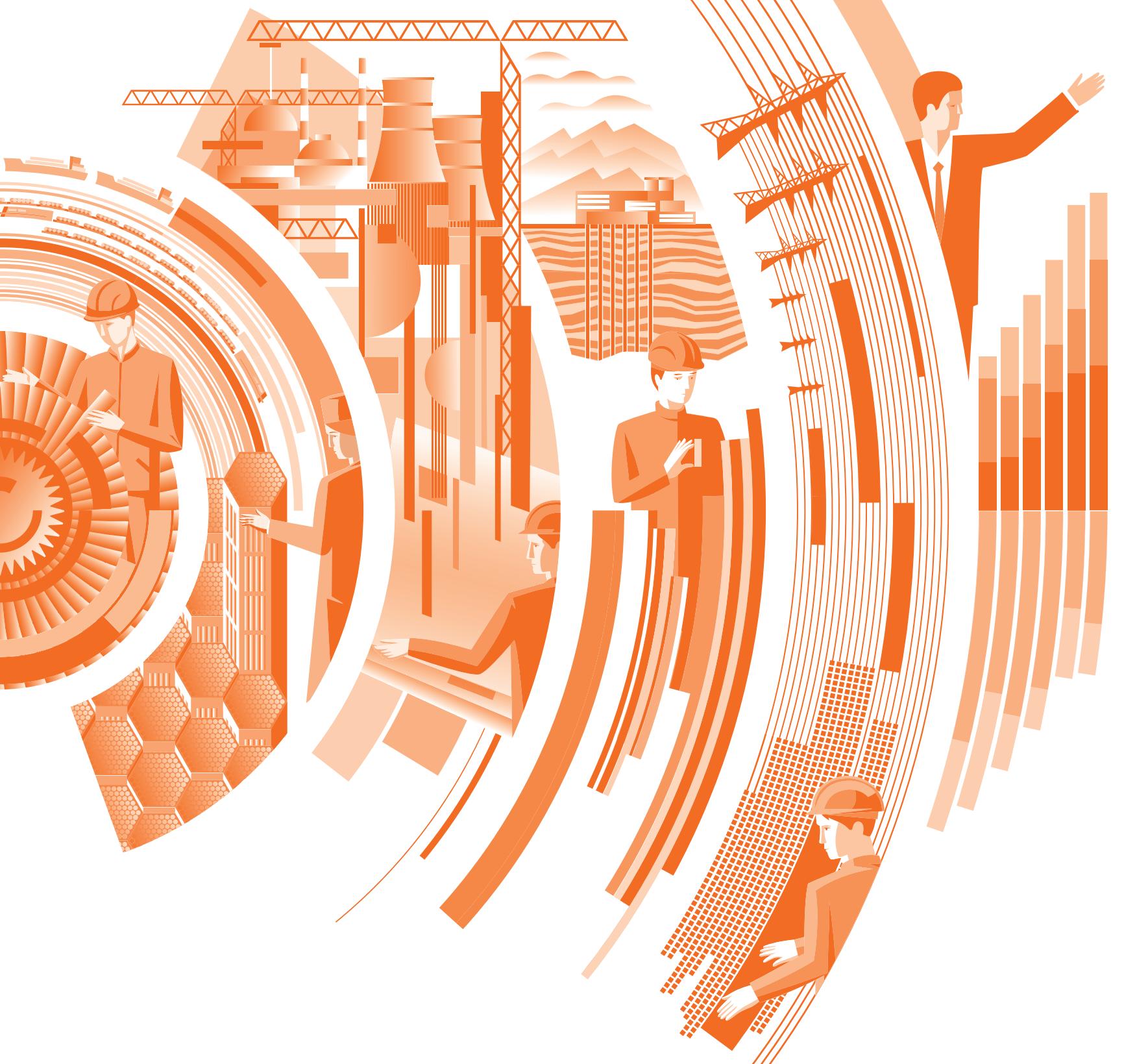
Due to the COVID-19 pandemic, in 2020, JSC TVEL reviewed a list of its key risks, adding the risk of a deterioration in the epidemiological situation¹.



¹ Information on measures aimed at reducing this risk is presented in the Specific Risks and Management Approaches section of these Reporting Materials.

Chapter 1

OVERVIEW OF THE DIVISION



GRI 102-1
GRI 102-5
GRI 102-7

The Fuel Company of State Atomic Energy Corporation ROSATOM (ROSATOM), JSC TVEL (TVEL Fuel Company, JSC TVEL, the Company), is a leading player in the global nuclear fuel cycle (NFC) front-end market and the only supplier of nuclear fuel for Russian nuclear power plants (NPPs) and the nuclear-powered icebreaker fleet.

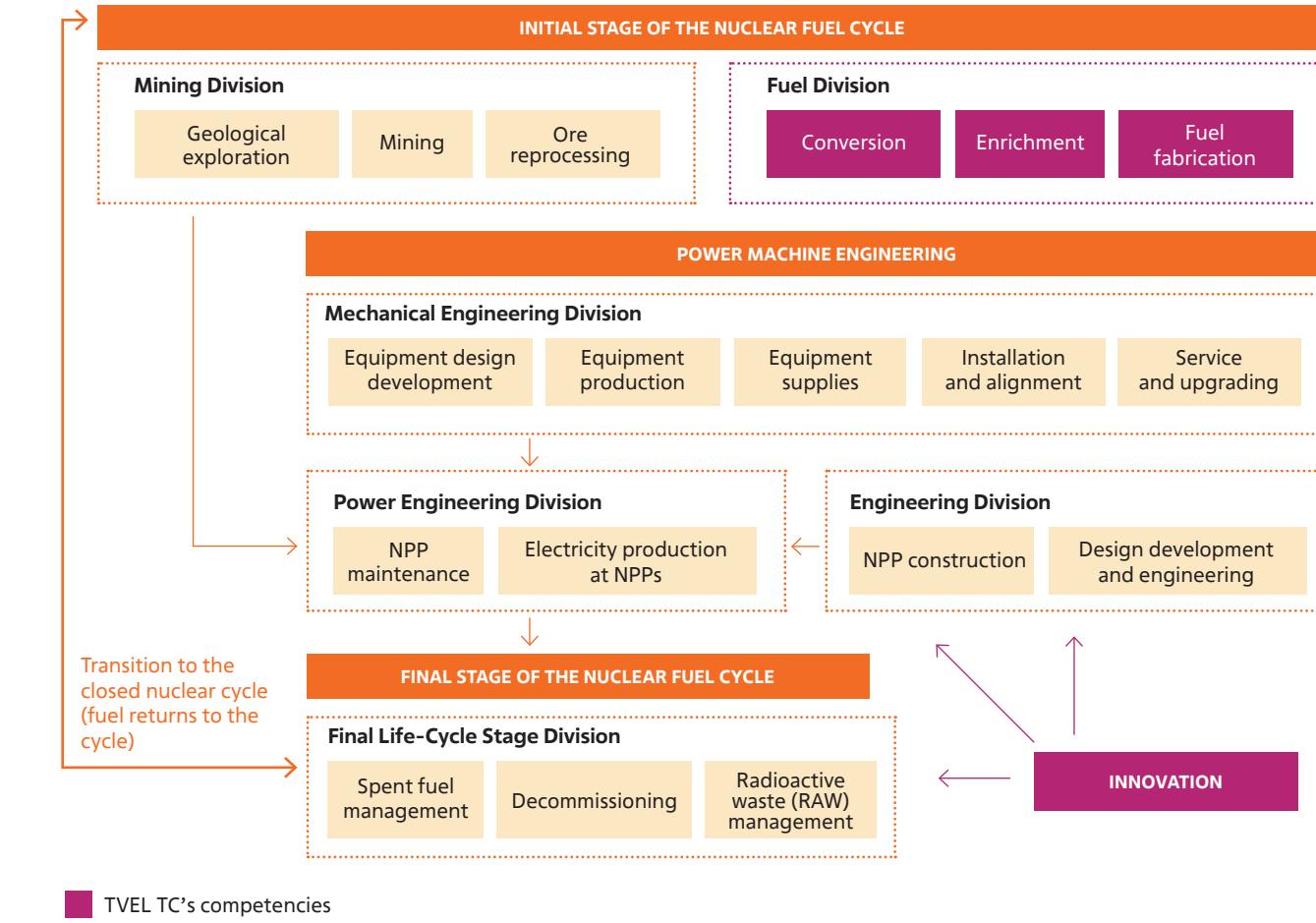
The Fuel Division actively develops new businesses in the chemical industry, metals industry, energy storage technology, 3D printing, digital product industry, as well as in the decommissioning of nuclear facilities.

TVEL Fuel Company is the world's largest producer of enriched uranium and stable isotopes.

1.1 Role of the Division in the structure of ROSATOM

Combining assets of ROSATOM's Fuel Division, the Company comprises nuclear fuel fabrication, uranium conversion and enrichment enterprises, manufacturers of gas centrifuges, as well as research and development (R&D) and engineering institutions. TVEL Fuel Company includes ROSATOM's industry integrators responsible for additive manufacturing and energy storage systems, as well as an industry business accelerator.

JSC TVEL provides nuclear fuel for 75 power reactors in Russia and 14 countries of Europe and Asia, and research reactors in nine countries. One in every six commercial reactors in the world runs on fuel produced by TVEL.



Business areas

GRI 102-2

The core business of JSC TVEL is largely focused on the global market. The Company is the main supplier of fuel for foreign NPPs equipped with Russian-design VVER reactors; it has the necessary capabilities for the production of nuclear fuel for PWR and BWR reactors, fuel components from reprocessed uranium (in cooperation with Framatome), as well as fuel pellets for BWR and PHWR reactors. TVEL Fuel Company has developed its own design of a fuel assem-

bly for PWR reactors, TVS-KVADRAT, which it offers to operators. The Fuel Division's enterprises also produce nuclear fuel and its components for research reactors of Russian and foreign design worldwide.

TVEL Fuel Company supplies a wide range of non-nuclear products and services to the Russian and international markets in the following areas: the metals and chemical industries, mechanical engineering, additive manufacturing technologies and energy storage systems. The optimal organisational format for non-nuclear business development in the Company is the establishment of industry integrators.

Research and development in TVEL Fuel Company comprises a wide range of areas, from the improvement of nuclear fuel designs and materials, implementation of the closed nuclear fuel cycle concept, and development of innovative types of fuel to solving scientific application tasks.

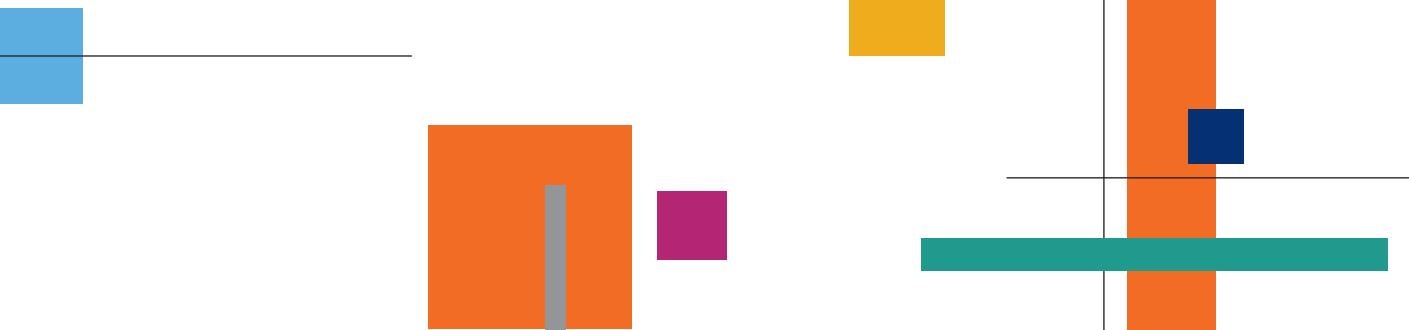
GRI 102-4
GRI 102-6



Regions of operation

The enterprises of TVEL Fuel Company are located in 10 regions of the Russian Federation, which allows it effective cooperation with partners in many areas.

A special feature of the social environment in the Company's regions of operation is the fact that some of its enterprises are located in closed administrative and territorial formations (CATFs), such as Seversk, Novouralsk and Zelenogorsk, and in a single-industry town, Glazov. These enterprises play a central role in the local economy and are major taxpayers.



Geographical footprint of TVEL Fuel Company



10 REGIONS OF THE RUSSIAN FEDERATION

1. **Moscow**
TVEL, VNIINM, Moscow Poly-metal Plant, Central Design and Technological Institute
2. **Moscow Region**
MSZ (Elektrostal)
3. **Saint Petersburg**
Branch of RME Centrotech
4. **Vladimir Region**
Vladimir Tochmash Production Association (Vladimir), KMP (Kovrov)
5. **Udmurt Republic**
Chepetsk Mechanical Plant (Glazov)
6. **Sverdlovsk Region**
UEIP, RME Centrotech (Novouralsk)
7. **Novosibirsk Region**
NCCP (Novosibirsk)
8. **Tomsk Region**
SCP (Seversk)
9. **Krasnoyarsk Territory**
ECP (Zelenogorsk)
10. **Irkutsk Region**
AECP (Angarsk)



Corporate governance system

JSC TVEL builds its corporate governance system in accordance with Russian and global best practices and standards.

The Company performs its current corporate governance tasks as stipulated by applicable Russian legislation regulating operations of the joint-stock company and its governing bodies, ROSATOM's unified industry-wide methodological guidelines and related local corporate governance regulations.

Corporate governance principles

JSC TVEL applies some provisions of the Corporate Governance Code recommended by Letter No. 06-52/2463 of the Bank of Russia dated April 10, 2014 and with due regard to special characteristics of ROSATOM's legal status stipulated in laws and regulations of the Russian Federation that ensure consistent management of organisations in the nuclear industry. These provisions are incorporated in a number of local regulations of the Company.

GRI 102-18
GRI 102-22

Governing bodies

In accordance with the Articles of Association, JSC TVEL has the following governing bodies:

- The General Meeting of Shareholders (sole shareholder – JSC Atomenergoprom);
- The Board of Directors;
- President (sole executive body).

The Board of Directors plays a key role in strategic management of JSC TVEL and the entire Fuel Company. Members of the Board of Directors are determined by JSC Atomenergoprom, the sole shareholder, based on qualification and competencies needed to solve set tasks.

As per JSC TVEL's (sole shareholder's) Resolution No. 53 dated June 29, 2020, seven members were elected to the Board of Directors:

- **Dmitry Baidarov**, Head of the New Business Support Department at ROSATOM;
- **Boris Arseev**, Deputy Director for Development and International Business, Director of the International Business Department at ROSATOM;
- **Vladislav Korogodin**, Director of NFC LC and NPP Management at ROSATOM;
- **Natalia Nikipelova**, President of JSC TVEL;
- **Ilya Nikolsky**, Director of the Business Analytics Department at ROSATOM;
- **Yury Olenin**, Deputy Director General for Science and Strategy at ROSATOM;
- **Sergey Polgorodnik**, Director General of JSC TENEX.

There are no independent members (within the meaning of the Corporate Governance Code recommended by the Bank of Russia) of the Board of Directors at JSC TVEL.

According to the Articles of Association, the sole shareholder's Resolution No. 51 dated September 25, 2019, as well as based on the contract signed with the Company, Natalia Nikipelova, President of JSC TVEL, performs functions of the sole executive body.

Improving governance processes

In 2020, the Fuel Company continued to develop a programme for the transformation of corporate functions.

The Programme for the Transformation of TVEL's Functions is aimed at the optimisation and reengineering of business processes of corporate functions. The Programme is expected to reduce end-to-end process flow time by 50%, cut the cost of functions by 20%, and increase the function satisfaction level.

The transformation means:

- Reorientation to the customer-centric philosophy;
- Transition from a functional management model to a process management model;
- Introduction of the end-to-end process practice and process owners;
- Transition to a business partnership model (conceptual changes in the role of a corporate function);
- Replacing the executive's role with the business partner's/change leader's/end-to-end process owner's role;
- Responsibility of business units and business partners for business performance;
- Strengthening vertical functional structures through standardising processes and documents, creating centres of expertise and competence, adopting unified service standards;
- company-wide 'mobilisation' of functions;
- company-wide process automation and digitisation.

Key results in 2020

Despite the significant growth in some costs (IT, PPE, etc.), the Fuel Division fulfilled its plans to cut the cost of functions in 2020, with considerably more business processes transformed and shorter lead time.

- In 2020, the transformation covered 70% (+32% in 2020) of functional business processes;
- The lead time reduced by 33% (+29% in 2020);
- The economic effect from the transformation of functions reached ~ RUB 635 million.
- The share of the decrease in the unit cost of functions averaged ~42% (up to 82% for some functions).



Compliance and introduction of quality management systems and standards

The Integrated Management System of the Fuel Company includes:

- The Corporate Quality Management System (under ISO 9001:2015);
- The Corporate Environmental Management System (under ISO 14001:2015);
- The Corporate Occupational Health and Safety Management System (under ISO 45001:2018);
- The Corporate Energy Management System (under ISO 50001:2018).

In 2020, the Division developed the Integrated Management System of the Fuel Company's Enterprises meeting requirements of ISO standards. As for the Corporate Occupational Health and Safety Management System, ISO 45001:2018 was successfully adopted.

In 2020, the Fuel Company's enterprises (JSC TVEL, PJSC MSZ, PJSC NCCP, JSC Chepetsk Mechanical Plant, JSC VNIINM, JSC SCP, JSC PA ECP, JSC UEIP, JSC AECP, PJSC KMP, JSC Vladimir Tochmash Production Association, LLC RME Centrotech, JSC Industrial Innovation, and JSC Central Design and Technological Institute) successfully passed a second witness audit conducted by representatives of LLC Intercertifika TÜV jointly with TÜV Thüringen: the enterprises comply with requirements of international standards ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 and ISO 50001:2018.

In 2020, JSC TVEL and JSC UEIP adapted their management systems to the requirements of ISO 28000 'Supply Chain Security Management Systems.' Certification audits are expected to be conducted in 2021.

As part of improving internal audits of the Integrated Management System of the Fuel Company, as well as minimising impacts of the pandemic, the Company developed checklists as required by ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 and ISO 50001:2018.

At PJSC MSZ and PJSC NCCP, production processes were successfully inspected by Fortum (Finland), Vattenfall Nuclear Fuel AB (Sweden), as well as by NNEG Energoatom and representatives of Rivne NPP (Ukraine).

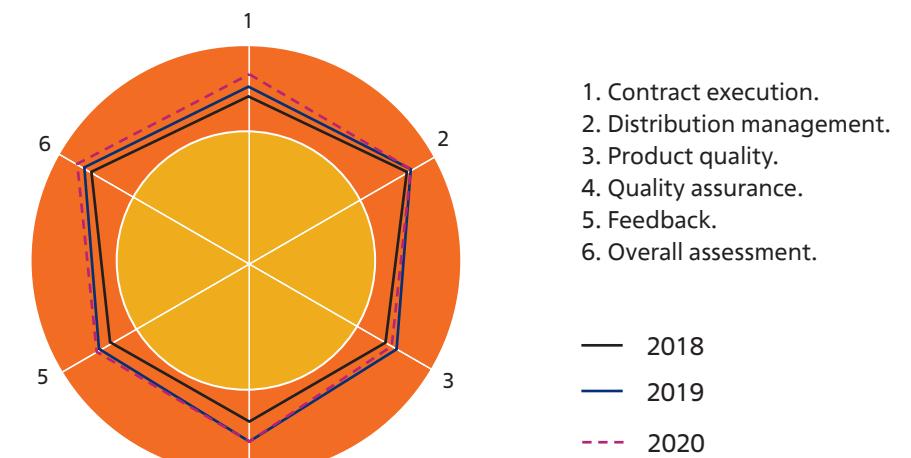
IMSSs were successfully audited by Fortum (Finland) at PJSC NCCP, by Vattenfall Nuclear Fuel AB (Sweden) at JSC VNIINM, PJSC MSZ, PJSC NCCP and JSC TVEL, and by Slovenské elektrárne a.s. (Slovakia) at JSC TVEL and PJSC MSZ.

As part of the contract for the supply of products to the Belarusian NPP, PJSC NCCP successfully passed an audit conducted by representatives of JSC ASE Engineering Company.

Following the audits and inspections, Slovenské elektrárne a.s., Fortum and Vattenfall Nuclear Fuel AB confirmed JSC TVEL's qualification as a nuclear fuel supplier and qualifications of PJSC MSZ and PJSC NCCP as nuclear fuel producers.

Due to a difficult epidemiological situation, most inspections and audits were successfully organised and conducted remotely.

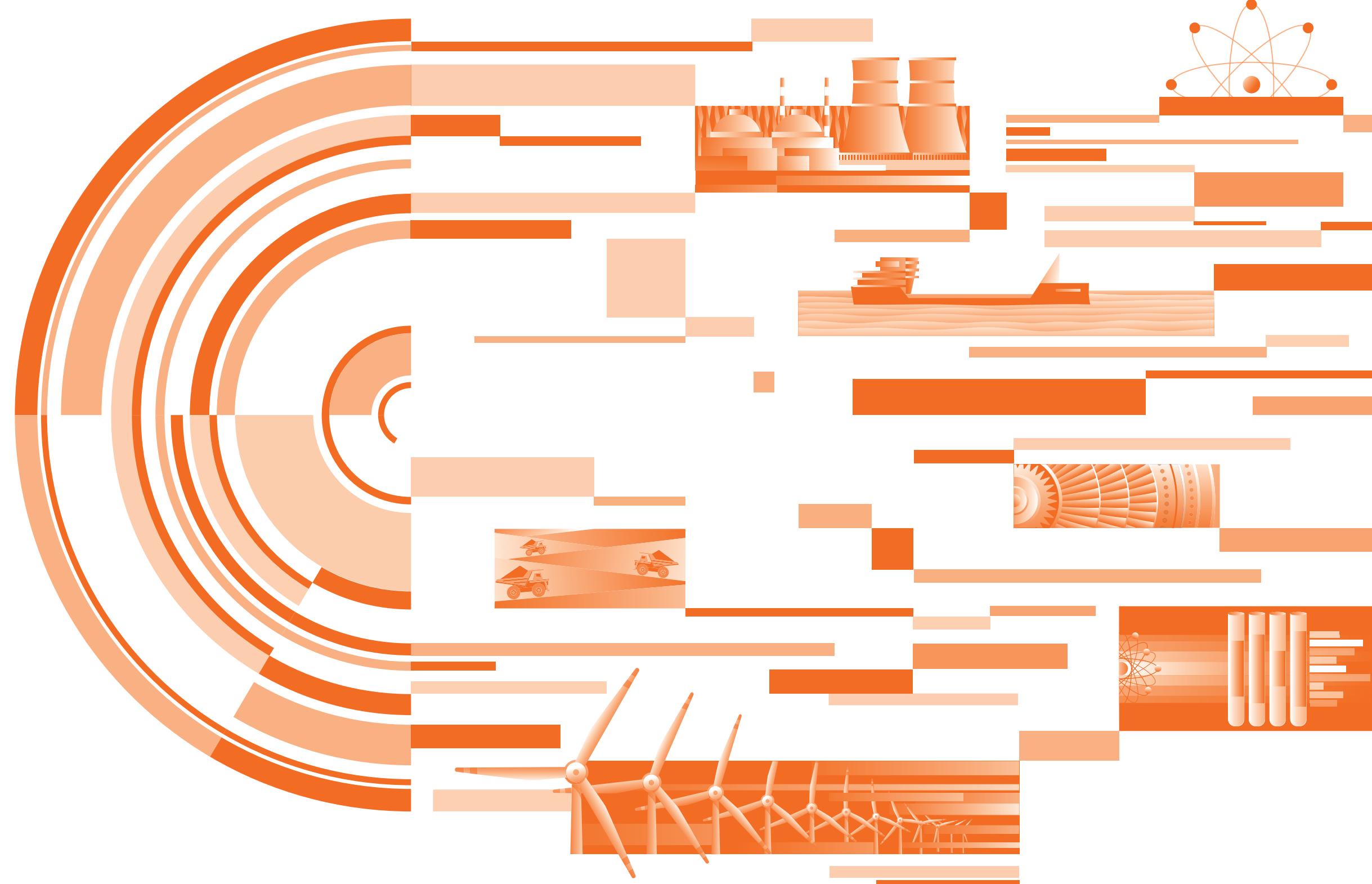
The map of satisfaction among consumers of TVEL FC's products and services



In recent years, we have had sufficiently high consumer satisfaction levels (4.6).



KEY RESULTS AND EVENTS OF THE REPORTING YEAR





Key results in 2020

Indicator	2018	2019	2020
Revenue (net) from sales of products, RUB million	163,173	194,619	208,737
Average headcount, people	22,451	22,111	21,946
Gross tax deductions (actually paid), RUB million	15,106	12,976 ²	14,773 ³
Lost Time Injury Frequency Rate (LTIFR)	0.13	0.02	0.02
10-year portfolio of overseas orders for NFC front-end products and services, USD billion	13.3	13.9	15.7
Environmental costs, RUB million	2,204	3,297.3 ⁴	2,263.4



Key events of 2020

- Fuel assemblies produced by ROSATOM's TVEL Fuel Company were loaded into new Generation 3+ nuclear power units with VVER-1200 reactors at Leningrad NPP-2 and the Belarusian NPP.
- The first batch of new VVER-440 nuclear fuel was loaded into the reactor of Paks NPP's (Hungary) power unit No. 3.
- JSC TVEL and the Nuclear Power Corporation of India Limited (NPCIL) signed an agreement on a project to transition two operating power units at Kudankulam NPP equipped with VVER-1000 reactors to new TVS-2M fuel and to extend the fuel cycle from 12 to 18 months.

- In the research reactor market, contracts were signed for the supply of nuclear fuel and its components to research facilities in the Czech Republic and Egypt.
- Nuclear fuel was delivered for research reactors in Hungary and the Czech Republic.
- The first batch of uranium/plutonium MOX fuel (18 fuel assemblies) was loaded into the BN-800 fast-neutron reactor at Beloyarsk NPP, and then the first batch of MOX fuel (168 NFAs) for the full reloading of the reactor was manufactured and delivered to the plant.
- The transition to NFAs with NFEs with claddings made of the EK-164 radiation-resistant austenitic steel was completed for the BN-600 fast-neutron reactor at Beloyarsk NPP. This allows longer fuel cycles and higher fuel efficiency.
- The experimental uranium/plutonium REMIX fabrication facility was created at the Siberian Chemical Plant (JSC SCP) in Seversk jointly with the Mining and Chemical Plant.
- At Balakovo NPP, the third cycle of irradiation of experimental NFAs for a VVER-1000 reactor with experimental REMIX-based NFEs was launched at Balakovo NPP.
- As part of the Prory (Breakthrough) project, the installation of unique process equipment of the fabrication/re-fabrication module for producing dense uranium/plutonium (MNUP) fuel was initiated at JSC SCP.
- A project on building the second DUHF defluorination unit was launched at the Electrochemical Plant (JSC ECP) in the CATF of Zelenogorsk, and the preparation was initiated to implement a project to construct two similar units at Ural Electrochemical Integrated Plant (JSC UEIP) in Novouralsk, Sverdlovsk Region.
- ROSATOM's first Additive Manufacturing Centre was opened at the site of Moscow Polymetal Plant (JSC MZP). Two 3D printing metal powder units were put into operation at RME Centrotech in Novouralsk.
- The establishment of LLC RENERA, an industry integrator responsible for energy storage systems, was completed.
- JSC NovaWind manufactured the first batch of 2.5 MW wind generators with magnets made of rare-earth alloys and shipped them to the Karmalinovskaya Wind Power Plant for installation.

² The calculation includes the following taxes and fees imposed on the organisations covered in the Report:

- income tax paid by both organisations forming part of the consolidated taxpayer group and organisations outside the consolidated taxpayer group;
- insurance premiums paid to extra-budgetary funds;
- other taxes, fees and charges to be included in the cost or value of non-current assets (property tax, land tax, state duties, etc.). The amount of VAT to be paid in 2019 totalled RUB 7.2 billion. Taxes paid (including VAT payable to the budget) in 2019 totalled RUB 20.19 billion.

³ The calculation includes the following taxes and fees imposed on the organisations covered in the Report:

- income tax paid by both organisations forming part of the consolidated taxpayer group and organisations outside the consolidated taxpayer group;
- insurance premiums paid to extra-budgetary funds;
- other taxes, fees and charges to be included in the cost or value of non-current assets (property tax, land tax, state duties, etc.). The amount of VAT to be paid in 2020 totalled RUB 6.8 billion. Taxes paid (including VAT payable to the budget) in 2020 totalled RUB 21.67 billion.

⁴ The increase in environmental costs was caused mainly by the fact that tailings storage facility No. 1 of JSC Chepetsk Mechanical Plant, which had been in federal ownership, was recorded on the balance sheet of the enterprise.

Chapter 3

SUSTAINABLE DEVELOPMENT



Projects in the area of environmental protection and decommissioning of facilities posing nuclear and radiation hazards

Elimination of ‘nuclear legacy’

GRI 103-2

TVEL Fuel Company is gradually implementing its comprehensive nuclear legacy elimination programme. 2016 saw the launch of a new Federal Target Programme on Nuclear and Radiation Safety for the Period from 2016 through 2020 and for the Period until 2030. The programme includes 17 measures worth a total of RUB 36.3 billion, including RUB 31.4 billion to be allocated from the federal budget. These measures will be implemented at the sites of JSC SCP, JSC AECP, JSC UEIP, PJSC NCCP, PJSC MSZ and JSC VNIINM.

In 2020, as part of the preparation for the decommissioning, the Company completed its engineering and radiation safety audit of uranium tetrafluoride production facilities at Chepetsk Mechanical Plant in Glazov, developed and approved design and estimation documentation for the decommissioning of a production facility at the Mechanical Engineering Plant in Elektrostal, as well as completed the mothballing of the B-1 and B-25 storage pools for radioactive waste at the Siberian Chemical Plant in Seversk.

For details on FPNRH (facilities posing nuclear and radiation hazards) decommissioning activities of 2020, see Chapter 9. Safety of Operations.

Programme for Safe Treatment of DUHF

In 2020, ROSATOM approved the Programme for Safe Treatment of Depleted Uranium Hexafluoride (DUHF). The Programme implies expanding the Fuel Division’s capacities to increase the amount of DUHF stored in an environment-friendly way from the current 10,000 tonnes to 60,000 tonnes by 2028, as well as decreasing the number of depleted uranium storage sites from four to two. The Programme is expected to be completed in 2057 with the full elimination of DUHF at all sites.

For details on activities conducted in 2020 under the Programme for Safe Treatment of DUHF, see Chapter 9. Safety of Operations.

Zero Carbon Footprint project

In 2020, TVEL Fuel Company launched a project titled ‘TVEL’s Zero Carbon Footprint.’ Project activities include assessing the Fuel Division’s carbon footprint, setting targets for its reduction, and developing a road map to achieve these tar-

gets. The project is expected to result in the Division being assigned an international climate rating.

The Fuel Division’s project is aimed at reducing TVEL Fuel Company’s carbon footprint to zero in order to contribute to fighting against global warming, including adopting microgrids based on renewable energy sources, switching to electric vehicles and using energy storage systems to improve energy efficiency. In the Fuel Division, the project is coordinated by LLC RENERA.

A carbon footprint is the total greenhouse gas (GHG) emissions (carbon dioxide, methane, nitrogen oxide, etc.) caused, directly or indirectly, by an individual, organisation, or product, expressed as carbon dioxide equivalent.

In 2019, the Russian government signed the Paris Agreement, whereby the participating countries take on a commitment to adhere to a low-carbon development strategy in order to achieve a balance between emissions and carbon-dioxide absorption by 2050. The Agreement comes into force in 2021.

Establishment and development of priority social and economic development areas (PSEDAs)

Pursuant to Decrees No. 125, 130 and 132 of the Government of the Russian Federation dated February 12, 2019 and signed by Dmitry Medvedev, Chairman of the Russian Government, priority social and economic development areas (PSEDAs) were established in the towns where the Fuel Company’s enterprises operate: Glazov, the CATF of Novouralsk and the CATF of Seversk.

Since the PSEDAs were established, thanks to efforts of ROSATOM, JSC TVEL, the Fuel Division’s enterprises, and local authorities, 31 PSEDA residents were registered, with 538 jobs created and about RUB 600 million invested.

For details on PSEDA development activities conducted in 2020, see Chapter 8. Developing the Regions of Operation.

Support for national projects

In 2020, as part of the Education, Demography, and Housing and Urban Environment national projects, authorities of host towns and cities of the Fuel Company signed 54 agreements with federal and regional state agencies, which allowed them to attract RUB 613.9 million from federal and regional sources. JSC TVEL’s financial investments in these projects in the regions of operation totalled RUB 44.9 million.

JSC TVEL supported the national projects in Elektrostal, Glazov, Zelenogorsk, Seversk and Novouralsk.

For details on activities conducted in 2020 as part of the social projects, see Chapter 8. Developing the Regions of Operation.



Chapter 4

DIGITISATION: TECHNOLOGIES AND PRODUCTS



To improve performance, as part of the Fuel Company's digital strategy, the Division is implementing more than 135 IT projects in eight areas of digital transformation for the period from 2018 through 2023.

The Fuel Company's digital strategy focuses on the following areas:

- import substitution of digital solutions and software as part of achieving government and industry objectives;
- introducing key end-to-end technologies (digital twins, AI and user activity robotics, VR and AR technologies, predictive analytics, and mass data processing);
- creating and developing digital products for further promotion in industry and external markets;
- IT function transformation.

Economic benefits from digital transformation are projected at RUB 5 billion as a cumulative total by the end of 2030.

Key digitisation projects in 2020:

- in the reporting year, the Fuel Company continued to implement a design and production engineering management (PDM/PLM) system;
- a real-time manufacturing management (MES) system was piloted at PJSC NCCP and also applied at JSC Chepetsk Mechanical Plant's facilities;
- the treasury introduced a data recognition and extraction system;
- a closed enterprise resource planning (ERP) system was developed across all large production enterprises of the Fuel Division;
- LLC RME Centrotech launched a project to create a digital engineering system;
- JSC TVEL launched an internal corporate portal.

As for the development of business apps, an equipment maintenance and repairs management system (EMRMS) was deployed at PJSC MSZ and PJSC NCCP. The Fuel Company's economic benefits from this solution have already exceeded RUB 70 billion per year (EMRMS costs decreased by 3.67%).

In 2020, thanks to digital infrastructure and cybersecurity projects, the Fuel Company managed to organise remote work for its users and hold a live Q&A session with the Company's President via the KURS remote system.

As part of the digital product development strategy 2030 updated in 2020, the Division launched a new digital service, Atombot. Procurement, in the Russian market. This service reduces lead time by more than 30% and excludes almost all errors and follow-on revisions when preparing procurement specifications. The solution is expected to be deployed at the Fuel Division's enterprises in 2021.

Area	Key results in 2020	Plans for 2021
Business apps	<ul style="list-style-type: none"> ■ the deployment of the Fuel Company's ERP system was completed at JSC Vladimir Tochmash Production Association and JSC VNIINM, the closed ERP system now covers all large sites; ■ a data recognition and extraction system was introduced at the treasury; ■ an EMRMS was deployed at PJSC MSZ and PJSC NCCP; ■ TVEL's corporate portal was launched; ■ a stage of import substitution in performance management was completed at the Fuel Company (BI). 	<ul style="list-style-type: none"> ■ to configure a platform for product quality prediction models at JSC Chepetsk Mechanical Plant; ■ to test hypotheses for models predicting product quality and equipment condition at PJSC NCCP; ■ to launch a mobile EMRMS at JSC Chepetsk Mechanical Plant and PJSC NCCP; ■ to launch CRM for non-nuclear production facilities and to start its deployment at nuclear production facilities; ■ to deploy Atombot. Procurement across the Fuel Division's enterprises; ■ to start working on BPMS, user monitoring, and the Skrepka (Paperclip) digital assistant.
Industrial automation	<ul style="list-style-type: none"> ■ JSC TVEL started to implement the Fuel Company's unified PDM system and interact with JSC Atomenergomash as part of this; ■ technical specifications and a roadmap were developed to create the digital engineering system at LLC RME Centrotech; ■ the MES system was piloted at PJSC NCCP and also deployed at JSC Chepetsk Mechanical Plant's facilities; ■ a laboratory information system was piloted at PJSC MSZ. JSC PA ECP started to implement a similar system project; ■ a conceptual design was developed for a digital work cell. 	<ul style="list-style-type: none"> ■ to put the Fuel Company's unified PDM system into operation at fabrication facilities; ■ to launch a digital system for technical documentation exchange (PLM) between JSC TVEL and JSC Atomenergomash; ■ to pilot software required to start working on digital engineering at Centrotech-Engineering; ■ to launch the real-time production management system (MES) at NCCP and develop it at Chepetsk Mechanical Plant's facilities; ■ to put the laboratory management system into operation at ECP and to prepare for the launch of projects at Vladimir Tochmash Production Association and UEP; ■ to launch a project aimed at creating an occupational incident detection system (PPE video analytics) at AECP, Chepetsk Mechanical Plant, SCP.
Infrastructure and cybersecurity	<ul style="list-style-type: none"> ■ JSC TVEL launched the Fuel Company's data centre and started the migration of information systems; ■ the Fuel Company's users were transferred to remote work; ■ the Fuel Company launched a workstation import substitution project; ■ the Company held the industry's first live Q&A session with a head of a division via the KURS system. 	<ul style="list-style-type: none"> ■ to complete the migration of information systems to the new data centre and to deploy a backup branch of the data centre located in Udomlya; ■ to upgrade ERP computer equipment; ■ to involve all enterprises of the Fuel Division in the industry-wide workstation import substitution project; ■ to create infrastructure for the Fuel Division's engineering centre, including a centralised computer cluster; ■ to create new 3D VDI infrastructure to connect employees of the Fuel Division's enterprises to the centralised PDM system through an enterprise data network; ■ to introduce a solution by Perimatrix, a Russian developer, to protect confidential information processed by JSC TVEL.

Chapter 5

INNOVATION AND DEVELOPMENT OF SCIENCE





Innovation and science management system

Innovative activities in the nuclear industry are a key prerequisite for long-term business competitiveness and sustainability of TVEL Fuel Company, since NFC front-end services and products form part of the core business of enterprises in the Fuel Division.

As part of ROSATOM's strategic goals — to increase its global market share and create new products, the Fuel Division develops ***its key innovation areas***:

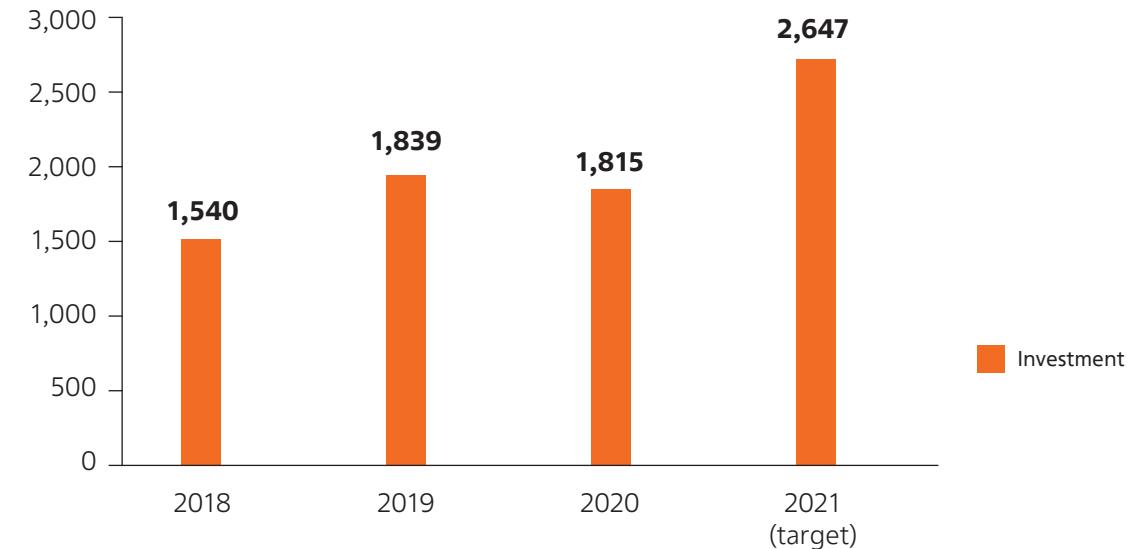
- development of nuclear fuel for a two-component energy system with a closed fuel cycle;
- development and improvement of nuclear uranium fuel and reactor cores for Russian-design power reactors (primarily VVER-1000/1200/1300);
- development of nuclear fuel for Western-design reactors (PWRs);
- development of fuel for VVER and PWR reactors based on advanced technologies;
- development of nuclear fuel for fast-neutron reactors (BN-600/800/1200; BREST-OD-300; CFR600);
- development of nuclear fuel for small nuclear power plants, research reactors and nuclear icebreakers.

Work on NPP power units that are currently in operation or under construction is focused on the achievement of the following objectives:

- higher fuel burnup;
- longer service life of NFAs;
- more reliable nuclear fuel;
- justification of NFA performance during NPP operation at increased capacity (for VVER-1000, up to 107% of rated capacity) in strict compliance with safety requirements.

The implementation of plans for international business development and expansion into new markets is supported by the development of new-type gas centrifuges, optimisation of TVS-KVADRAT fuel designs, and the development of new fuel types for small NPPs, research reactors and new reactor cores for nuclear icebreakers.

TVEL's investment in R&D, RUB million



Key project results in 2020

Development and implementation of nuclear fuel and cores for Russian-design power reactors (VVER)

- A new version of VVER-440 nuclear fuel was developed. Acceptance tests were conducted for fuel pellets, plugs for NFEs and NFEs with gadolinium, upper and spacer grids, NFEs and NFEs with gadolinium, rods, and second-generation VVER-440 NFAs with an optimal water/uranium ratio. Eighteen fuel bundles were delivered to power unit No. 3 of Paks NPP. The unit runs at full capacity.
- NPP-2006 reactor cores started to be used abroad for the first time. Power unit No. 1 of the Belarusian NPP was launched (VVER-1200).
- NNSA, China's supervisory agency, gave a licence for the 18-month cycle operation of units No. 3 and 4 of Tianwan NPP (China).

- The Company signed an agreement for providing a rationale for the transition of Kudankulam NPP (India) to the 18-month nuclear cycle while using TVS-2M.

Development of fuel for fast-neutron reactors

- BN-800 NFAs for the first full reloading of the BN-800 reactor core with MOX fuel and the first batch of BN-800 NFAs with MOX fuel made of reactor-grade plutonium dioxide underwent acceptance testing.
- Engineering designs were developed for NFEs for BN-800 NFAs with MOX fuel and BN-800 NFAs with uranium fuel and claddings made of the EK164 steel.
- Upgraded passive protection rods and rod shells for the BN-800 reactor were developed and manufactured by PJSC MSZ and tested as part of acceptance procedures.
- Experimental BREST-type NFAs 30, 31, 32 with MNUP fuel for the BN-600 reactor were developed and manufactured at experimental units of JSC SCP's Chemical and Metallurgical Plant and tested as part of acceptance procedures.
- A full-scale mockup of the CFR-600 CCS assembly was delivered to the Chinese customer for seismic tests.
- Experimental pipes designed for manufacturing shells of CCS and passive protection assembly displacers for the CFR-600 reactor underwent acceptance testing.
- Mockups of CCS and passive protection assemblies were created. Hydraulic tests of the mockups were completed.

Development of nuclear fuel for foreign-design reactors (PWRs)

The operation of a batch of experimental TVS-KVADRAT fuel assemblies was completed at power unit No. 3 of Ringhals NPP in Sweden (PWR-900 reactor). Post-irradiation examination of components of irradiated fuel was initiated at Studsvik Nuclear AB in Sweden, the NFEs are leak-tight, with no damages. The characteristics of irradiated NFEs comply with project specifications.

Development of accident tolerant fuel

- The second stage of irradiation testing was completed for Russian accident tolerant fuel for VVER and PWR reactors with increased resistance to off-design accidents. Post-irradiation examination of NFEs was conducted after the first stage of testing.
- An investment project is underway to research and develop technology for the production of new-generation leak-tight SiC-based NFEs.

Development of fuel for small-capacity nuclear power plants (SNPPs) and research reactors

- Engineering designs were released for a startup neutron source and a shutdown road for the AS-14-15 reactor core of the RITM-200N RU at SNPPs.
- The IRT-4M engineering design was supplemented with information on the introduction of and a rationale for NFAs with increased uranium-235 loading. Two experimental IRT-4M 0019.20.00.000-01 NFAs with the uranium-235 loading rate increased by 10% were manufactured. The experimental NFAs were tested as part of acceptance procedures and delivered to the Czech Republic to conduct resource reactor testing in the LVR-15 reactor.

Progress on the project ‘Towards Zero Nuclear Fuel Failure’ in 2020

- In 2020, the number of leaking NFAs at NPPs equipped with VVER-1000/1200 reactors as part of the Zero Nuclear Fuel Failure (ZNFF) project did not increase as compared to 2019.
- The share of power units with VVER-1000/1200 reactors under the ZNFF project with no fuel failures reached 80% in 2020, which is no more than in 2019.
- In general, in 2015-2020, the number of units running without leaking for several fuel cycles increased. In 2020, there were no complaints against JSC TVEL from customers.
- In 2020, two joint commissions (JSC Rosenergoatom Concern and JSC TVEL) took measures to determine the causes of NPA leaks at Rostov and Kalinin NPPs and detected no NFA production non-conformities that could cause the leaks. The commissions also conducted a factor analysis of NFA fabrication leaking impacts at PJSC MSZ, PJSC NCCP and JSC Chepets Mechanical Plant and found no fuel production non-conformities.
- Manufacturing plants took measures to improve nuclear fuel control technology and quality.

Balanced Nuclear Fuel Cycle product area

In 2020, ROSATOM approved an action plan for the Balanced Nuclear Fuel Cycle project for 2020–2021.

The Balanced NFC product area combines SNF reprocessing services and fabrication of uranium/plutonium fuel for foreign customers and plays an important role in the development of a responsible environmental policy both at the Company and in the industry (through the disposal of SNF and reuse of irradiated plutonium).

The strategic goal in this area is to create and offer uranium/plutonium fuel for VVER and PWR reactors as part of the development of a comprehensive balanced NFC offer for foreign customers; to develop technologies for fractionation and reactor-based disposition of minor actinides (neptunium, americium).

These activities comply with the Strategy 2018 aimed at closing the NFC and forming a two-component nuclear power industry based on fast- and thermal-neutron reactors.

The development of the Balanced NFC involves the following activities:

- developing uranium/plutonium fuel for thermal-neutron reactors;
- ensuring the afterburning of minor actinides in fast-neutron reactors;
- reprocessing SNF at foreign NPPs with fractionation of high-level radioactive waste (HRAW);
- developing SNF/HRAW long-term storage systems.

To show that it is feasible to produce uranium/plutonium fuel for thermal-neutron reactors, it is planned to create sites at JSC SCP and Mining and Chemical Combine (FGUP GHK) to produce a pellet, NFE and NFA with REMIX fuel at the first stage. Based on the outcomes, the experimental production is expected to be organised.

Proryv (Breakthrough) project

The Proryv project is of the utmost importance to the nuclear industry. It is ROSATOM's strategic project and federal project No. 1 under a comprehensive programme titled 'Development of Equipment, Technologies and Scientific Research in the Field of Nuclear Energy Use in the Russian Federation for the Period up to 2024' approved on December 24, 2020 by Mikhail Mishustin, Chairman of the Government of the Russian Federation.

Technologies developed under the Proryv project are expected to make Russia a global nuclear power leader.

As part of the project, the Pilot and Demonstration Energy Facility (PDEF) is being constructed at the site of JSC SCP. The ultimate goal of PDEF is to demonstrate the sustainable operation of a full range of facilities that make it possible to close the nuclear fuel cycle based on inherently safe fast reactors.

The construction of the PDEF will make it possible to develop and demonstrate industrial technologies for closing the nuclear fuel cycle to be rolled out on an industrial scale based on an industrial power generation facility equipped with 1,200 MW fast-neutron reactors (IPGF).

IPGF-based CNFC is a new integrated product in the area of nuclear power technologies that will enable ROSATOM to be a sustainable global company and a leader in the NFC and related industrial sectors.

Key results in 2020:

The installation of unique process equipment was commenced at the fuel fabrication/re-fabrication module producing dense mixed uranium/plutonium nitride (MNUP) fuel at the site of JSC SCP. The module will be one of the main elements of the Pilot and Demonstration Energy Facility, which includes a 300 MW power unit with a BREST-OD-300 fast-neutron reactor, as well as onsite facilities forming part of the closed nuclear fuel cycle.

Plans for 2021:

- to install main process equipment of the fuel fabrication/re-fabrication module, complete the installation of stage 1 auxiliary systems of the PDEF and commissioning operations;
- to receive a licence for building the BREST-OD-300 RU and primary construction works;
- to develop work design documentation for key equipment of the reactor section.

REMIX fuel

REMIX is an innovative type of fuel. In 2020, an investment project was launched to upgrade the experimental nuclear fuel fabrication facility at the Siberian Chemical Plant (JSC SCP) to produce experimental NFAs with uranium/plutonium REMIX fuel for VVER-1000 reactors.

By 2025, the Company plans to start the pilot production of REMIX fuel to load Russian-design VVER-1000/1200 reactors and accumulate reference experience in REMIX NFA fuel fabrication and operation.

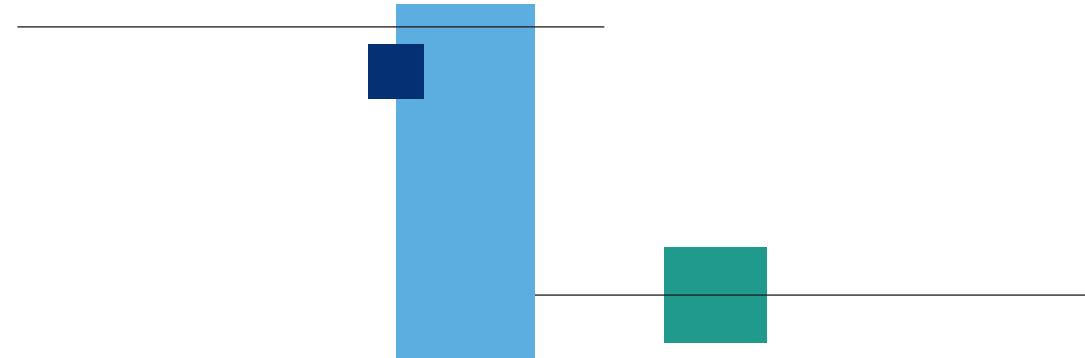
If pilot operation is successful, REMIX fuel may start to be used in VVER-1000/1200 reactors and may be launched on foreign markets after 2030.

MOX fuel

In 2020, significant progress was made on the project to produce mixed oxide (MOX) fuel consisting of a blend of uranium and plutonium. The first batch of uranium/plutonium MOX fuel (18 fuel bundles) was loaded into the BN-800 fast-neutron reactor at Beloyarsk NPP. The first batch of MOX fuel for the full reloading of the reactor (169 NFAs) was manufactured and delivered to the plant.

The Company ensured the production and acceptance testing of the experimental batch of BN-800 NFAs with MOX fuel made of reactor-grade plutonium extracted from SNF of VVER reactors at the Mining and Chemical Combine (FGUP GHK). The tests confirmed that production facilities can run on nuclear materials specified in the design scheme.

Plans for 2021 include the production of MOX NFAs (171 pcs.) for the 10th reloading of the BN-800 RU at Beloyarsk NPP and the supply of the first part of the batch.



MNUP fuel

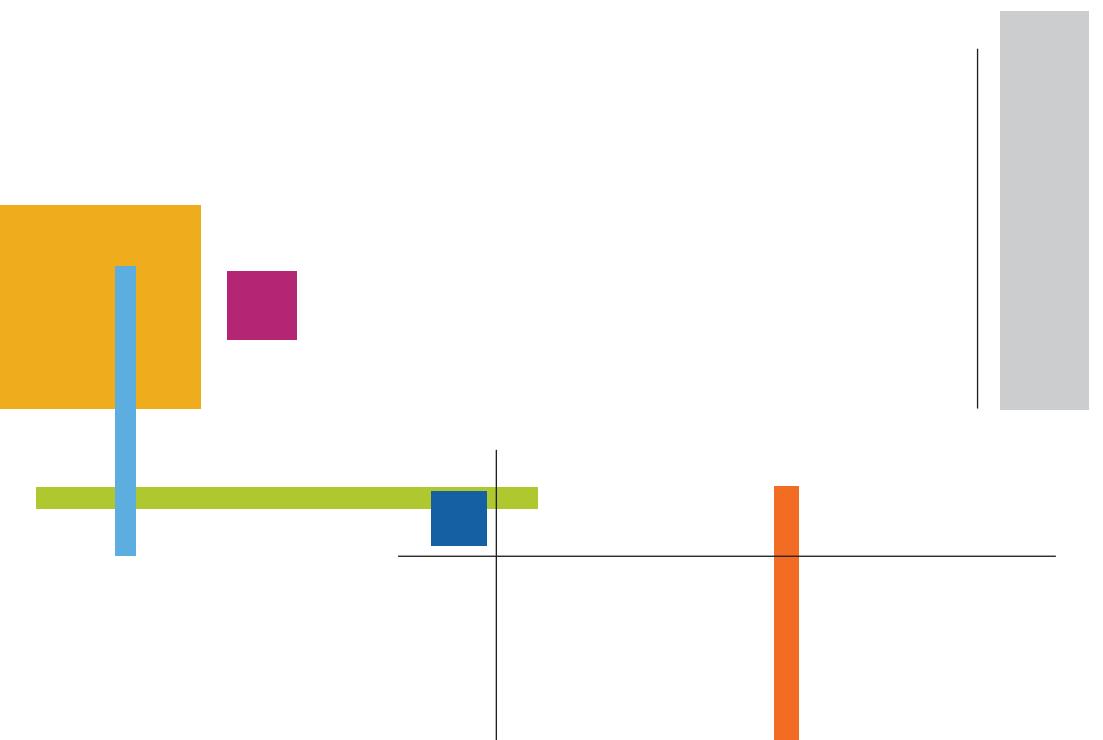
Three experimental NFAs 30, 31, 32 with mixed uranium/plutonium nitride (MNUP) fuel were developed and manufactured at the experimental power facility at the Siberian Chemical Plant (JSC SCP) for testing in a BN-600 reactor to provide a rationale for the performance of nuclear fuel for a BREST-OD-300 RU.

As part of the spring reloading of the BN-600 reactor, three experimental NFAs 22, 23, 24 with MNUP fuel were loaded in the reactor core for irradiation to provide a rationale for performance of nuclear fuel for a BREST-OD-300 RU.

For two experimental NPAs with MNUP fuel tested in the BN-600 reactor, it was permitted to continue their operation to provide an experimental rationale for the MNUP fuel operating life.

Alexander Lokshin, First Deputy Director General for Operations Management at ROSATOM, approved the Resolution on Organising the Development, Production and Operation of Experimental NFAs 26, 27, 28 with BN-1200 NFEs with Mixed Uranium/Plutonium Nitride Fuel in the BN-600 Reactor Core and Their Post-Irradiation Examination.

Alexander Lokshin, First Deputy Director General for Operations Management at ROSATOM, approved the Resolution on Organising the Development, Production and Operation of MS-2-FM with Samples Made of Ferritic/Martensitic Steel Irradiated up to 169 Dpa in the BN-600 Reactor Core and Its Post-Irradiation Examination.



Chapter 6

NEW PRODUCTS AND BUSINESSES



Chemical industry

In 2020, the Company renewed existing export contracts for lithium products and signed new ones; the contracts are worth a total of USD 14.9 million.

Qualification of battery-grade lithium metal produced by PJSC NCCP was carried out with new customers, namely manufacturers of lithium batteries and pharmaceuticals from Japan, Europe, Canada, Israel and India.

In the reporting year, the Fuel Company continued to strengthen its positions in the market of automotive catalysts for Russia's car industry, which resulted in a 20%+ increase in revenue from car components.

Effective cooperation between JSC Production Association Electrochemical Plant and JSC Isotope Regional Alliance, ROSATOM's industry integrator promoting isotope products, led to more supplies of isotope products and a 14% increase in overall isotope revenue year-on-year. Revenue from sales of isotope products exceeded RUB 1.5 billion for the first time.

The Company's portfolio of orders for new chemical products grew by more than 100% and exceeded RUB 14 billion.

Superconducting materials

Under the R&D agreement with the European Organisation for Nuclear Research (CERN), a qualification batch of superconducting wires based on a niobium-tin compound (Nb₃Sn) was manufactured in accordance with CERN's requirements.

In December 2020, a qualification batch of 50 km wire was produced and supplied to CERN.

The superconductor will be used to make a cable for the Future Circular Collider (FCC) developed by CERN. If TVEL Fuel Company passes the qualification successfully, it can supply Nb₃Sn wires for this project. A total of about 6,000 tonnes of superconducting strands will be required in order to build the FCC.

The prime cost of superconducting wires reached USD 1,000 per kilogram as compared to the target of EUR 1,000 per kilogram. Based on this technology, the Company prepared one know-how, two requests for international patents, and three IP creation notifications.

Metals industry

- The Company manufactured and shipped the first batch of 2.5 MW wind generators with permanent magnets made of rare-earth alloys.
- The Division set up the production of several dozen new rolled titanium products compliant with Russian and foreign standards; this included achieving positive R&D results for technology for manufacturing 6.35 x 0.41 mm tubes.
- The Company organised the production of zirconium oxynitrate powder, an important component in petro-chemical catalyst synthesis, a raw material in the zirconium dioxide production, and a much-in-demand chemical reagent.
- A test sample of a titanium rod was shipped to a foreign customer for subsequent production of prosthetic implants as part of a joint initiative to develop implant production.
- A joint road map was signed with JSC Russian Railways for testing and arranging production and potential supplies of high-strength contact wire for a high-speed railway. R&D was conducted to test the process flow design on models.

Additive manufacturing technologies

2020 saw further development of legislative and organisational additive-manufacturing initiatives:

- Under a letter of intent between the Government of the Russian Federation and ROSATOM aimed at developing a high-technology area, Technology of New Materials and Substances, in Russia, the Government of the Russian Federation signed the Additive Manufacturing Roadmap.
- ROSATOM approved the Strategic Additive Manufacturing Programme and the industry-wide Additive Manufacturing Roadmap.
- LLC RusAT, an industry integrator responsible for additive manufacturing, jointly with Russia's largest companies from aviation, space, mechanical engineering and other strategic industries, initiated the establishment of the Additive Manufacturing Development Association.

In 2020, LLC RusAT, an industry integrator responsible for additive manufacturing, assembled two models of printers whose operation involves laser melting of metal powder.

The Additive Manufacturing Centre, Russia's first industrial 3D manufacturing facility using domestically developed technologies and equipment, was opened at the site of JSC MZP.

Energy storage systems

In 2020, ROSATOM completed the establishment of its industry integrator responsible for energy storage systems on the basis of LLC RENERA⁵. The integrator supplies lithium-ion batteries for passenger electric vehicles and logistics equipment, as well as energy solutions (stationary systems for emergency and continuous power supply and load leveling, energy storage systems for hybrid systems).

LLC RENERA also develops energy storage systems for JSC Atomenergopromsbyt's project aimed at optimising the cost of power purchases for industrial consumers.

The integrator launched pilot production at the site of JSC MZP; an energy storage system was developed for Bal-kancar, a major European supplier of electric logistics vehicles, and the development of an energy storage system for LLC ARMZ Mining Machinery was commenced.

In the reporting year, LLC RENERA also implemented ROSATOM's first project to supply energy storage systems for onsite transport under a lease arrangement with JSC Chepetsk Mechanical Plant.

Another use scenario of energy storage technologies is lithium-ion traction batteries for children's electric go-karts. Supported by LLC RENERA, Russia's first electric go-cart race was held in St Petersburg. Compared to traditional gasoline cars, the new vehicles are lighter and greener and can be used indoors since they do not produce emissions.

Digital products

In 2020, JSC TVEL approved its updated digital-product development strategy 2030 aimed at creating and developing digital products for further promotion and distribution in industry and external markets.

As part of the product strategy 2030, the Company launched a new digital product, Atombot. Procurement, in the Russian market. This service reduces lead time and excludes almost all errors and follow-on revisions when preparing procurement specifications.

In 2020, revenue from digital products totalled RUB 61.3 million.

As part of promotion of JSC TVEL's digital products in the regions of operation, the Company established cooperation with the Ministry of Digitisation of the Novosibirsk Region.

The Digital ROSATOM managing council decided to create a joint venture to produce telecommunications equipment.

In the reporting year, the Digital Engineering Centre developed a digital twin of a decanter centrifuge, as well as a digital model of an autonomous generating centre mockup to comply with and improve performance specifications.

Decommissioning of facilities posing nuclear and radiation hazards

Since JSC TVEL became an industry integrator responsible for the decommissioning of facilities posing nuclear and radiation hazards, it has been actively working to consolidate and develop the industry's capabilities and references in the sphere of decommissioning of facilities posing nuclear and radiation hazards, including preparing such facilities for decommissioning and waste management. It also focuses on the development of a comprehensive integrated offer covering the full cycle of services ranging from decommissioning project development and facility teardown to post-decommissioning site remediation.

In 2020, the integrator approved a product strategy in the area of the decommissioning of facilities posing nuclear and radiation hazards.

Although in 2020 customers' plans significantly changed due to the COVID-19 pandemic, the integrator's contracting revenue in Russia and abroad met the target for 2020 and exceeded RUB 4 billion.

In 2020, the integrator concluded 11 contracts worth a total of more than RUB 1 billion in the international market (Belgium, Finland, Germany, Spain, Bulgaria and the People's Republic of China).

In the reporting year, TVEL Fuel Company's revenue under 18 contracts implemented on the basis of decommissioning competence centres reached RUB 1.67 billion.

The Company's ten-year portfolio of overseas orders in the new business area exceeded RUB 4 billion.

⁵ Part of ROSATOM's TVEL Fuel Company.

Robotics technologies for the decommissioning of facilities posing nuclear and radiation hazards

In 2020, preparatory work was completed on a comprehensive research and development project covering a full innovative cycle, Robotics Technologies for the Decommissioning of Nuclear Facilities (RTDNF). The development of robotic systems will reduce environmental damage and eliminate the use of technologies that involve personnel working in hazardous areas during the decommissioning of facilities posing nuclear and radiation hazards. In addition, the development of robotics technologies will allow Russia to become a research and tech leader in the critical area, independent of foreign technologies. Based on the results of the comprehensive R&D robotics project, a production site will be created to produce industrial prototypes of robotic systems.

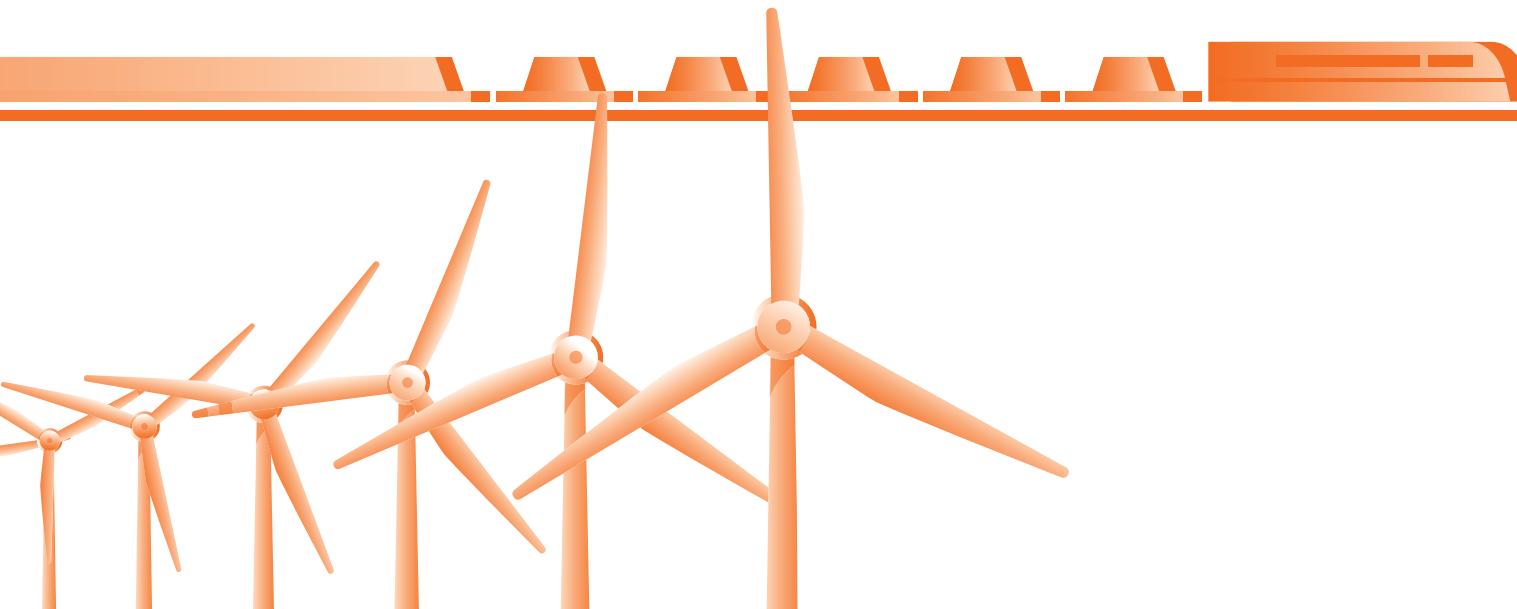
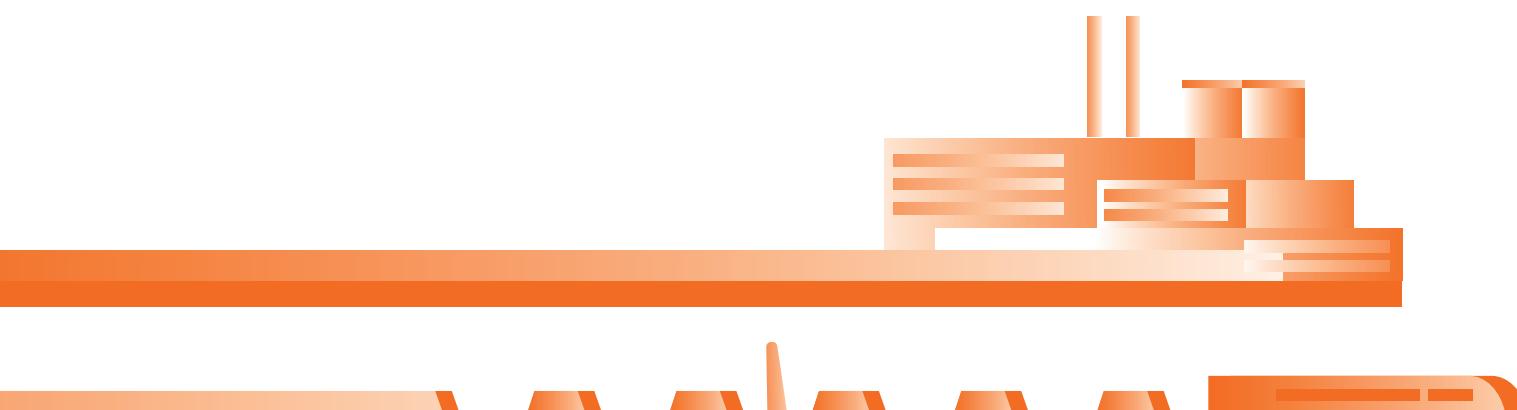
Under the decommissioning RPA project, educational courses are expected to be developed for related employees. According to the plan, the training infrastructure will be created at the site of JSC SCP as part of the unified decommissioning and RAW management training centre.

As part of the Unified Industry-Wide Procedures for Planning, Funding and Monitoring R&D under the Unified Industry-Wide Subject-Specific Plan (UISSP) of ROSATOM and Its Organisations (ROSATOM's Order No. 1/1035-P dated September 15, 2020), in 2020, the integrator organised cross-divisional cooperation with JSC Science and Innovation's research institutes in the area of R&D acceptance under ROSATOM's UISSP and approved UISSP R&D where the integrator acts as a legal and business customer of R&D on the decommissioning of facilities posing nuclear and radiation hazards.

The Digital Critical-Knowledge Preservation Platform was piloted, and master's degree programmes were successfully implemented to prepare decommissioning professionals at leading Russian universities: Lomonosov Moscow State University and National Research Nuclear University MEPhI.

Plans for 2021:

- to approve the integrator's Product Programme 2040 aimed at creating and developing a comprehensive product offering for Russian and foreign markets. In accordance with this Programme, investment in decommissioning is expected to equal RUB 1.5 billion in 2021, with a total of RUB 15 billion to be invested until 2040;
- to expand the geography of the integrator's foreign decommissioning business;
- to launch new educational programmes focused on the integrator's activities, test and approve developed innovative technology solutions, and expand the scope of decommissioning-related works.



Chapter 7

DEVELOPING THE HUMAN CAPITAL





HR system

The HR policy of TVEL Fuel Company is focused on achieving a steady growth of labour productivity, maintaining a balance between the interests of the employer and employees, and leveraging professional and managerial capabilities of employees in accordance with the Company's long-term development strategy.

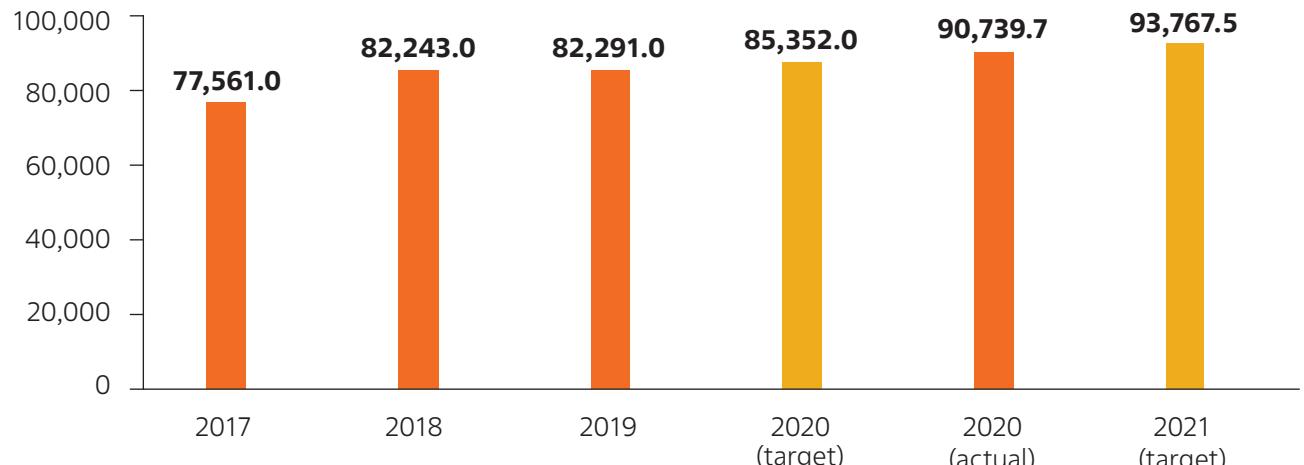
Medium-term plans for developing the HR policy include:

- developing and further improving the safety culture;
- ensuring the effectiveness of incentives;
- developing a system of professional qualifications;
- developing the corporate culture;
- promoting the employer's brand.

Incentive and remuneration system

TVEL Fuel Company's incentive and remuneration policy is aimed at providing competitive remuneration. In the reporting period, the average monthly salary grew by 10.3% compared to 2019 and reached RUB 90,740⁶.

Average salary in TVEL Fuel Company (including the headquarters), RUB



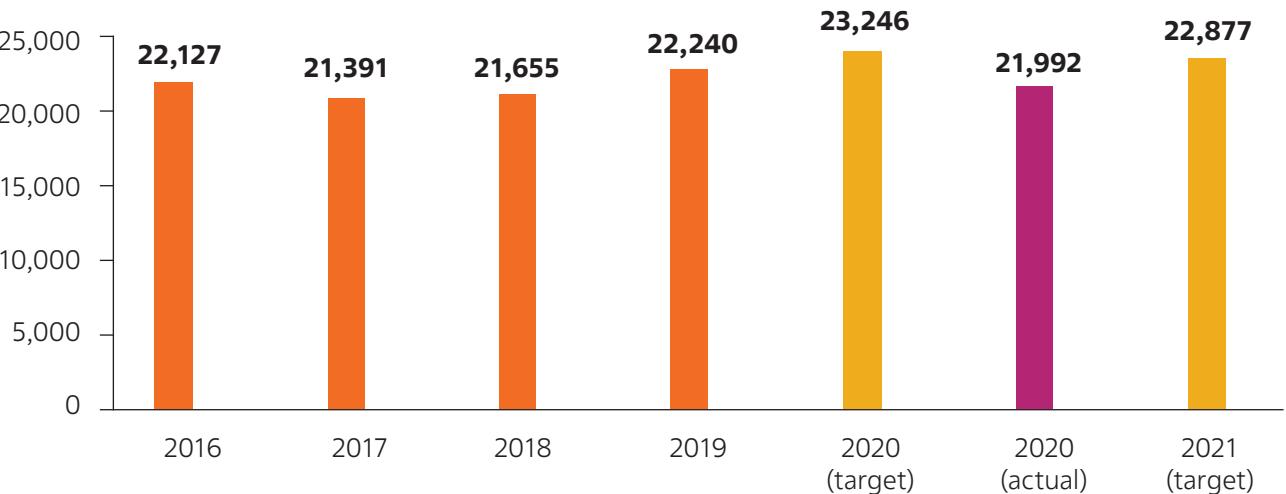
⁶ Taking into account JSC TVEL.



Key personnel characteristics

The number of employees is growing due to the expansion of general industrial operations. The manufacture of non-nuclear products not only provides the Company with access to new product markets and geographic regions, but also opens up some additional employment opportunities for qualified personnel if employees are released as a result of downsizing in core operations.

Headcount in TVEL Fuel Company, people



1,326 new employees were hired by TVEL Fuel Company in 2020, including 851 men; 397 of these employees are under 30. The biggest number of new employees were hired in the Vladimir Region (264), while the smallest number of new hires was recorded in the Novosibirsk Region (39).

- 91% staffing
- 1.7% personnel turnover
- 45 years average age
- 19.1% young specialists under 35



Employee engagement

Employee engagement and commitment to the Company's mission and success are a major driver of business efficiency and performance. Enterprises in the Division and in the industry conduct an annual employee engagement survey under a single brand, Your Opinion Matters to ROSATOM. The annual surveys provide an insight into the overall attitude of teams in the enterprises, and make it possible to measure trends in the level of satisfaction with working conditions across 19 factors (satisfaction with the Company's benefits, training and development opportunities, professional opportunities, etc.) and assess the share of engaged employees, who:

- recommend the company as an employer to their families and friends;
- strive to perform their duties to the best of their abilities, improve processes in the enterprise and make suggestions for improvements;
- intend to remain with the Company in the future.

Based on the findings of the surveys, the management of each TVEL enterprise develops the relevant action plans aimed at maintaining and improving the employee engagement rate. These efforts enable TVEL Fuel Company to remain a leader among the Divisions of the industry in terms of employee engagement, with the final scores matching those of the Best Employers in Russia.

Employee engagement rate, %

	2018	2019	2020
Average across TVEL Fuel Company	82	87	86



Personnel training

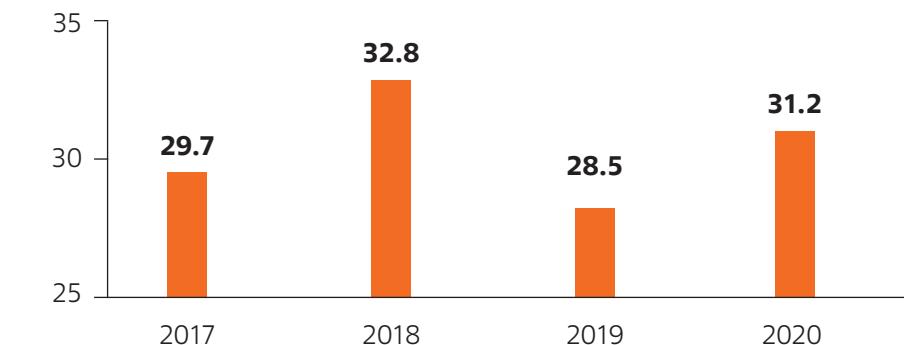
GRI 103-1

Traditionally, high-skilled employees who have unique knowledge and develop their competence have been TVEL Fuel Company's important asset ensuring internal business stability and modernisation. The Company's HR policy prioritises personnel training and development.

Enterprises in the Fuel Division regularly implement training programmes aimed at developing employees' competences pursuant to the Regulations on Personnel Training and Development. Investments in personnel training in 2020 totalled RUB 124 million. In the reporting year, the number of the Fuel Company's employees who completed at least one training programme reached 10,585 people.

GRI 103-2

Average number of training hours per employee



GRI 404-1

TVEL's enterprises regularly implement both industry-wide and divisional training programmes aimed at developing the competences of both the Company's managers and employees.

GRI 404-2



Partnership with educational institutions

Recruitment of promising young people is a priority in the HR policy of TVEL Fuel Company. The Fuel Division expects that, by recruiting young professionals, in the future it will be able to maintain and strengthen its position in the field of science and advanced technology.

The Division cooperates with educational institutions under a plan for collaboration with universities and graduates, which is annually updated.

In 2020, 373 students of universities and vocational schools did an internship in the Company's enterprises, with 19 students subsequently hired by TVEL Fuel Company. It is intended that in 2021, about 440 students will do an internship.

The Fuel Division applies a systematic approach to critical knowledge⁷ preservation based on IAEA's current knowledge management concepts. As part of this approach, the Division develops knowledge maps. Personnel and organisational knowledge maps combine separate pieces of knowledge from different places and give an overview of the knowledge and skill structure at the organisation. The final product of critical knowledge is a detailed critical knowledge preservation programme that includes both methods for the preservation of critical knowledge and skills, as well as measures required to reduce negative impacts from their loss.

In addition, a mentorship programme aimed at sharing key knowledge and skills is traditionally implemented in the industry.



Implementation of the social policy

GRI 103-2
GRI 201-3
GRI 403-6

TVEL Fuel Company is implementing eight corporate social programmes:

- private pension plans;
- voluntary health insurance;
- accident and illness insurance;
- providing better living conditions for employees;
- health resort treatment for employees and their children, recreation for children;
- financial assistance to employees;
- support for retirees;
- sporting and cultural events.

Social programmes implemented by TVEL Fuel Company are an important motivation tool. The Company's expenditure on social programmes in 2020 totalled RUB 1,196 million, i.e. RUB 55,100 per employee.

422.6 **Support for retirees**
RUB million

227.3 **Voluntary health insurance**
RUB million

135.2 **Private pension plans**
RUB million

123.4 **Sporting and cultural events**
RUB million

89.7 **Health resort treatment; recreation for children**
RUB million

197.7 **Other social programmes**
RUB million



Occupational health and safety

The Company's occupational health and safety costs in 2020 totalled RUB 2.40 billion, or RUB 96,800 per employee.

The Lost Time Injury Frequency Rate (LTIFR) in TVEL Fuel Company in 2020 stood at 0.02, with the target set by ROSATOM at 0.3.

The injury frequency rate (calculated as the number of injuries per 1,000 employees) in 2020 stood at 0.04; injuries were recorded in JSC Chepetsk Mechanical Plant. There were no fatalities among employees of TVEL Fuel Company.

⁷ Critical knowledge means knowledge accumulated at an organisation in specific areas, as well as personal knowledge and experience of employees, prioritised in a resource-constrained environment according to business specifics.



Chapter 8

DEVELOPING THE REGIONS OF OPERATION



Response to the pandemic in host towns and cities

The spread of COVID-19 and work in a high-alert mode in host towns and cities of the Fuel Company's organisations became the key challenges of 2020.

To support its host towns and cities, in 2020, the Fuel Company took the following top-priority measures:

- daily COVID-19 monitoring;
- collection and analysis of information on current and required assistance resources;
- collection of information on healthcare facilities' preparedness for treatment of patients with COVID-19 and needs for expendable supplies and medical equipment.

With ROSATOM's funds, ROSATOM's Department for Regional Interaction, JSC Rusatom Healthcare, JSC TVEL, and the Fuel Company's trade unions managed to organise the supply of medical equipment and PPE (personal protective equipment) to facilities of Russia's Federal Medical-Biological Agency in host towns and cities, purchase high-tech equipment and expendable supplies for disease treatment and prevention, and allocate funds to increase bed capacity, with a total of more than RUB 700 million spent.

The Fuel Company's organisations spent more than RUB 100 million on organising PCR test centres and purchasing PPE and sanitisers for healthcare facilities in host towns and cities.

JSC TVEL allocated funds to the CATFs of Novouralsk, Seversk, Zelenogorsk, and Glazov — RUB 6 million per town — for purchasing recirculating systems, ambulance vehicles, sanitisers, expendable supplies for treatment, and PPE for healthcare facilities, as well as for educational and cultural institutions.

Financial aid to organisations and people in host towns and cities totalled more than RUB 800 million.

For details on the response to the pandemic, see the chapter Response to the Pandemic.



Establishment and development of priority social and economic development areas

Pursuant to Decrees No. 125, 130 and 132 of the Government of the Russian Federation dated February 12, 2019, priority social and economic development areas (PSEDAs) were established in three towns where the Fuel Company's enterprises operate: Glazov (Udmurtia Republic), Novouralsk (Sverdlovsk Region) and Seversk (Tomsk Region).

In 2020, a comprehensive system of work with potential residents of PSEDAs has been improved taking into account the specifics of closed territorial formations, industry-wide standards, and local aspects. Special emphasis was placed on developing an effective structure for the administration and management of PSEDAs. Joint task forces involving representatives from local authorities, primary taxpayers, JSC TVEL, JSC Atom-TOR (the managing company of PSEDAs in nuclear towns) were created in host towns and cities.

Despite pandemic-related challenges, restrictions and response measures causing a decline in economic activity and heightened tensions in labour markets, the developed system allowed PSEDAs to achieve high results in 2020. Seversk and Novouralsk PSEDAs attracted the highest number of residents.

Since Glazov, Seversk and Novouralsk PSEDAs were established (since February 2019):

- 31 residents were registered (in 2020 – 23);
- 536 jobs were created (in 2020 – 373);
- RUB 586 million were attracted (in 2020 – 510.8).

According to Order No. 2966 of the Ministry of Industry and Trade of the Russian Federation dated September 8, 2020, the Ural Industrial Cluster non-profit organisation was included in the registry of industrial clusters.



Social projects and charity initiatives

In 2020, as part of the Education, Demography, and Housing and Urban Environment national projects, 54 agreements were signed with federal and regional state agencies, which attracted RUB 613.9 million to host towns and cities of the Fuel Company's enterprises from federal and regional sources. These funds were spent on urban environment projects, support for schools, the Quantorium educational centre built in Novouralsk, educational and cultural events, and volunteering development.

TVEL Fuel Company's investment in these projects in the regions of operation totalled RUB 44.9 million, including RUB 20 million for initiatives supporting the Housing and Urban Environment national project: a roller ski run, playgrounds, and street rebuilding.

In 2020, the Fuel Company continued to participate in the funding of projects supported as part of competitions held by the Russian Ministry of Education. The Company allocated RUB 2.15 million to the support of 11 educational institutions in its host towns and cities, with about RUB 32 million attracted from federal and regional budgets.

An educational project, Children's Foresight, is being implemented in cooperation with the Agency for Strategic Initiatives in Glazov and Zelenogorsk. As part of the project, children develop entrepreneurial skills and create and implement social urban environment projects. A similar initiative is expected to be launched in Seversk in 2021.

Following social project competitions, JSC TVEL allocated about RUB 21 million to 22 projects.

In 2020, TVEL Fuel Company supported the Hello, People! Inclusive Sketch Theatre in the Zelenogorsk CATF so it could take part in the National Festival of Art. Contracts were signed to support the AtomClasses ('nuclear classes') established in the towns and cities where the Fuel Company's enterprises operate.

Element of the Future festival of children's technologies

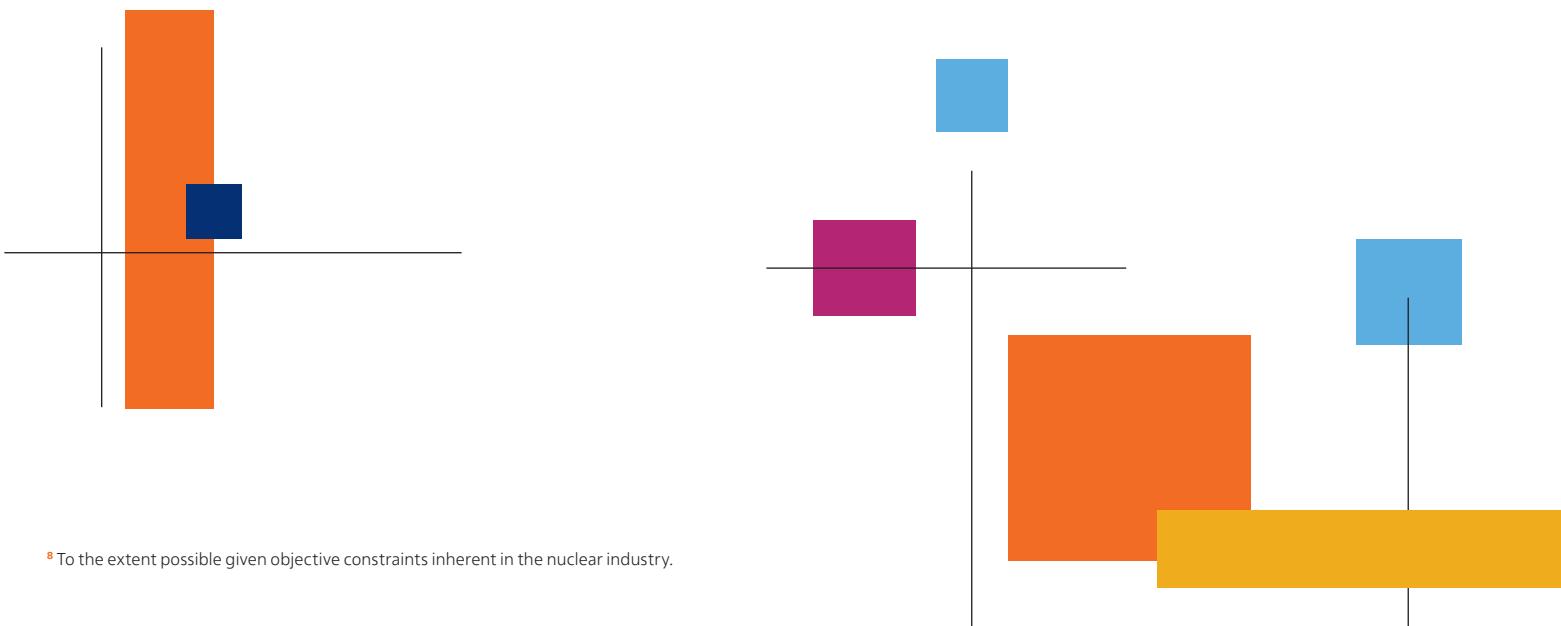
As part of the Agreement on the Development of Children's Science Parks between JSC TVEL and NRC Kurchatov Institute, a model and a plan for cooperation in organising the Element of the Future festival of children's technologies were developed. About 100 schoolchildren from Novouralsk, Glazov, Seversk, Zelenogorsk and Elektrostal took part in online camps hosted by the Kurchatov Institute Technology Park and focused on IT, cryptography, nature-like energy systems, and modern natural sciences. Following practical training, the best students will go to Artek and later will attend the finale of the festival in Novouralsk.



External stakeholder engagement

TVEL Fuel Company is committed to the principle of transparency⁸ and continuously engages with its stakeholders; it also systematises, analyses and takes into account their requests. This approach enables it to promptly respond to potential risks associated with stakeholder relations, primarily social and reputational risks.

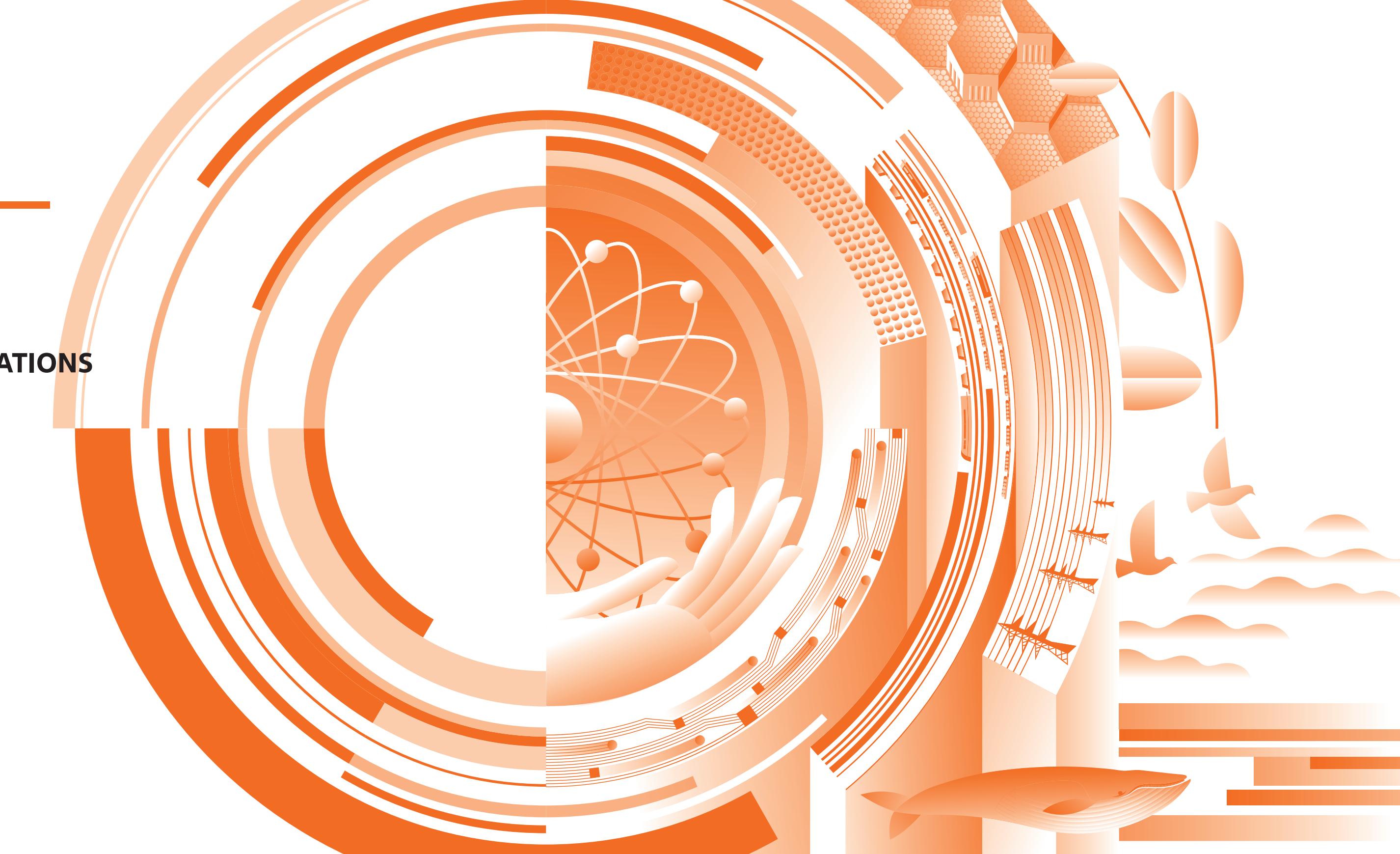
As the system of relations with each stakeholder group has and will have a significant impact on TVEL Fuel Company's business, the practice of considering stakeholders' interests when developing short-term, medium-term and long-term plans and conducting daily operations is a prerequisite for sustainable development. Analysis of key events, financial and production results, as well as the sustainable development performance of the Company shows that social capital is one of the main sources of business stability.



⁸ To the extent possible given objective constraints inherent in the nuclear industry.

Chapter 9

SAFETY OF OPERATIONS





GRI 103-1

Developing and improving the safety culture

JSC TVEL's strategy for the development and improvement of the safety culture is aimed at implementing a safety culture policy and sets priorities and targets for further improvement of the safety culture.

GRI 103-2

The Company has completed the first short-term stage of this strategy: safety culture activities were integrated into the management system of JSC TVEL and controlled organisations through developing and introducing systemic components.

The key medium-term objectives are to improve organisational safety factors and enhance personnel reliability; to strengthen the role of executives of all levels in ensuring safety and cultivating a commitment to safety among employees.

In 2020, a unified corporate information platform, Knowledge Base, was launched. This platform allows the Company to communicate best safety-culture practices from both Russian and foreign companies, enhance the reliability of employees and engage them in safety issues and data (text, image and media files) exchange between subsidiaries, as well as expands communications through Q&A, discussions, exchange of views, information distribution, personnel training and testing.

GRI 403-3

To enhance personnel reliability, the Fuel Company developed, adopted and successfully uses a tool allowing executives to monitor what employees do while performing production tasks and what is going on in workplaces and provide feedback to personnel.

In 2020, a digital platform was developed and implemented to record, systematise and process monitoring results. The corporate monitoring data collection and analysis system shows monitoring results online, which enables prompt decision-making.

GRI 103-3

In 2020, the external assessment of the safety culture was completed at all of the Fuel Division's companies. Independent experts recognised a high level of the safety culture and determined points of growth for further development and improvement of the safety culture.



Safety of nuclear technologies and nuclear fuel cycle products

The key priorities of the environmental policy of TVEL Fuel Company include ensuring nuclear and radiation safety at all of the Company's facilities and preventing radiation exposure of personnel, the general public and the environment.

Radiation monitoring

The Programme for the Development of the Industry-Wide Radiation Monitoring System for 2021–2030 was approved by ROSATOM's Regulation No. 1-1/780-R dated December 2, 2020.

The programme includes measures to be taken by JSC TVEL's enterprises.

JSC TVEL developed an action plan to implement the Programme for the Development of the Industry-Wide Radiation Monitoring System for 2021–2030. This plan involves the standardisation of radiation measurement methods at the Fuel Division's organisations, as well as the reequipping of radiation monitoring laboratories at JSC VNIINM and JSC SCP.

Elimination of the ‘nuclear legacy’

TVEL Fuel Company takes steps to address the ‘nuclear legacy’, including the rehabilitation of contaminated territories, as part of its strategic initiative, Environmental Responsibility.

2016 saw the launch of a new Federal Target Programme on Nuclear and Radiation Safety for the Period from 2016 through 2020 and for the Period until 2030 (FTP NRS 2, <http://фцп-ярб2030.рф>)⁹.

⁹ As amended by Decree No. 2107 of the Russian Government dated December 15, 2020.

Decommissioning competence centres

Competence centres for the decommissioning of facilities posing nuclear and radiation hazards have been established in JSC SCP, JSC AECP, JSC Central Design and Technological Institute and JSC VNIINM.

The key objective of these competence centres is to prepare for the decommissioning of and to decommission facilities posing nuclear and radiation hazards both in Russia and abroad using the enterprises' own resources.

In 2020, the Fuel Division's enterprises prepared for decommissioning at the following organisations: JSC SCP, JSC Chepetsk Mechanical Plant, PJSC MSZ, JSC VNIINM, JSC NCCP, JSC AECP. As part of these efforts, the Division completed comprehensive engineering and radiation monitoring at uranium tetrafluoride production facilities, unit No. 4 at JSC Chepetsk Mechanical Plant in Glazov, as well as developed and approved design and estimation documentation for the decommissioning of unit No. 242 at PJSC MSZ in Elektrostal.

In 2020, the mothballing of the B-1 and B-25 RAW storage pools was completed at JSC Siberian Chemical Plant in Seversk.

- gradual reduction of DUHF stocks from 2027–2028 through commissioning W-UEIP units with a capacity of 20,000 tonnes of DUHF per year and W3-ECP units with a capacity of 10,000 tonnes of DUHF per year;
- removal of DUHF from the site of AECP by 2035 and from the site of JSC SCP by 2038.

The programme is expected to be completed in 2057 with full elimination of DUHF stocks at all sites.

DUHF is formed as a result of uranium enrichment (in the form of hexafluoride – UF₆) in cascades of gas centrifuges when producing nuclear fuel. After defluorination, uranium hexafluoride is converted into a chemically safe state of depleted uranium oxide powder, which can be stored for a long time in open areas without environmental risks. Depleted uranium oxide is the material used for fabrication of mixed uranium-plutonium MOX fuel for the unique Russian BN-800 fast neutron reactor (its core is currently being gradually loaded with MOX fuel instead of the bundles with enriched uranium).

Apart from nuclear fuel, depleted uranium, with its high density and refractoriness, can be applied in other industries. In particular, for the production of medical equipment screens for X-ray and gamma radiation protection, counterweights and gyroscopes in aircraft and shipbuilding, catalysts for certain chemical reactions, etc. Fluorine-containing products obtained by DUHF defluorination, such as hydrofluoric acid and anhydrous hydrogen fluoride, are later sold as commercial certified chemical products.

Programme for Safe Treatment of Depleted Uranium Hexafluoride

In 2020, ROSATOM approved the Programme for Safe Treatment of Depleted Uranium Hexafluoride (DUHF). The programme goal is to proceed from accumulation to planned decrease and complete elimination of existing DUHF stocks.

The programme covers the following areas:

- using all 'rich' heaps created when applying diffusion technology and first-generation gas centrifuges as raw materials for enriched uranium production;
- distributing W-type units reconverting DUHF to depleted uranium oxides;
- decreasing the number of DUHF storage separation facilities from four to two within 15 years.

The programme includes the following key stages:

- stopping the growth of DUHF stocks in 2024 through increasing the capacity of W-ECP units to 20,000 tonnes of DUHF per year;

Construction of new DUHF reconversion facilities in Zelenogorsk

In 2020, JSC PA ECP (Zelenogorsk) and Orano Projects started to implement the W2-ECP (Russia's second DUHF defluorination unit) project. Over the ten years of operation of Russia's sole W-ECP unit, the enterprise has reprocessed more than 100,000 tonnes of depleted uranium hexafluoride. After the commissioning of the second similar unit in 2023, the capacity of the DUHF processing plant will increase from 10,000 to 20,000 tonnes per year.

Unlike the first W-ECP unit, the new equipment will be integrated into an existing production site instead of being installed in an empty facility. The Electrochemical Plant (ECP) has enough experience to solve such tasks. In addition, in recent years, the unit has been significantly improved by both ECP's employees and French engineers. The project team intends to standardise these improvements and use all trusted technical solutions.

Prior to the active construction stage, ECP made many preparatory arrangements: it conducted engineering surveys and developed project and work documentation. After required inspections, positive opinions, including a related resolution by Russia's General Board of State Expert Review, were issued.

Construction of new DUHF reconversion facilities in Novouralsk

In 2020, enterprises of ROSATOM's TVEL Fuel Company – Central Design and Technological Institute (JSC CDTI) and Ural Electrochemical Integrated Plant (JSC UEIP; Novouralsk, Sverdlovsk Region) – entered into an agreement to develop a project aimed at creating a DUHF defluorination facility in Novouralsk.

As part of project development, JSC CDTI will prepare a declaration of intent to invest in construction, conduct engineering surveys, and develop a justification of investment in the DUHF processing unit at the site of JSC UEIP, which will operate similarly to the W-ECP unit located at the Electrochemical Plant in Zelenogorsk, Krasnoyarsk Territory (JSC PA ECP, an enterprise of ROSATOM's TVEL Fuel Company). The expected capacity of the W-UEIP site is 20,000 tonnes of DUHF per year (two lines with a capacity of 10,000 tonnes per year).



Environmental safety

Energy conservation and energy efficiency improvement programme

GRI 103–1

GRI 103–2

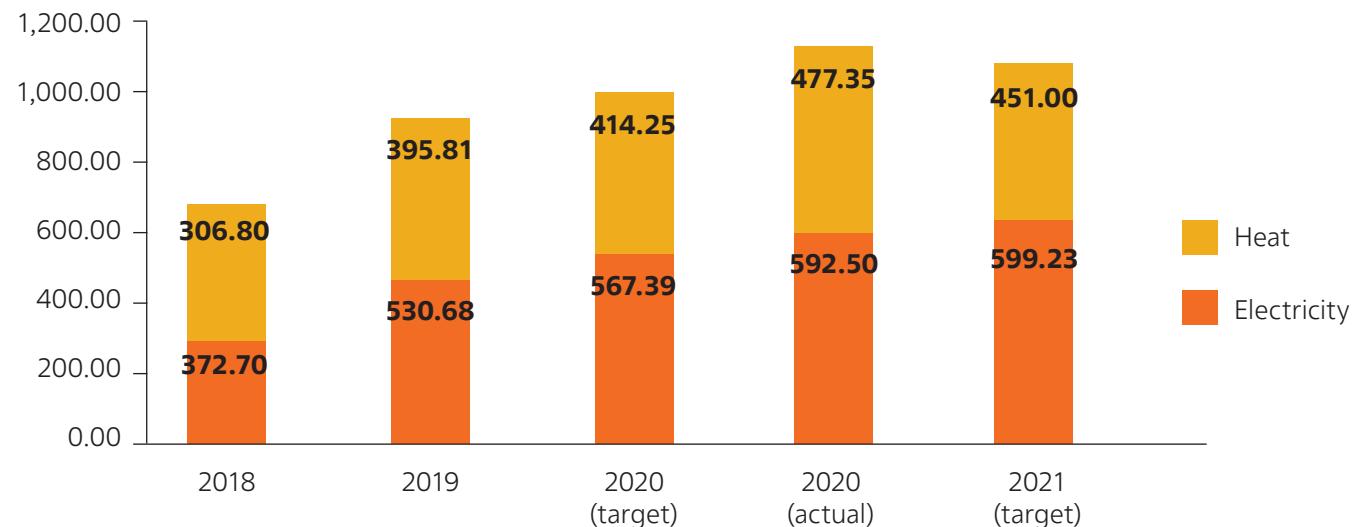
GRI 103–3

The Fuel Company is a leader in the implementation of automated energy accounting systems and a methodology for improving energy efficiency in the nuclear industry, including energy audits, developing long-term investment, organisational and technical programmes, and implementing specific energy conservation measures. Since 2011, the Company's enterprises have been participating in the implementation of the Energy Conservation and Energy Efficiency Improvement Programme approved following energy audits and thermal inspections in the Company's enterprises.

In 2020, electricity and heat consumption in enterprises managed by TVEL Fuel Company was reduced by 9.37% (283.50 million kWh) and 18.03% (422,240 Gcal) respectively against 2015 as the base year under comparable conditions. The reduction in energy consumption (under conditions comparable to 2015) in monetary terms totalled 15.01% (RUB 1,490.35 million), against a target of 8%.

The reduction in energy consumption did not involve a reduction in the scope of the production programme of TVEL Fuel Company; it was achieved by implementing measures forming part of the Energy Conservation and Energy Efficiency Improvement Programme. In 2020, investment in the Programme totalled RUB 105.96 million. In 2021, investment is expected to reach RUB 443.43 million.

Total energy savings from energy conservation and energy efficiency improvement measures, in monetary terms under comparable conditions, RUB million



Use of primary energy sources, million GJ¹⁰

Energy source	2018	2019	2020 (target)	2020 (actual)	2021 (target)
Gas	0.313	0.27	0.25	0.23	0.28

Management of industrial and consumer waste

In 2020, the total amount of industrial and consumer waste in the Fuel Company's enterprises decreased by 20% as compared to 2019 and reached 27,600 tonnes.

The decrease in waste generation was caused by the following factors:

- JSC Vladimir Tochmash Production Association: changes in output;
- JSC PA ECP: the completion of the upgrading of a heating pipe main and overhaul repairs of a highway.

¹⁰ Including those associated with electricity and heat generation at thermal power plants in the subsidiaries of TVEL Fuel Company. In 2017, Chepetsk Mechanical Plant and JSC UEIP sold their thermal power plants to JSC ITPC; in 2018, JSC ITPC acquired the thermal power plants of JSC SCP. All thermal power plants previously owned by the enterprises of TVEL Fuel Company were excluded from its scope as from January 1, 2018. Between 2017 and 2019, coal for the thermal power plant of JSC SCP was supplied by JSC ITPC.

The major part of the waste (51%) is hazard class 5 waste (practically non-hazardous). The decrease in the share of hazard class 5 waste compared to 2019 is due to the completion of a significant part of construction works.

Water use and discharge

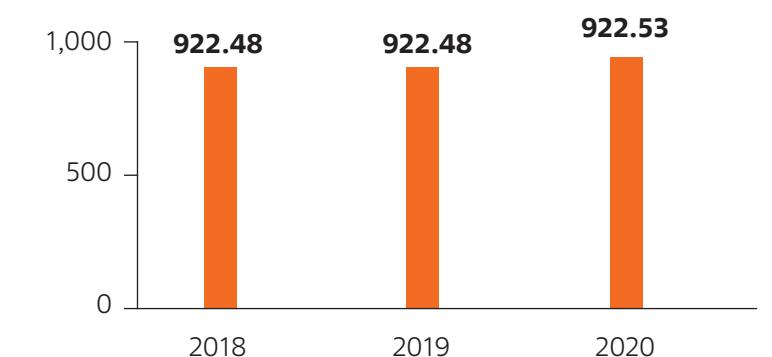
GRI 306–1

In 2020, water withdrawal by the Company's enterprises decreased by 13% and totalled 491.2 million m³; water consumption for operational needs increased by 6% to 212.7 million m³. As a result, the Company's enterprises discharged 235.7 million m³ of water (65.7% of the permissible limit) into water bodies, making up a major portion of the total water discharge.

The water withdrawal limit for 2020 was set at 538.2 million m³, while the actual water withdrawal amounted to 91.3% of the limit.

The volume of recycled water totalled 256.1 million m³ in 2020. The share of recycled and reused water in the total water withdrawal totalled 52.1% and 0.01% respectively.

Greenhouse gas (GHG) emissions, '000 tonnes of carbon dioxide equivalent¹¹



The major share of greenhouse gas emissions in TVEL Fuel Company is associated with industrial processes.

There were no emergencies or incidents that could have a negative impact on the environment in the enterprises of TVEL Fuel Company in 2020.

Environmental costs

GRI 305–6

Pollutant emissions

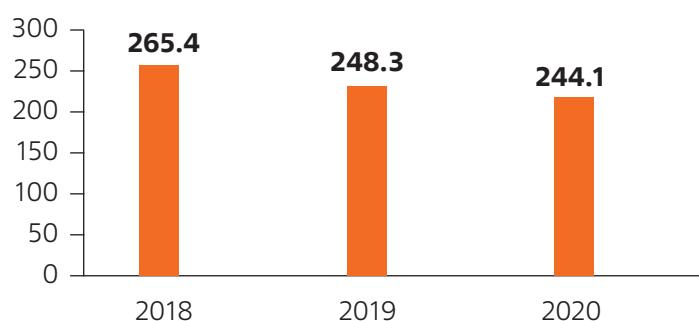
In 2020, the total pollutant emissions into the atmosphere from the Company's enterprises decreased by 0.6% to 1,390 tonnes (45.3% of the permissible limit).

The largest volume of emissions was recorded at Chepetsk Mechanical Plant as a result of industrial processes involved in chemical and metals production.

In 2020, environmental costs across the Company decreased by 37% to RUB 2,084.2 million.

The increase in waste management costs in 2020 was caused by the fact that fixed environmental assets (tailings storage facilities) of JSC Chepetsk Mechanical Plant, which had been in federal ownership, were recorded on the balance sheet of the enterprise in 2019. Therefore, costs of 2020 are comparable to costs of 2018.

Emissions of ozone-depleting substances, tonnes



¹¹ The calculation of greenhouse gas emissions includes carbon dioxide emissions, since carbon monoxide released into the atmosphere from industrial sources is oxidised to carbon dioxide. The indicators were calculated and recalculated in accordance with the Methodological Guidelines and Procedure for Quantifying GHG Emissions by Organisations Carrying Out Economic and Other Activities in the Russian Federation, approved by Order No. 300 of the Ministry of Natural Resources and Environment dated June 30, 2015, namely:

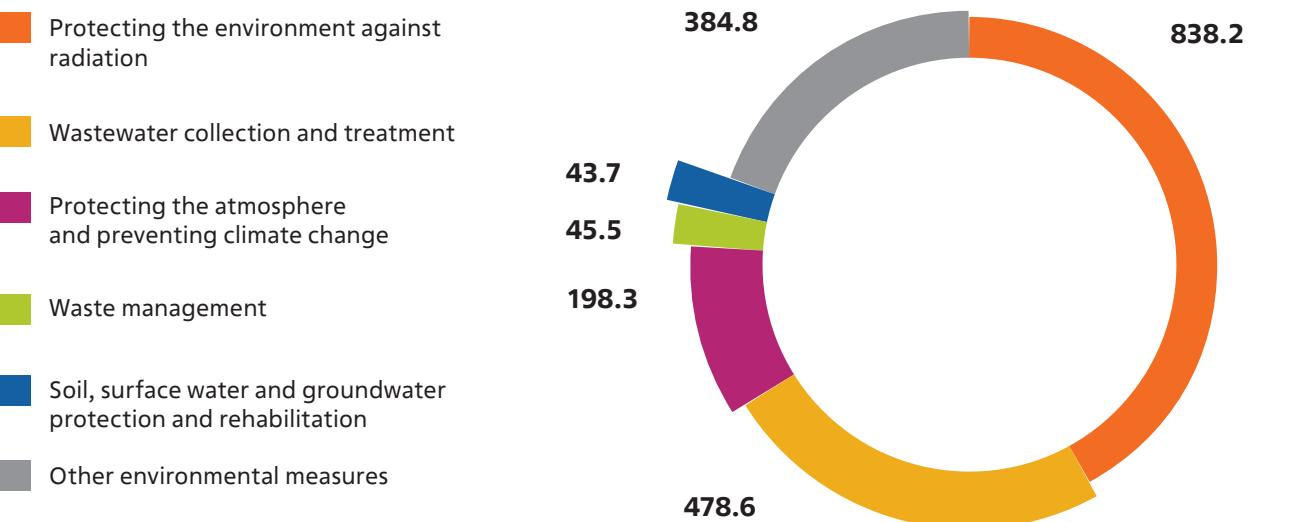
1. The calculation was based on formula No. 2 provided in the Methodological Guidelines.
2. The amount of CO₂ emissions was calculated by recalculating the amount of CO emissions (multiplication by a factor of 1.57).
3. The calculation of the total amount of greenhouse gas emissions from the enterprises of TVEL Fuel Company includes CH₄ (methane) emissions from JSC UEIP and perfluoromethane (Freon 13) emissions from Chepetsk Mechanical Plant, taking into account the global warming potential specified in Appendix No. 3 to the Methodological Guidelines.
4. The calculation of the total amount of greenhouse gas emissions from TVEL Fuel Company includes CH₄ (methane) emissions from JSC UEIP and perfluoromethane (Freon 13) emissions from Chepetsk Mechanical Plant, taking into account the global warming potential specified in Appendix No. 3 to the Methodological Guidelines.

Environmental costs in TVEL Fuel Company, RUB million¹²

Cost item	2018	2019	2020
Protecting the environment against radiation	944.2	1,020.6	838.2
Wastewater collection and treatment	482.9	463.0	478.6
Protecting the atmosphere and preventing climate change	180.2	188.7	198.3
Waste management	38.2	1,116.7	45.5
Protection and rehabilitation of soil, surface water bodies and groundwater	95.2	49.2	43.7
Other environmental measures	463.0	378.7	384.8
Total	2,203.7	3,301.4	2,084.2

JSC UEIP, JSC SCP and Chepetsk Mechanical Plant accounted for the largest share of environmental costs in TVEL Fuel Company.

Structure of environmental costs in TVEL Fuel Company in 2020, %



The major share of the costs was related to protecting the environment against radiation (RUB 838.2 million). Wastewater collection and treatment (RUB 478.6 million) also made up a significant share of the costs.

¹² The funds were allocated for both technical and organisational measures.

Chapter 10

SPECIFIC RISKS AND MANAGEMENT APPROACHES



The Internal Control System (ICS) of TVEL Fuel Company is an integrated set of organisational structures, processes and rules for their execution, as well as control system characteristics, which occasionally or continuously performs an internal control function and ensures the achievement of internal control goals.

GRI 103-2

Risk management in TVEL Fuel Company is based on continuous monitoring of the external and internal environment, and comprehensive analysis of threats and opportunities that affect the achievement of both the economic and social goals of the Company.

The main purpose of the risk management system (RMS) is to identify, assess and mitigate the threats that could affect the Company's performance.

Due to the COVID-19 pandemic, a risk of a deterioration in the epidemiological situation was added to the list of JSC TVEL's key risks. To reduce this risk, a Crisis Centre was established in March 2020. Uniting executives of JSC TVEL and its subsidiaries, the Crisis Centre allowed the Fuel Division to promptly take anti-coronavirus measures, reduce negative impacts of the pandemic on the Fuel Company's operations as much as possible and meet business targets for 2020.

GRI 102-15

Key risks of the Division

Risks	Risk management mechanisms
Risk of a decrease in the sales of NFC products/services	<ul style="list-style-type: none"> ■ Improving the technical and economic characteristics of fuel; introducing new types of fuel; ■ Promoting products in new market segments.
Risk of a failure by external counterparties (suppliers and buyers) to perform their contractual obligations in full and on schedule	<ul style="list-style-type: none"> ■ Stipulating payment methods and/or types of collateral in contracts to reduce credit risks; ■ Monitoring the counterparties' financial position in order to detect any changes in the financial position of the counterparty entailing a change in the credit risk level and (or) the nature of credit risk management measures; ■ Qualification of counterparties using non-financial parameters.

Risks	Risk management mechanisms
Risk of an increase in the cost of fabrication, enrichment and conversion services	<ul style="list-style-type: none"> ■ Cooperation with suppliers based on the principles of the Uniform Industrial Procurement Standard of ROSATOM; ■ Implementation of the ROSATOM Production System; ■ Implementation of long-term programmes and investment projects aimed at optimising the technology and production processes; ■ Development and implementation of performance improvement programmes in all enterprises of the Company; ■ Implementation of the cost control framework in order to appoint persons responsible for various costs; ■ Long-term forecasting of the balance between the needs and capacities of the enterprises (jointly with ROSATOM and related Divisions of ROSATOM); ■ Inventory optimisation and faster inventory turnover.
Nuclear and radiation safety risks	<ul style="list-style-type: none"> ■ Upgrading and automating the facilities and ensuring their safe operation; ■ Decommissioning facilities of TVEL Fuel Company posing nuclear and radiation hazards and addressing the 'nuclear legacy', using funds allocated under the FTP NRS 2 programme and industry reserves; ■ Personnel training and development; ■ Continuous monitoring of nuclear and radiation safety; ■ Setting and achieving the goals and objectives, developing measures to reduce nuclear and radiation safety risks; ■ Comprehensive reviews and inspections.
Environmental safety risk	<ul style="list-style-type: none"> ■ Setting the goals and objectives and developing measures to reduce environmental and occupational health and safety risks; ■ Considering draft environmental regulations. Explaining practice in the application of the regulations; ■ Taking occupational safety measures using ROSATOM's special reserve funds; ■ Holding emergency response drills and personnel training, sharing information for out-of-schedule emergency preparation; ■ Conducting comprehensive inspections, audits, environmental monitoring; ■ Improving the integrated environmental (ISO 14001:2004) and occupational health and safety (ISO 45001:2018) management system.

Risks	Risk management mechanisms	Risks	Risk management mechanisms
Occupational health and safety risk	<ul style="list-style-type: none"> ■ Improving and developing a safety culture; ■ Taking injury prevention measures; ■ Promoting safe work; ■ Providing collective and personal protective equipment to employees; ■ Conducting comprehensive inspections and audits; ■ Setting the goals and objectives and developing measures to reduce occupational health and safety risks; ■ Planning occupational health and safety costs according to the Industry-Wide Agreement; ■ Improving the integrated management system for occupational health, industrial and environmental safety (ISO 14001: 2004; ISO 45001:2018). 	Reputational risk	<ul style="list-style-type: none"> ■ Following the industry-wide regulation on informing the public of emergencies posing threats to ROSATOM's business and public reputation; ■ Implementing the Unified Information Policy of ROSATOM's TVEL Fuel Company; ■ Integrated communications; ■ Implementing target communication programmes to promote products and services of JSC TVEL and its subsidiaries; ■ Developing a value-based corporate culture and implementing the Promotion of ROSATOM's Values Among the Public project; ■ Spurring activities of municipal communication and conciliation commissions; ■ Implementing a communication campaign to minimise risks of negative publications about DUHF imports in the Russian Federation.
Industrial safety risk	<ul style="list-style-type: none"> ■ Holding emergency response drills; ■ Conducting comprehensive audits and inspections; ■ Performance appraisal for the non-professional emergency response team; ■ Setting the goals and objectives and developing measures to reduce industrial safety risks; ■ Allocating funds and resources and arranging civil liability insurance; ■ Improving the integrated management system for occupational health, industrial and environmental safety (ISO 14001: 2004; ISO 45001:2018). 	Deterioration in the epidemiological situation	<ul style="list-style-type: none"> ■ Using non-contact thermometers; ■ Ensuring social distancing by setting a maximum number of employees on premises and making sure that employees follow these rules; ■ Changing work start and end times to prevent personnel from crowding at front gates; ■ Introducing staggered lunch hours; ■ Disinfecting facilities; ■ Regularly informing employees of the need to follow sanitary rules; ■ Restricting business trips; ■ Employee COVID-19 testing; ■ COVID-19 vaccination among employees.
Social and political risks	<ul style="list-style-type: none"> ■ Implementing action plans to dampen social and political risks in the regions of operation; ■ Interacting with regional and local authorities to develop regions, collect more regional taxes and maintain social and economic stability; ■ Implementing social and charity initiatives in TVEL Fuel Company's regions of operation; ■ Building a system of multi-level internal (including on a cascade basis) and external communications; ■ Holding public forums in TVEL Fuel Company's regions of operation. 		

Pilot project to introduce a unified risk management approach to new business projects

In 2020, The Fuel Company, jointly with ROSATOM, completed a pilot project aimed at developing a unified approach to quantitative risk assessment using the CAPEX@RISK model. This model makes it possible to assess potential deviations from project deadlines and costs taking into account impacts from risks, promptly develop risk management measures and assess their effectiveness.

Meaningful insights from the project can be applied to all new-business development projects.

Information on the Reporting Process

GRI 102–46

The reporting process involved a review of the Company's operations in 2020. The report discloses the main performance indicators of TVEL Fuel Company, prospective development areas, and information on measures providing a framework for long-term sustainable development.

The reporting materials include information on the operating results of JSC TVEL and its subsidiaries.

GRI 102–54

In previous reporting periods, TVEL Fuel Company prepared its annual integrated reports under the Comprehensive option of GRI SRS (Sustainability Reporting Standards, Global Reporting Initiative). Due to changes in ROSATOM's Public Reporting Standard, these reporting materials have been prepared in accordance with the Core option.

GRI 102–48

There are no restatements of indicators, as well as significant changes in covered topics and the scope of these reporting materials compared to previous reports.

In 2020, the Fuel Company focused not only on the COVID-19 pandemic affecting all business areas but also on the development prospects of the closed nuclear fuel cycle.

When preparing the materials, the Company conducted a questionnaire survey among stakeholders to update material topics to be covered. The stakeholders put forward no proposals on covering more topics.

Additional Information

GRI Index

Indicator	Chapter/Comments
GRI 101: Foundation (2016)	
GRI 102: General Disclosures (2016)	
Company profile	
102-1 Name of the organisation	Chapter 1. Overview of the Division
102-2 Activities, brands, products and services	Chapter 1. Overview of the Division
102-4 Location of operations	Chapter 1. Overview of the Division
102-5 Ownership and legal form	Chapter 1. Overview of the Division
102-6 Markets served	Chapter 1. Overview of the Division
102-7 Scale of the organisation	Chapter 2. Key Results and Events of the Reporting Year Chapter 7. Developing the Human Capital
102-8 Information on employees and other workers	Chapter 7. Developing the Human Capital
102-11 Precautionary Principle or approach	TVEL Fuel Company follows the precautionary principle by forecasting and assessing environmental risks, which enables it to avoid, reduce or control the discharge or emission of any types of pollutants or waste generation, and prevent or minimise the impact of its operations on the environment, personnel and the population of the Company's regions of operation.
102-13 Membership of associations	https://www.tvel.ru/about-company/
Strategy	
102-14 Statement from the most senior decision-maker of the organisation	Message from the Head of the Division
102-15 Key impacts, risks and opportunities	Chapter 10. Specific Risks and Management Approaches
Ethics and integrity	
102-16 Values, principles, standards, and norms of behaviour	Chapter 1. Overview of the Division
Governance	
102-18 Governance structure	Chapter 1. Overview of the Division https://www.tvel.ru/about-company/corporate-governance/
102-22 Composition of the highest governance body and its committees	Chapter 1. Overview of the Division

Indicator	Chapter/Comments
102-23 Chair of the highest governance body	https://www.tvel.ru/about-company/corporate-governance/
102-24 Nominating and selecting the highest governance body	https://www.tvel.ru/about-company/corporate-governance/
102-25 Conflicts of interest	If a person simultaneously serves on the governance bodies of other companies (cross-board membership), such a member of the Board of Directors shall not vote on matters related to the approval of a transaction between these companies, provided that this person is considered to be interested in the transaction (or does not qualify as independent) pursuant to the Federal Law on Joint-Stock Companies. The list of affiliated individuals is disclosed on the Internet at http://www.e-disclosure.ru/portal/company.aspx?id=400&type=6 .
102-33 Communicating critical concerns	Meetings of the Board of Directors are convened by the Chairman on an as-needed basis. The agenda of the meeting is prepared by the Chairman of the Board of Directors.
Stakeholder engagement	
102-41 Collective bargaining agreements	All enterprises of TVEL Fuel Company (except JSC TVEL) have signed collective agreements that cover 100% of employees of these enterprises (98% of the average headcount of TVEL Fuel Company).
102-43 Approach to stakeholder engagement	Chapter 8. Developing the Regions of Operation Information on the Reporting Process
Report profile	
102-45 Entities included in the consolidated financial statements	The financial indicators disclosed in this Report have been calculated based on the managerial accounting data of the following companies: JSC TVEL, JSC United Company ESC, JSC AECP, JSC SCP, JSC UEIP, JSC PA ECP, JSC EC RGC, PJSC KMP, LLC RME Centrotech, JSC Vladimir Tochmash Production Association, PJSC MSZ, JSC Chepetsk Mechanical Plant, JSC Moscow Polymetal Plant, PJSC NCCP, JSC VNIINM, LLC Ecoalliance, JSC Industrial Innovation, LLC Iskra, JSC UEC, NUKEM Technologies GmbH, Nukem Technologies Engineering Services GmbH. Taxes paid in the Russian Federation do not include data from foreign entities: NUKEM Technologies GmbH, Nukem Technologies Engineering Services GmbH&.
102-46 Defining report content and topic Boundaries	Information on the Reporting Process
102-48 Restatements of information	Information on the Reporting Process
102-49 Changes in reporting	Information on the Reporting Process
102-54 Claims of reporting in accordance with the GRI Standards	Information on the Reporting Process
102-55 GRI Content Index	GRI Index

Indicator	Chapter/Comments
Material topics	
GRI 201: Economic Performance (2016)	
<i>GRI 103: Management Approach (2016)</i>	Chapter 7. Developing the Human Capital
201-3 Defined benefit plan obligations and other retirement plans	Chapter 7. Developing the Human Capital TVEL Fuel Company has in place defined benefit pension plans. All pension plans are unfunded.
201-4 Financial assistance received from the government	JSC TVEL received no financial assistance from the government, as defined in the relevant accounting standards.
GRI 205: Anti-Corruption (2016)	
205-2 Communication and training about anti-corruption policies and procedures	All employees of TVEL Fuel Company are required to review the anti-corruption practices applied in the Company. https://www.tvel.ru/sustainable-development/kachestvo-upravleniya-i-vzaimodeystvie-s-zainteresovannymi-storonomi-/prorachnost-i-protivodeystvie-korruptsii/
205-2 Communication and training about anti-corruption policies and procedures	All employees of TVEL Fuel Company are required to review the anti-corruption practices applied in the Company. https://www.tvel.ru/sustainable-development/kachestvo-upravleniya-i-vzaimodeystvie-s-zainteresovannymi-storonomi-/prorachnost-i-protivodeystvie-korruptsii/
GRI 302: Energy (2016)	
<i>GRI 103: Management Approach (2016)</i>	Chapter 9. Safety of Operations
302-1 Energy consumption within the organisation	Chapter 9. Safety of Operations
302-4 Reduction of energy consumption	Chapter 9. Safety of Operations
GRI 305: Emissions (2016)	
<i>GRI 103: Management Approach (2016)</i>	Chapter 9. Safety of Operations
305-1 Direct (Scope 1) GHG emissions	Chapter 9. Safety of Operations
305-6 Emissions of ozone-depleting substances (ODS)	Chapter 9. Safety of Operations
GRI 306: Effluents and Waste (2016)	
<i>GRI 103: Management Approach (2016)</i>	Chapter 9. Safety of Operations
306-1 Water discharge by quality and destination	Chapter 9. Safety of Operations

Indicator	Chapter/Comments
306-3 Significant spills	There were no significant spills.
306-4 Transport of hazardous waste	The Company's enterprises are not involved in cross-border waste transportation. The Company does not transport, process or transfer for processing any waste produced in the enterprises of the Fuel Company and classified as hazardous in accordance with the Basel Convention.
306-5 Water bodies affected by water discharges and/or runoff	Wastewater discharges do not have a significant impact on the biodiversity of water bodies and related habitats.
GRI 307: Environmental Compliance (2016)	
<i>GRI 103: Management Approach (2016)</i>	Chapter 9. Safety of Operations
307-1 Non-compliance with environmental laws and regulations	Chapter 9. Safety of Operations
GRI 401: Employment (2016)	
<i>GRI 103: Management Approach (2016)</i>	Chapter 7. Developing the Human Capital
401-1 New employee hires and employee turnover	Chapter 7. Developing the Human Capital
401-2 Benefits provided to full-time employees that are not provided to temporary or part-time employees	Part-time employees are provided with the same benefits as full-time employees, provided that the Company is their main place of employment.
GRI 402: Labour/Management Relations (2016)	
402-1 Minimum notice periods regarding operational changes	In the event of significant operational changes in the Company, employees are to be notified of such changes no later than two months in advance, as stipulated in employment laws of the Russian Federation and the Collective Agreement concluded by each subsidiary of the Company.
GRI 403: Occupational Health and Safety (2018)	
<i>GRI 103: Management Approach (2016)</i>	Chapter 7. Developing the Human Capital Chapter 9. Safety of Operations
403-1 Occupational health and safety management system	Chapter 9. Safety of Operations
403-3 Occupational health services that contribute to the identification and elimination of hazards and minimisation of risks	Chapter 9. Safety of Operations
403-6 Promotion of worker health	Chapter 7. Developing the Human Capital
403-9 Work-related injuries	Chapter 7. Developing the Human Capital
GRI 404: Training and Education (2016)	
<i>GRI 103: Management Approach (2016)</i>	Chapter 7. Developing the Human Capital
404 -1 Average hours of training per year per employee	Chapter 7. Developing the Human Capital
404-2 Programmes for upgrading employee skills	Chapter 7. Developing the Human Capital

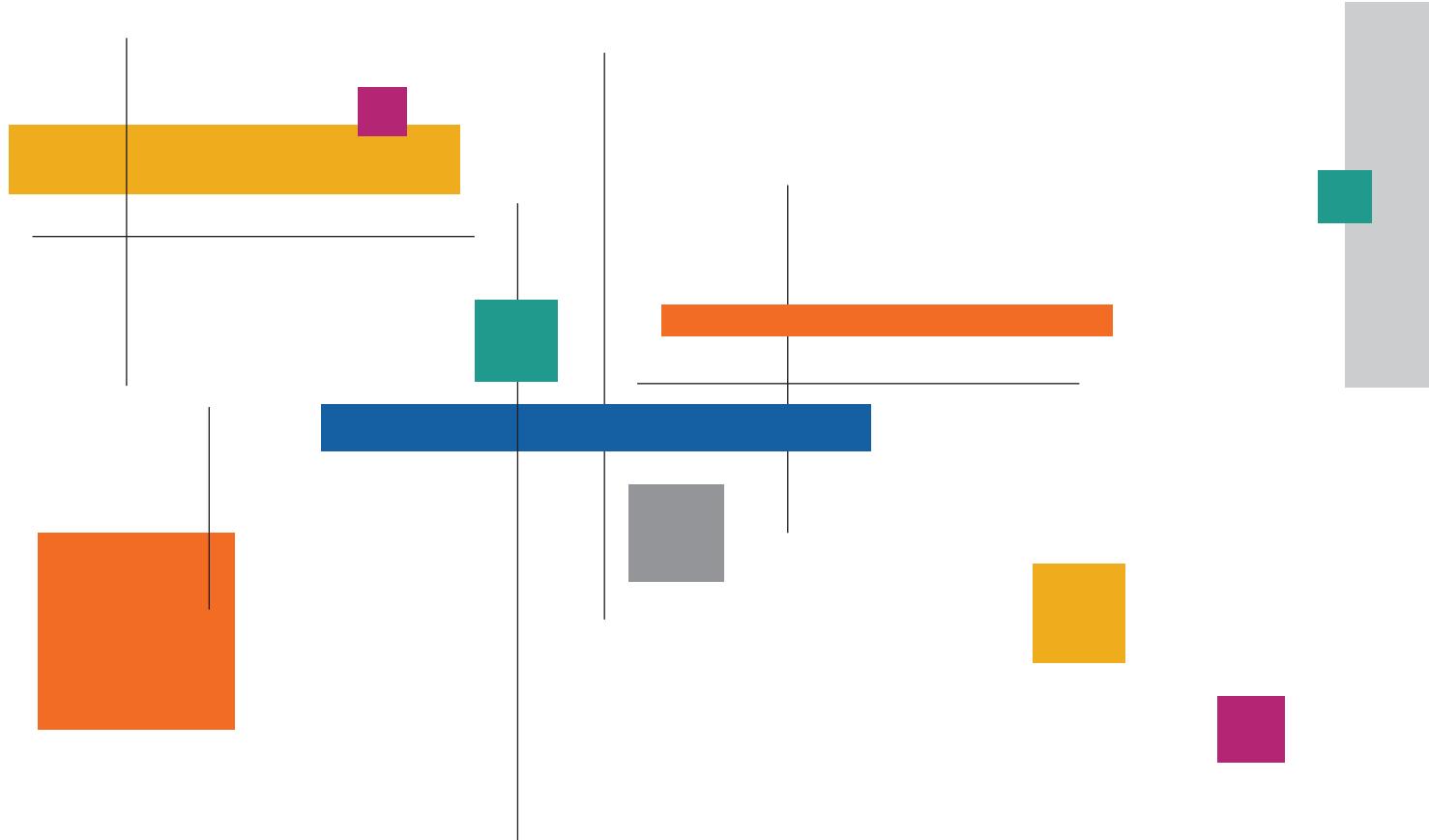
Indicator	Chapter/Comments
GRI 413: Local Communities (2016)	
<i>GRI 103: Management Approach (2016)</i>	Chapter 8. Developing the Regions of Operation
413-2 Operations with significant actual and potential negative impacts on local communities	There are no significant negative impacts.
GRI 419: Socioeconomic Compliance (2016)	
419-1 Compliance with laws and regulations in the social and economic area	There were no significant violations of the law and, accordingly, no fines or non-financial sanctions imposed on TVEL or its subsidiaries in 2020.
Position on global markets	
Share on the nuclear fuel fabrication market	Chapter 1. Overview of the Division
Overseas revenue	Chapter 2. Key Results and Events of the Reporting Year
New businesses	
Revenue from general industrial operations	Chapter 2. Key Results and Events of the Reporting Year
Environmental protection	
Environmental costs	Chapter 9. Safety of Operations
Implementation of measures stipulated by Federal Target Programmes	Chapter 9. Safety of Operations
Innovative development	
Outcomes of innovative activities	Chapter 5. Innovation and Development of Science
Remuneration	
Average salary	Chapter 7. Developing the Human Capital

Glossary and Abbreviations

AOEMMS	Automated operational and environmental monitoring measurement system
ARMS	Automated radiation monitoring system
CHPP	Combined heat and power plant
CO	Controlled organisation
CSS	Control and safety system
FNR	Fast-neutron reactor
FPNRH	Facilities posing nuclear and radiation hazards
GC	Gas centrifuge
IAEA	International Atomic Energy Agency
IP	Intellectual property
JV	Joint venture
KPI	Key performance indicator
LNG	Liquefied natural gas
NF	Nuclear fuel
NFA	Nuclear fuel assembly
NFE	Nuclear fuel element
NPP	Nuclear power plant
NPU	Nuclear power unit
NPU	Nuclear propulsion unit
NRS	Nuclear and radiation safety
NSGP	Nuclear steam generating plant
OKBM	Experimental Design Bureau of Mechanical Engineering
PSEDA	Priority social and economic development area
QMS	Quality Management System
Refinery	Refinery
RPS	ROSATOM Production System
RU	Reactor unit
SMBs	Small and medium-sized businesses
STC	Scientific and Technical Council
UIS Quality	Unified Industry-Wide Quality Management System of ROSATOM
VVER	Water-cooled water-moderated power reactor

Terms used in the report

Consolidated revenue	total revenue of organisations included in the consolidated financial statements in accordance with the methodology approved in the company, less intra-group revenue and other adjustments
LTIFR	Lost Time Injury Frequency Rate
Material topic	a topic that reflects a significant area of the Company's business or impact on stakeholders
Significant regions of operation	regions where production facilities and key personnel of the enterprise are located
Stakeholder	an individual, a group of persons or an organisation that is affected by the company and/or can affect it
Top management (senior management)	employees of the Company who make decisions that have a significant impact on the operations of the enterprise as a whole (from the level of directors in functional areas up to the Chief Executive Officer)



GRI 102–3

GRI 102–5

GRI 102–53

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Official community page on Facebook

<https://www.facebook.com/TvelFuelCompany/>

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