

**75 YEARS
OF NUCLEAR
INDUSTRY**

AHEAD
OF THE TIMES



**PERFORMANCE
OF THE POWER
ENGINEERING DIVISION
IN 2019**



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OF NUCLEAR
INDUSTRY**

*AHEAD
OF THE TIMES*



ROSENERGOATOM

ROSATOM

PERFORMANCE OF THE POWER ENGINEERING DIVISION IN 2019

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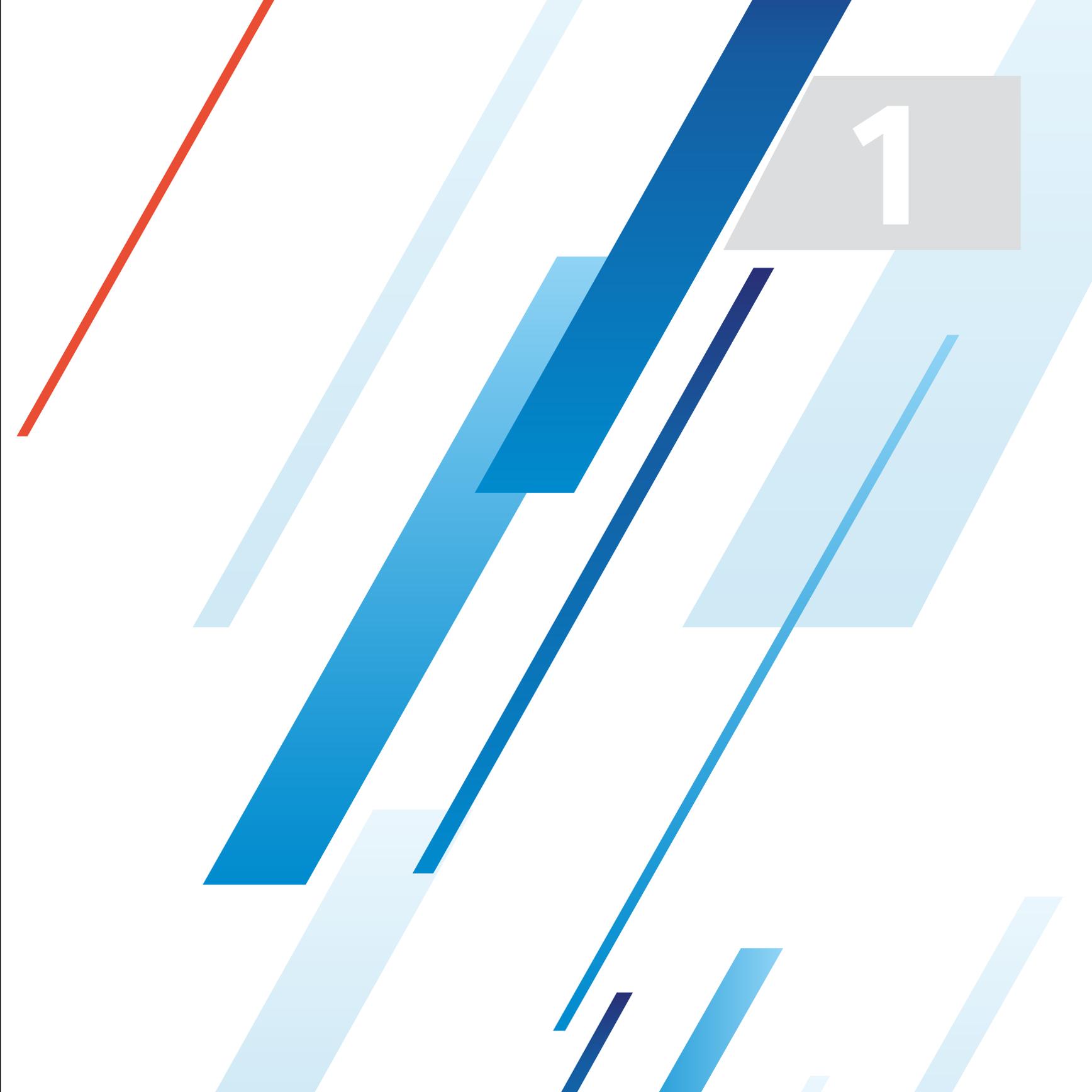
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1. MESSAGE FROM THE HEAD OF THE DIVISION

One of the highlights of the year was the successful achievement of targets set by the government for power generation at Russian NPPs in 2019. Electricity output reached a new all-time high in the history of the Russian nuclear power industry and totalled 208.78 billion kWh, exceeding the 2018 level by more than 4.5 billion kWh.

ANDREY PETROV

Director General of JSC Rosenergoatom,
Head of the Power Engineering Division



1

Dear colleagues,

The Power Engineering Division of State Atomic Energy Corporation Rosatom (ROSATOM) demonstrated a strong performance ahead of 2020, which marks the anniversary of the Victory in the Great Patriotic War and the 75th anniversary of the nuclear industry. The Division's performance against its key performance indicator targets exceeded 100%.

One of the highlights of the year was the successful achievement of targets set by the government for power generation at Russian NPPs in 2019. Electricity output reached a new all-time high in the history of the Russian nuclear power industry and totalled 208.78 billion kWh, exceeding the 2018 level by more than 4.5 billion kWh. Performance against the balance target set by the Federal Antimonopoly Service (FAS) of Russia (202.7 billion kWh) totalled 103% in 2019. Rostov, Kalinin and Balakovo NPPs contributed the most to power generation at Russian NPPs.

A major success of the last year was the commissioning of power unit No. 2 of Novovoronezh NPP-2 30 days ahead of schedule. Another significant milestone was the connection of a floating thermal nuclear power plant in Pevek to the grid and the start of power supply to the power system of the Chukotka Autonomous District.

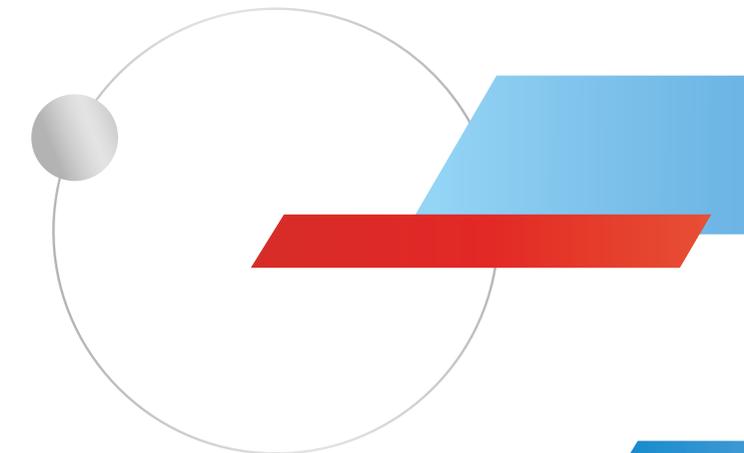
Safety of industrial facilities and personnel remains the highest priority for the Division. The number of incidents recorded at nuclear power plants decreased significantly compared to 2018. Occupational safety and health measures at facilities that are in operation and under construction enabled us to achieve the LTIFR target in 2019.

ROSATOM's Power Engineering Division continues to develop new products and promote international cooperation as it builds NPPs abroad and provides training for NPP personnel, manufactures isotope products for healthcare and develops new digital products. The Division also continues to participate in the development of regions where NPPs are located and provides social security for its employees.

Strong performance was driven by the knowledge, expertise and responsible attitude of the Division's employees. Therefore, I am convinced that we will successfully accomplish even the most challenging tasks in the industry related to ensuring the national energy security and providing the nuclear power industry with competitive advantages on both domestic and international markets.

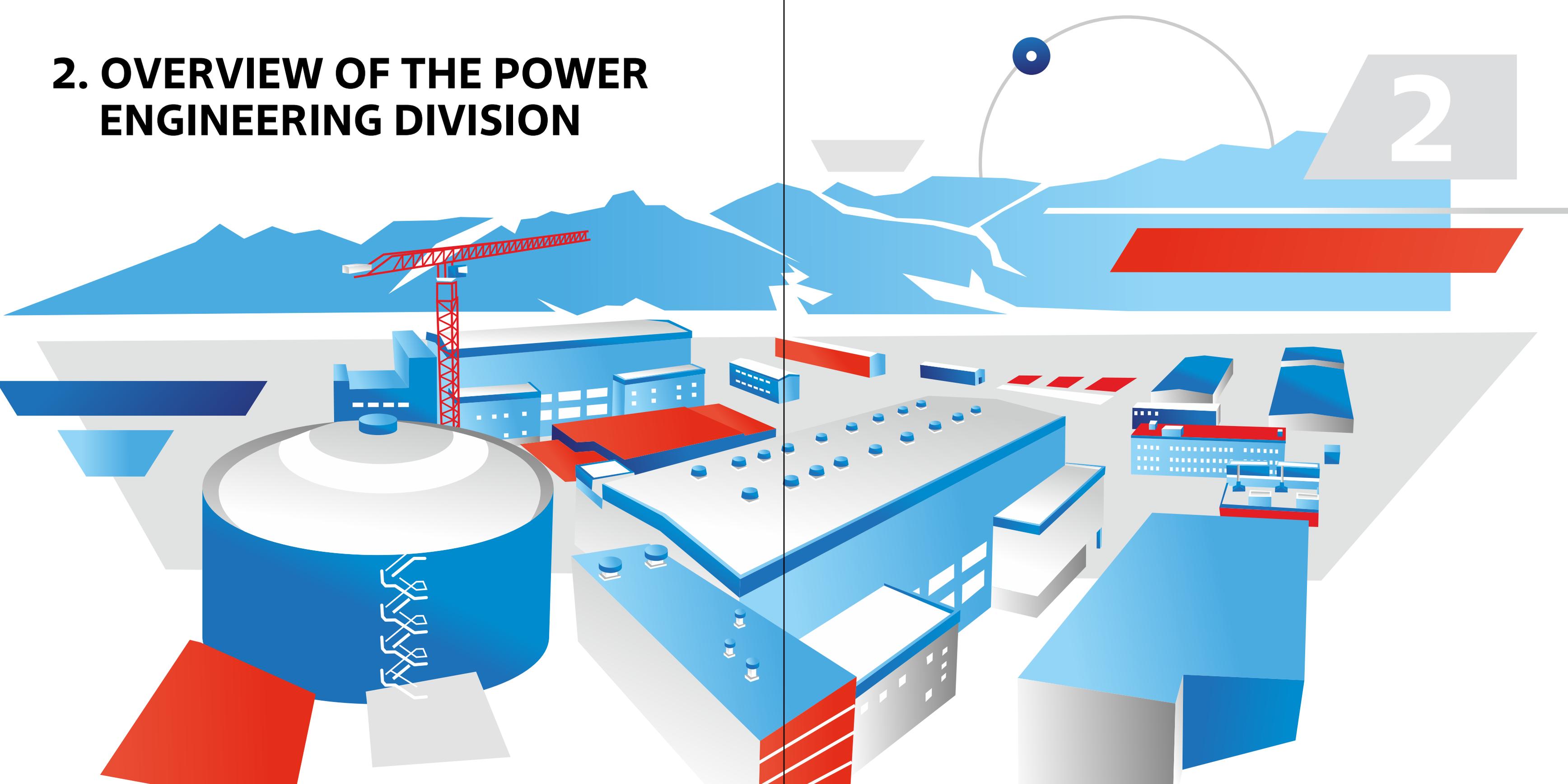


Andrey Petrov
Director General of JSC Rosenergoatom,
Head of the Power Engineering Division



2. OVERVIEW OF THE POWER ENGINEERING DIVISION

2



2.1. GENERAL INFORMATION

The Power Engineering Division (the Division) is the sole operator of nuclear power plants in Russia and one of the largest players on the Russian electricity market, ranking:

- First in terms of total electricity output among the largest power generation companies of Russia;
- Second in the world in terms of total installed capacity of NPPs.

208.78 BILLION KWH GENERATED IN 2019

30.28 GW – TOTAL INSTALLED CAPACITY OF NPPS

The Division’s core businesses are power and heat generation at its nuclear plants, and operation of nuclear power plants, radiation sources and facilities storing nuclear materials and radioactive substances in accordance with Russian legislation.

Our mission is to supply consumers with power and heat generated by the Division’s NPPs; our top business priority is to guarantee safety.

The Division’s operations are closely linked to the business priorities of ROSATOM and are underpinned by its three strategic goals:

- Increasing the international market share;
- Reducing production cost and the lead time;
- Developing new products for the Russian and international markets.

Under the resolution of the Board of Directors of the Division’s holding company, JSC Rosenergoatom (JSC Rosenergoatom, Rosenergoatom), these goals have been supplemented with the following commitments underpinning its safety priorities:

- To reduce the risk of accidents involving damage to the reactor core across the nuclear reactor fleet;
- To prevent workplace fatalities at NPPs;
- To prevent accidents at NPPs resulting in employee radiation exposure exceeding individual exposure limits;
- To prevent accidents at NPPs resulting in radioactive releases and discharges exceeding permitted limits.

ROLE OF THE POWER ENGINEERING DIVISION IN THE STRUCTURE OF THE NUCLEAR INDUSTRY

The Division includes operating nuclear power plants, directorates of NPPs under construction, the Capital Projects Implementation Branch Office, the Directorate for Construction and Operation of Floating Thermal Nuclear Power Plants (FTNPPs), the Technology Branch Office, the Pilot and Demonstration Engineering Centre for Decommissioning (PDEC) and the Akkuyu Engineering Centre; they all have the status of the Division’s affiliates.

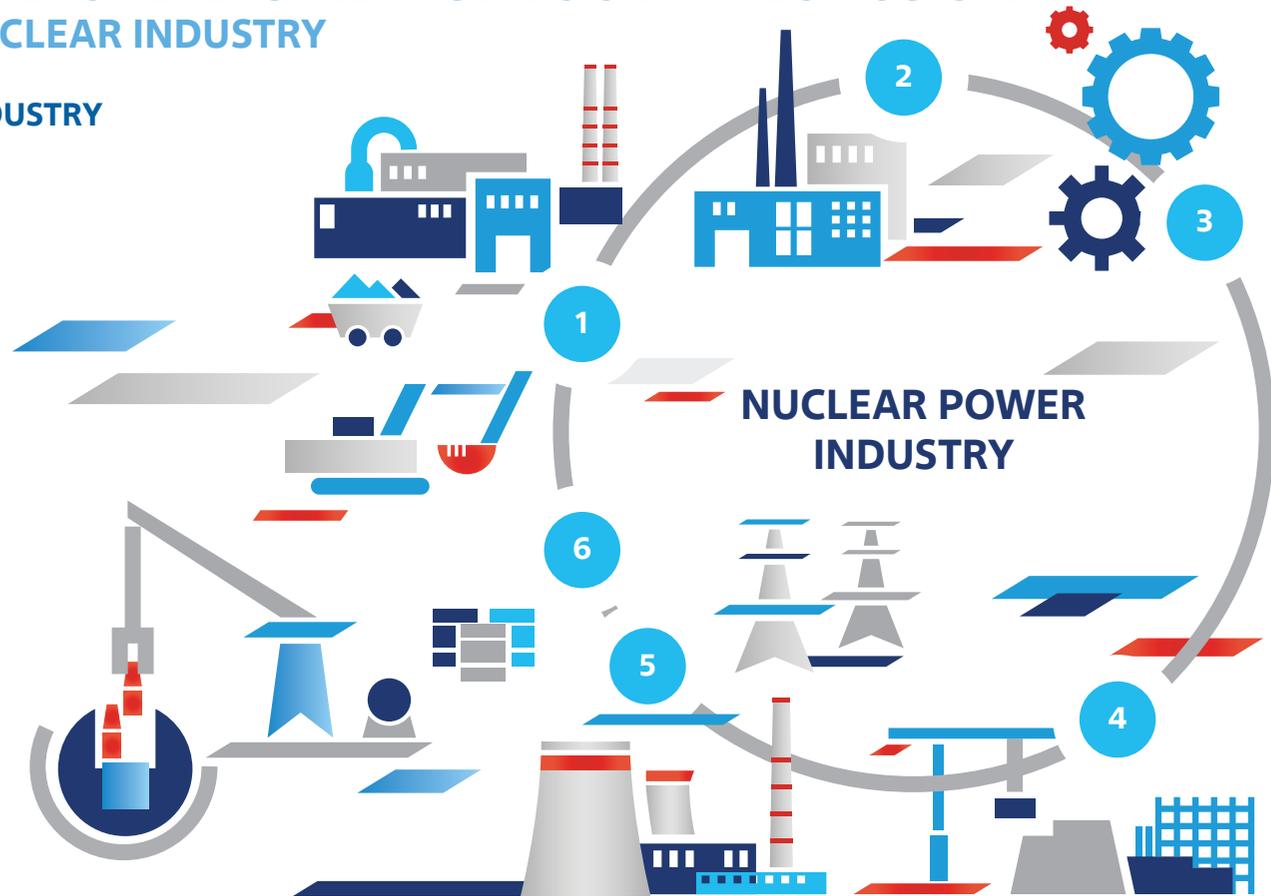
JSC ROSENERGOATOM’S SHAREHOLDERS (AS AT DECEMBER 31, 2019)

State Atomic Energy Corporation Rosatom	JSC Atomenergoprom
14.0074%	85.9926%

Rosenergoatom manages the Power Engineering Division, which comprises 37 organizations, including 19 subsidiaries of JSC Rosenergoatom.

ROLE OF THE POWER ENGINEERING DIVISION IN THE STRUCTURE OF THE NUCLEAR INDUSTRY

NUCLEAR INDUSTRY STRUCTURE



- 1 MINING DIVISION**
 - Geological exploration
 - Uranium mining
 - Ore processing

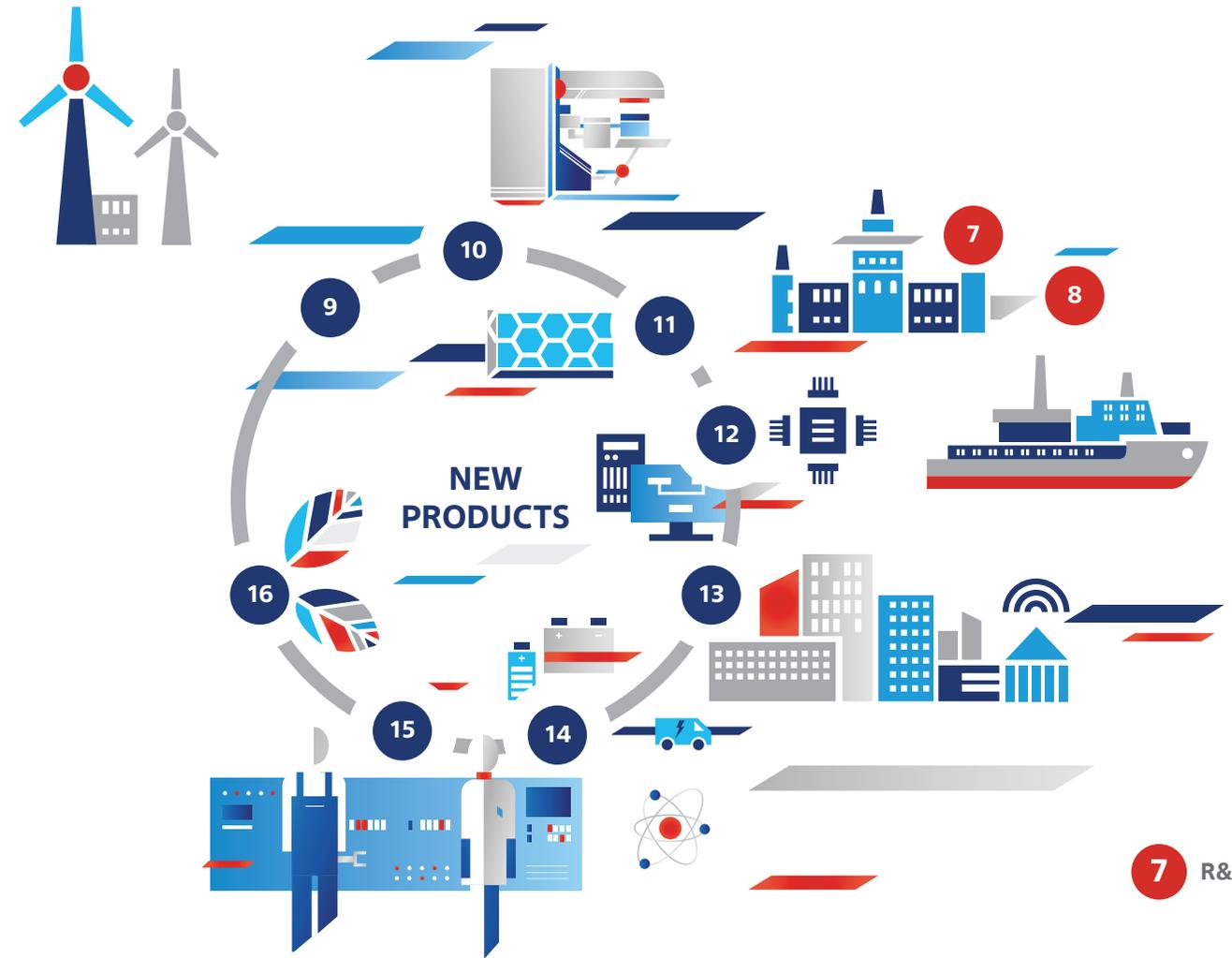
- 2 FUEL DIVISION**
 - Conversion
 - Enrichment
 - Fuel fabrication

- 3 MECHANICAL ENGINEERING DIVISION**
 - Equipment design
 - Equipment manufacture
 - Equipment supply
 - Installation and pre-commissioning
 - Maintenance and upgrade

- 4 ENGINEERING DIVISION**
 - Design and engineering
 - NPP construction

- 5 POWER ENGINEERING DIVISION**
 - Power generation at NPPs
 - NPP servicing

- 6 BACK END**
 - SNF management
 - Decommissioning
 - RAW management



- 8 DEVELOPING THE NORTHERN SEA ROUTE**

- 9 WIND POWER**

- 10 NUCLEAR MEDICINE**

- 11 ADVANCED MATERIALS AND TECHNOLOGIES**

- 12 DIGITAL PRODUCTS**

- 13 INFRASTRUCTURE SOLUTIONS**

- 14 ADDITIVE MANUFACTURING AND ENERGY STORAGE SYSTEMS**

- 15 PROCESS CONTROL SYSTEMS AND ELECTRICAL ENGINEERING**

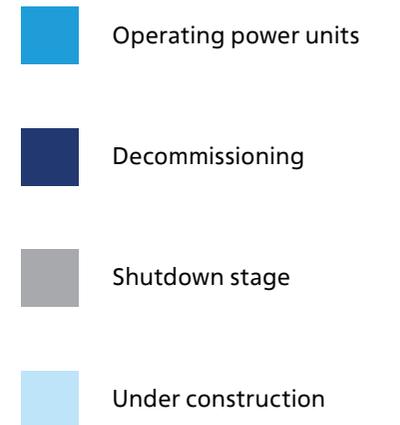
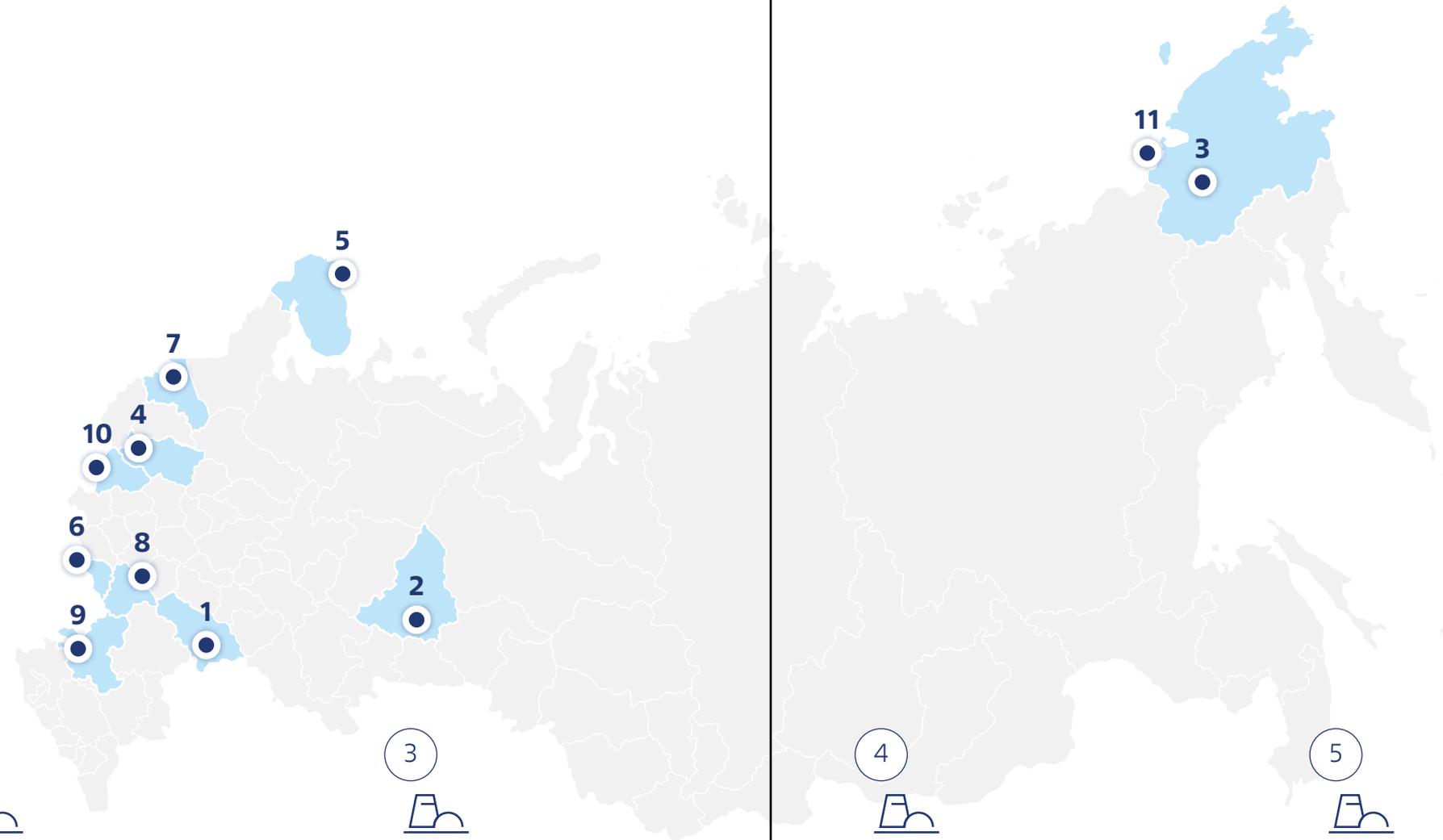
- 16 ENVIRONMENTAL SOLUTIONS**

BUSINESS GEOGRAPHY

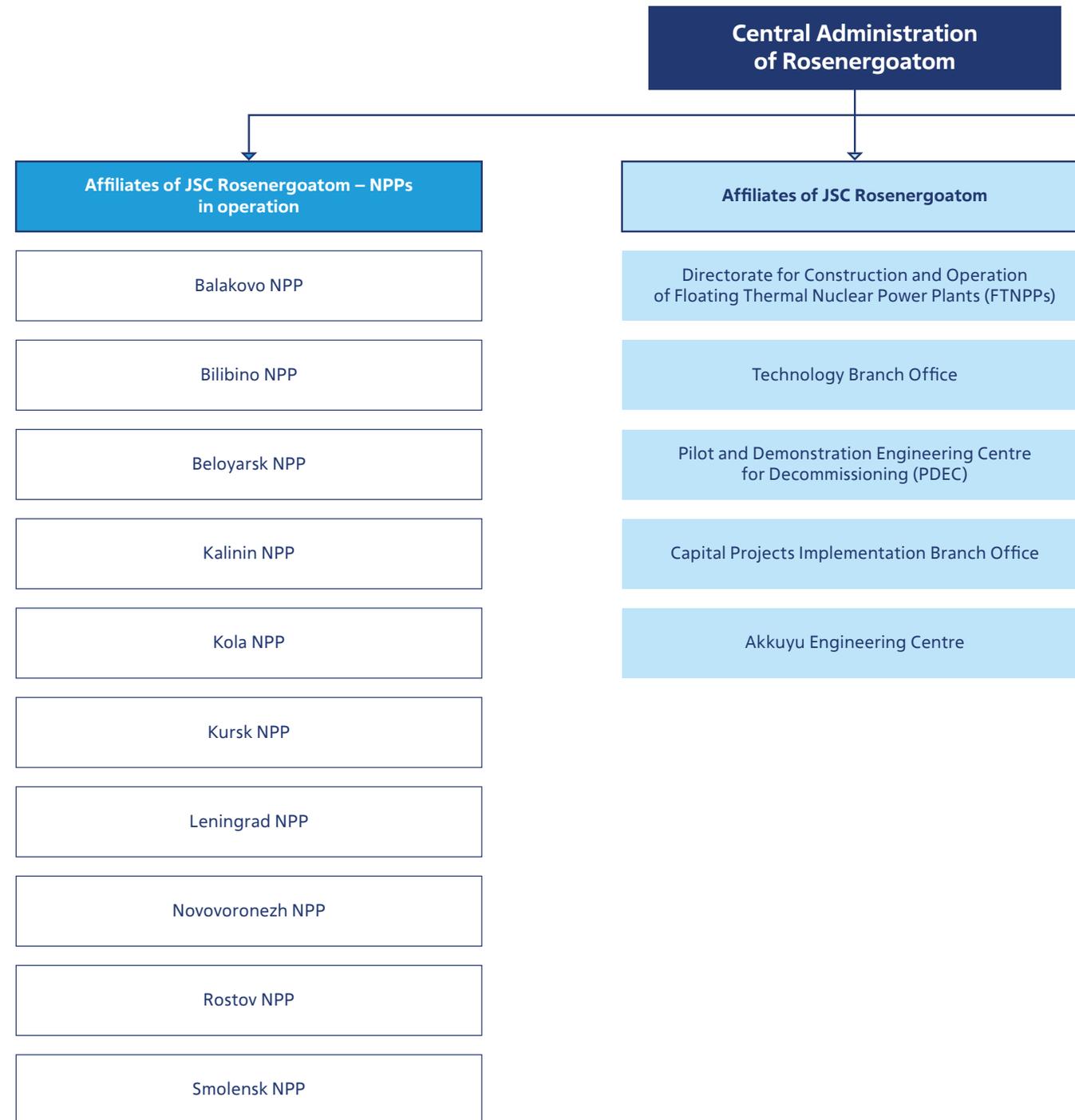
36
NPP power units
with total installed capacity
of 30.28 GW

208.8 billion kWh
electricity output

19%
share
in the energy mix
of the Russian Federation



ORGANIZATIONAL STRUCTURE OF JSC ROSENERGOATOM



2.2. CORPORATE GOVERNANCE SYSTEM

Rosenergoatom's corporate governance system is based on the requirements of Russian legislation; its aim is to enable efficient management, ensure compliance with the principles of transparency and availability of information, and safeguard the rights of shareholders and other stakeholders. Key documents regulating the observance of shareholder rights in Rosenergoatom include:

- Rosenergoatom's Articles of Association;
- The Regulation on Rosenergoatom's General Meeting of Shareholders;
- The Regulation on Rosenergoatom's Board of Directors.

Rosenergoatom's internal regulations can be found at: <https://www.rosenergoatom.ru/shareholders/>

STRUCTURE OF ROSENERGOATOM'S GOVERNING BODIES

The General Meeting of Shareholders is the highest governing body. The activities of the General Meeting of Shareholders are governed by Russian legislation, Rosenergoatom's Articles of Association and the Regulation on Rosenergoatom's General Meeting of Shareholders.

In 2019, two general meetings of shareholders were held, and the following issues were reviewed:

- Distribution of JSC Rosenergoatom's profit and losses for 2018;
- Election of members of Rosenergoatom's Board of Directors;
- Approval of amendments to Rosenergoatom's Articles of Association.

The Board of Directors is a collective governing body in charge of overall management of the Company. It is responsible for the development of the strategy, and monitors the activity of executive bodies in order to safeguard the rights and legitimate interests of Rosenergoatom's shareholders. The activities of the Board of Directors are governed by Russian legislation, provisions of Rosenergoatom's Articles of Association and the Regulation on the Board of Directors.

MEMBERS OF ROSENERGOATOM'S BOARD OF DIRECTORS¹

1. Alexander Lokshin

Chairman of the Board of Directors, First Deputy Director General for Operations Management of State Atomic Energy Corporation Rosatom

2. Sergey Adamchik

Chief Inspector of State Atomic Energy Corporation Rosatom

3. Oleg Barabanov

First Deputy Director General of Atomredmetzoloto JSC

4. Boris Silin

Advisor to the First Deputy Director General for Operations Management of State Atomic Energy Corporation Rosatom

5. Andrey Petrov

Director General of JSC Rosenergoatom

Members of the Board of Directors do not have an interest in Rosenergoatom's authorized capital, do not hold Rosenergoatom's ordinary shares, and have not entered into transactions involving the acquisition or sale of the Company's shares. Rosenergoatom's Board of Directors has no committees.

REPORT OF THE BOARD OF DIRECTORS ON PROGRESS IN DEVELOPMENT ACROSS KEY BUSINESS PRIORITIES

In 2019, the Board of Directors approved business priorities related to strategic safety objectives and measures aimed at their achievement, determined core business parameters in the approved budget, financial and economic targets and key performance targets for 2019 and long-term performance targets of Rosenergoatom.

Director General

The Director General is the sole executive body. Andrey Petrov was elected as Director General of JSC Rosenergoatom on October 7, 2015.

Remuneration of members of governing bodies

In 2019, no remuneration was paid to the members of Rosenergoatom's Board of Directors.

Share capital

As at December 31, 2019, Rosenergoatom's authorized capital totalled RUB 830,285,973,674 (eight hundred and thirty billion two hundred and eighty-five million nine hundred and seventy-three thousand six hundred and seventy-four roubles) and was divided into 830,285,973,674 ordinary shares with a par value of RUB 1 (one rouble) each.

The Board of Directors held 70 meetings and reviewed 80 issues in 2019.

Report on dividends paid

The general meeting of shareholders of Rosenergoatom held on June 28, 2019 (Minutes of Meeting No. 28) approved a resolution to refrain from declaring and paying out dividends on Rosenergoatom's ordinary shares for 2018, and no decision was made to pay out dividends for the first quarter, the first half or the nine months of the reporting year.

Major transactions and non-arm's length transactions

No major transactions which are subject to approval by the authorized governing body of a joint-stock company in accordance with Chapter X of the Federal Law on Joint-Stock Companies were made in 2019. Clause 3.10 of Rosenergoatom's Articles of Association stipulates that the provisions of Chapter XI of the Federal Law on Joint-Stock Companies do not apply to Rosenergoatom. Clause 14.2.35 of the Articles of Association defines conditions different from those set in the Federal Law on Joint-Stock Companies with regard to the recognition of non-arm's length transactions. In 2019, the Board of Directors authorized four non-arm's length transactions in accordance with the requirements of Rosenergoatom's Articles of Association.

¹ Elected on June 28, 2019 under the resolution of the Annual General Meeting of Shareholders of Rosenergoatom.

2.3. QUALITY MANAGEMENT STANDARDS AND SYSTEMS

The Division gives the highest priority to quality assurance at all stages of the NPP life cycle. It follows a quality policy aimed at achieving cost-efficient power generation and providing reliable heat and power supply to consumers in full compliance with nuclear and radiation safety requirements.

The quality management system is a core subsystem of the Division's Integrated Management System (IMS) compliant with the requirements of the ISO 9000 Series of Standards, Federal Rules and Regulations NP-090-11 Requirements for Quality Assurance Programmes for Nuclear Facilities, and IAEA General Safety Requirements No. GSR Part 2 Leadership and Management for Safety.

Operator guidelines and standards were updated and brought into force in the reporting period to support the development of a quality management system compliant with NP-090-11 and GOST R ISO 9001-2015, and to maintain the quality of products supplied to NPPs that are in operation and under construction.

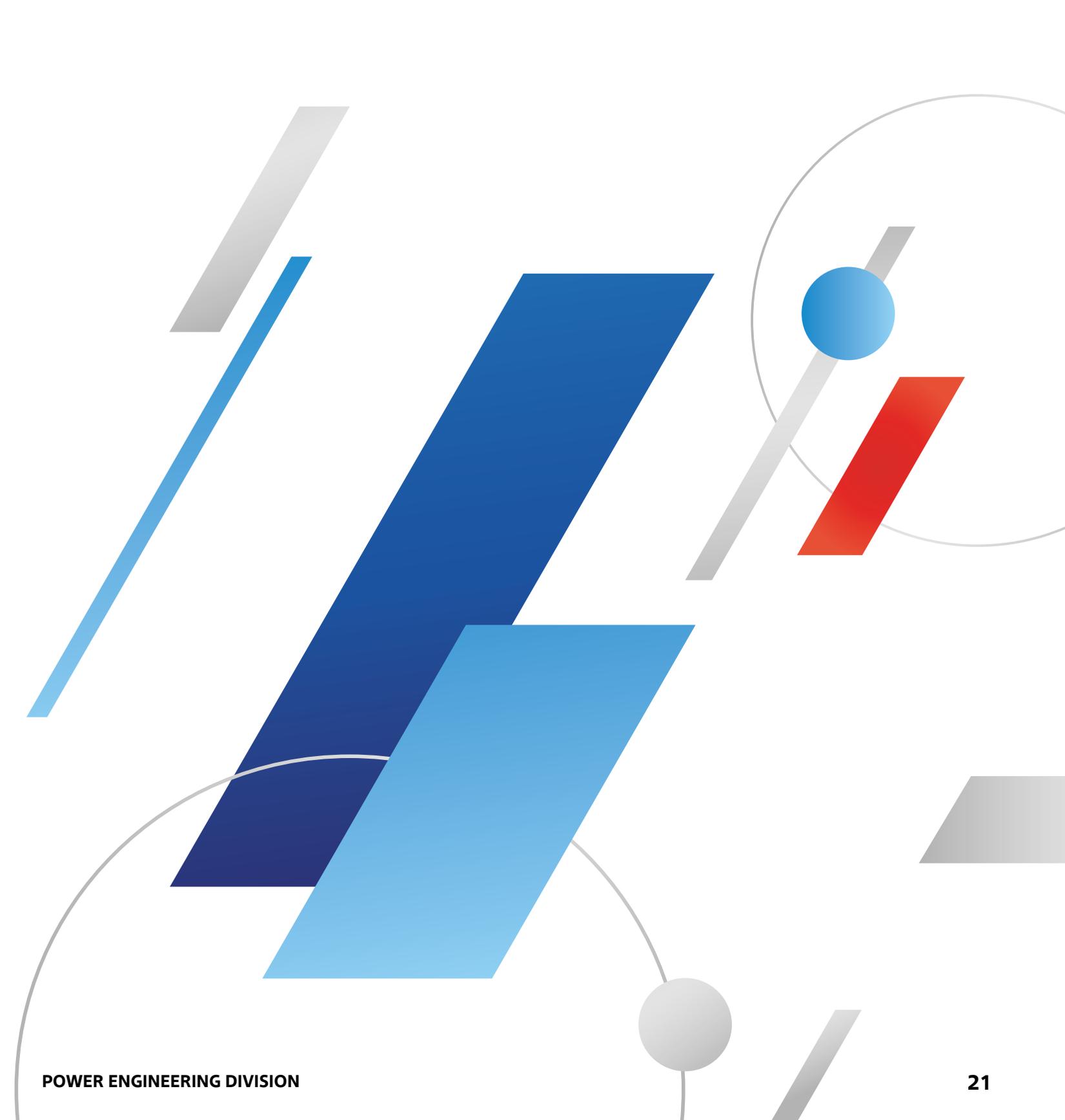
In 2019, a three-year certification cycle involving verification of compliance of Rosenergoatom's quality management system with the GOST R ISO 9001-2015 (ISO 9001:2015) standard was completed, and Certificate of Compliance No. 01 100 1718842 valid until December 26, 2020 was issued².

² The scope of certification included Design and Construction Management for Nuclear Facilities, Power Generation and Supply Management, and Power Generation and Supply.

The Division developed a process model that includes end-to-end processes in the operating organization (61 processes) and at NPPs (54). Integrated Management System (IMS) process data sheets were developed and adopted; process owners and methodologists were appointed; process indicators, including safety indicators, were determined, and a monitoring system was created. 800 employees received training in the monitoring procedure and process modelling.

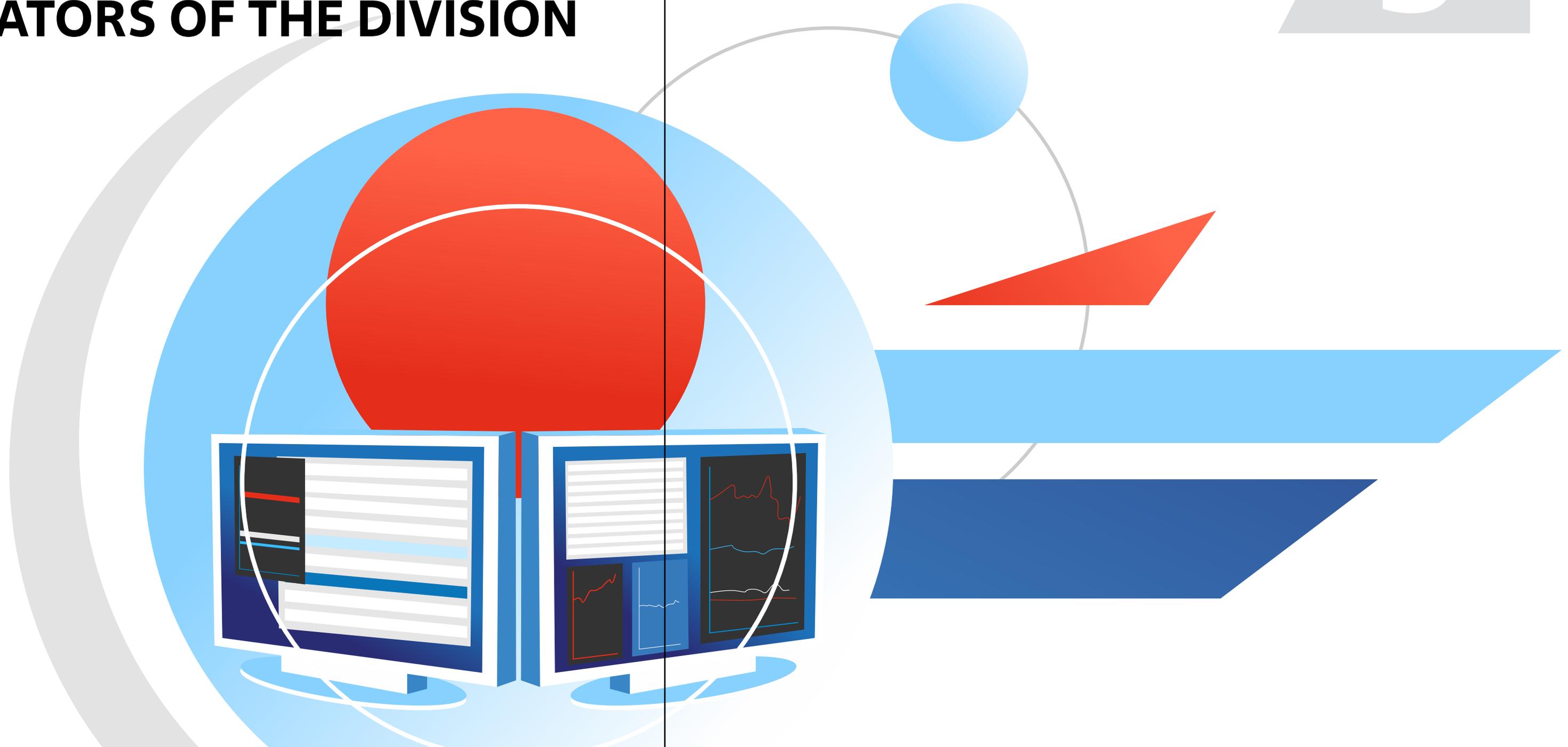
Six NPPs were audited in 2019 to verify their compliance with Quality Assurance for Safety in Nuclear Power Plants (General), Quality Assurance for Safety in Nuclear Power Plants (Operational), GOST R ISO 9001-2015 and IAEA General Safety Requirements No. GSR Part 2.

16 audits were conducted in 2019 in organizations performing work for and providing services to Rosenergoatom to verify their compliance with NP-090-11 and GOST R ISO 9001-2015. The quality of products for NPPs is monitored to support managerial decision-making and establish requirements in local regulations.



3. KEY RESULTS AND PERFORMANCE INDICATORS OF THE DIVISION

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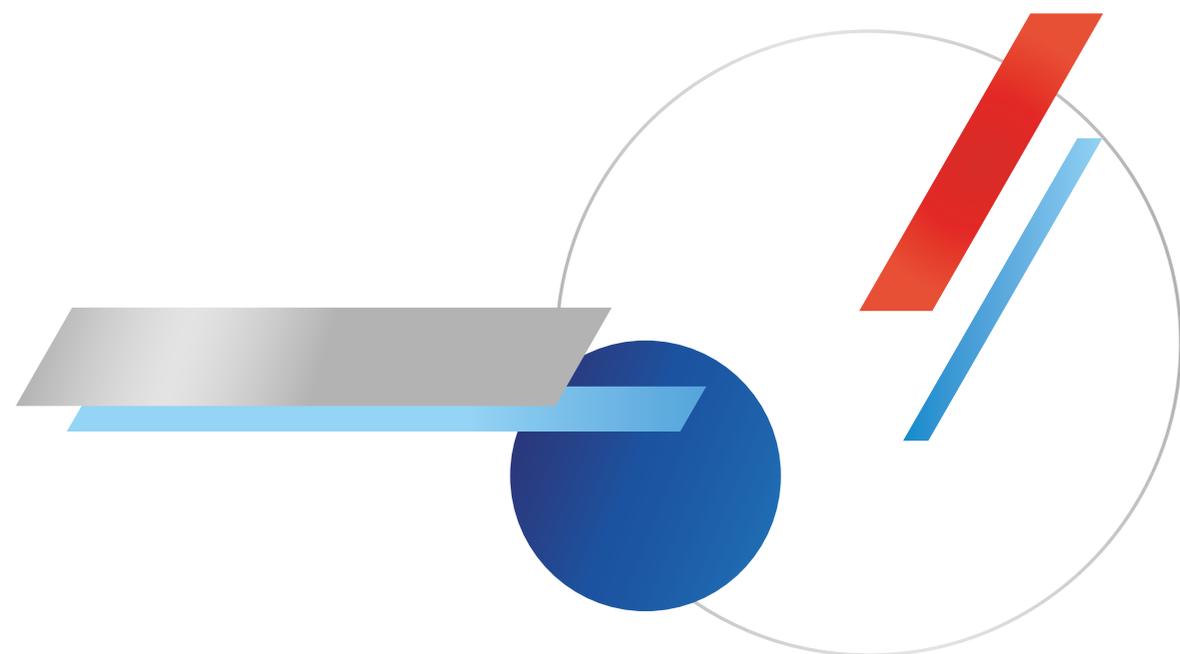


3.1. KEY RESULTS

Indicator	2017	2018	2019
Nuclear power generation, billion kWh	202.868	204.274	208.785
LTIFR (across the Power Engineering Division), %	0.08	0.08	0.04
Consolidated revenue, RUB million	418,871	466,622	546,851
Tax payments, RUB million ³	32,847	48,947	58,736
Average headcount (across the Division), people ⁴	48,433	48,860	54,412

³ Taxes actually paid to the state budgets, less refunds, excluding income tax across the Consolidated Taxpayer Group (CTG), for which payments to the budget system of the Russian Federation are made by the designated member of the CTG.

⁴ The increase compared to 2018 was due to the expansion of the scope of consolidation of the Division.



3.2. OPERATING RESULTS

Power generation at Russian NPPs in 2019 reached 208.8 billion kWh, up by 4.5 billion kWh (2.2%) year on year.

The Division ranks first in terms of electricity output among the largest Russian power generation companies.

THE INCREASE IN ELECTRICITY OUTPUT WAS DRIVEN MAINLY BY THE FOLLOWING FACTORS:

- New NPP power units commissioned in 2018 (power unit No. 4 of Rostov NPP and power unit No. 5 of Leningrad NPP) operating at rated capacity;
- Commissioning of a new power unit No. 2 at Novovoronezh NPP in 2019;
- Shorter duration of scheduled repairs at power units.

NPPs accounted for 19.0% of the total electricity output in Russia in 2019 (18.7% in 2018).

PERFORMANCE INDICATORS

Indicator	2017	2018	2019
Capacity factor, %	83.29	79.90	80.41
Operating power units (in the Russian Federation)	35	37	36 ⁵
Total installed capacity, MW	27,890.3	30,108.2	30,277.2

⁵ Excluding the FTNPP connected to the grid on December 19, 2019.

Indicator	2017	2018	2019
Power units under construction (in the Russian Federation), total capacity, MW	10,200	9,120	4,801
Number of commissioned power units	1	2	1
Number of power units under construction in the Russian Federation	9	9	5 ⁶
Number of power units with the extended service life (in the reporting period/total)	1/26	3/27	3/25
Performance against the targets of JSC Rosenergoatom's Investment Programme, %	98.7	101.5	104.3
Share of NPPs in the total electricity output in the Russian Federation, %; including:	18.9	18.7	19.0
IPS of the Centre	42.2	40.9	40.8
IPS of the Middle Volga	29.7	27.9	27.2
IPS of the Urals	3.9	3.4	3.7
IPS of the North-West	34.1	34.5	34.2
IPS of the South	23.2	28.1	32.9
IPS of the East ⁷	0.46	0.42	0.4

⁶ Power units No. 1 and No. 2 of Kursk NPP-2, power unit No. 2 of Novovoronezh NPP-2 (commissioned on October 31, 2019), power unit No. 2 of Leningrad NPP-2 and the FTNPP were under construction in 2019.

⁷ Including isolated power systems.

Company	Power generation, billion kWh			Installed capacity, GW		
	2017	2018	2019	2017	2018	2019
JSC Rosenergoatom	202.9	204.3	208.8	27.9	30.1	30.3
Gazprom Energoholding LLC	150.8	149.2	143.1	38.8	38.8	43.2
JSC RusHydro	140.3	144.2	142.8	39.0	39.4	39.7
INTER RAO – Electric Power Plants JSC	95.0	94.6	92.1	22.4	22.9	22.6
T Plus Group	53.6	55.1	53.9	15.7	15.5	15.5

Sources:

www.gazenergocom.ru, www.rushydro.ru, www.iraogeneration.ru, www.tplusgroup.ru

OUTCOMES OF THE REPAIRS AND MAINTENANCE CAMPAIGN

The frequency and duration of temporary shutdowns of NPP power units depend on routine maintenance and repairs and unscheduled shutdowns.

In 2019, 23 repairs were carried out at NPP power units, with their duration reduced by a total of 155 days (additional power generation totalled about 2.9 billion kWh). This was made possible due to:

- Search for and minimization of unproductive downtime during scheduled repairs as a part of development of the ROSATOM Production System;
- A conservative approach to repairs and maintenance scheduling;
- The absence of defects affecting the duration of the critical path of repairs.

The duration of unscheduled shutdowns at NPP power units related to equipment failures was reduced by 32% compared to 2018; shortfalls in power generation due to unscheduled shutdowns of power units were also reduced by 24%.

INVESTMENT ACTIVITIES

Performance against the target for the allocation of capital investments under the investment programme of JSC Rosenergoatom totalled 104%; the programme was implemented using the organization's own funds.

The Division implements measures aimed at improving project and investment efficiency.

More specifically, an Industry-Wide Programme of Measures to Improve the Maturity of Project Management (hereinafter referred as the Programme) was being implemented in 2019; the scope of the Programme includes Rosenergoatom and organizations controlled by it. Implementation of measures under the Programme will be continued in 2020.

The Division also continues to work systematically to develop its project methodology. This includes developing project competences through training at ROSATOM's Project Management School and training in accordance with the IPMA international standard.

3.3. PRODUCTION PLANS

The Division intends to continue to work systematically to establish a framework for the sustainable development of the company and its regions of operation, create an atmosphere of openness and transparency, and provide training and development opportunities and social assistance to employees.

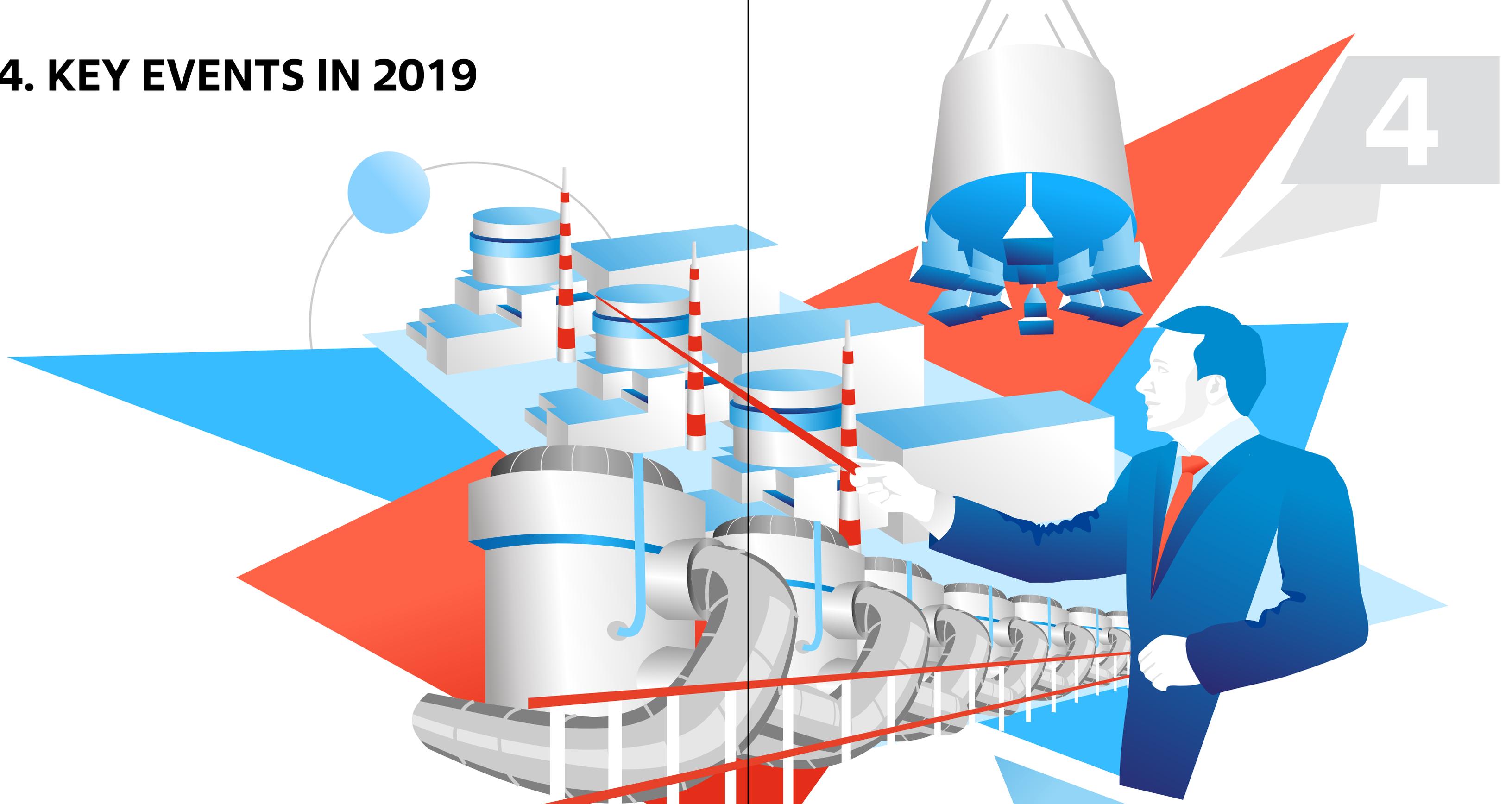
Safe operation of nuclear power plants is the top priority for the Division's development as an NPP operator. At the same time, the Division focuses on increasing power generation to ensure energy security in Russian regions, increasing its share on the international market, reducing production costs and the lead time, and developing new products.

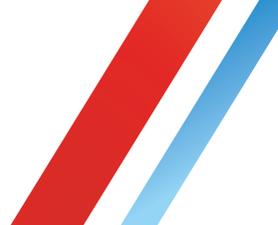
The target for power generation at the Division's NPPs in 2020 (the balance target of the Federal Antimonopoly Service) has been set at 207.6 billion kWh.

Plans for 2020 include commissioning the floating power unit forming part of the thermal nuclear power plant (Pevek, Chukotka Autonomous District), which will become the latest addition to the fleet of operating Russian NPPs, and start-up operations at power unit No. 2 of Leningrad NPP-2 (VVER-1200).

The Division is taking steps to obtain a licence for the operation of power unit No. 2 of Leningrad NPP (equipped with an RBMK-1000 reactor) without power generation. The power unit is scheduled to be shut down for decommissioning in December 2020.

4. KEY EVENTS IN 2019





January 14

■ A licence was obtained from the Federal Service for Environmental, Technological and Nuclear Supervision of Russia (Rostekhnadzor) for the operation of power unit No. 1 of Bilibino NPP, which had been shut down for decommissioning, without power generation for 15 years.

February 18

■ First criticality was achieved at power unit No. 2 of Novovoronezh NPP-2.

May 1

■ Power start-up of power unit No. 2 of Novovoronezh NPP-2 (connection to the grid).

June 17

■ Concreting of the foundation slab of the reactor building was completed at power unit No. 2 of Kursk NPP-2.

September 14

■ The floating power unit was delivered from Murmansk to the permanent location in Pevek (Chukotka Autonomous District).

September 20

■ Rosenergoatom signed an agreement on cooperation with members of the Data Centre Association.



October 31

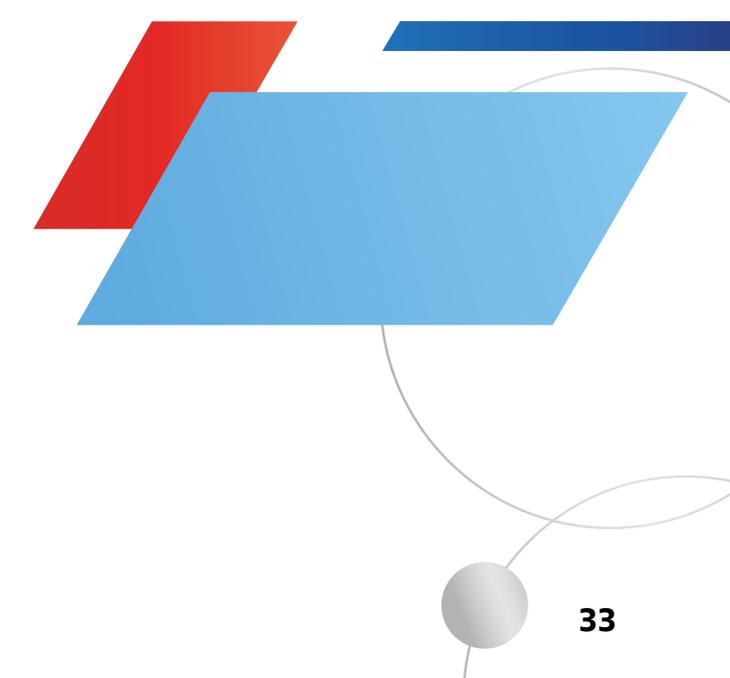
■ Power unit No. 2 of Novovoronezh NPP-2 was commissioned.

December 19

■ The floating thermal nuclear power plant in Pevek (Chukotka Autonomous District) was connected to the grid.

December 21

■ Nuclear power plants achieved the balance target for power generation set by the FAS Russia (202.7 billion kWh) ahead of schedule.



5. SUSTAINABLE DEVELOPMENT

5



As one of the largest electric power companies and the sole operator of NPPs in Russia, the Division has a significant impact on social and economic development and the environment both in the locations of the nuclear power plants and its regions of operation and at the global level.

The Division is fully aware of its economic, social and environmental responsibility towards society and is strongly committed to the UN Sustainable Development Goals (SDGs), which can only be achieved through collaborative efforts of governments, the private sector, civil society and the global community.

Nuclear power industry fully meets the targets for a sharp reduction of CO₂ emissions and carbon-free energy.

The operation of all Russian-design NPPs globally helps to prevent emissions totalling about 210 million tonnes of CO₂ equivalent per year.

Indicator	2019
Environmental costs, RUB billion	4.3
Occupational safety and health costs, RUB billion	3.86
Social expenditure, RUB billion	2.8
Social expenditure per employee, RUB '000	78.28
Charitable contributions, RUB million	826.1

KEY PROJECTS IMPLEMENTED IN 2019 IN THE DIVISION'S REGIONS OF OPERATION

MEGAWATT OF HEALTH

A sports and wellness project titled Megawatt of Health was launched by the Division in June 2019 in order to promote a healthy lifestyle among the employees of Rosenergoatom and NPPs. About RUB 4 million has been raised since the start of the project. The money has been allocated for charity projects to help children in the towns and cities where NPPs are located. It was a result of collaborative efforts of about 2,500 people from different branches and organizations of the Division. As part of this initiative, employees in the nuclear industry walked a total of 526,969.6 kilometres, ran 111,649.7 kilometres, swam 8,993.6 kilometres and cycled 215,549.3 kilometres. These figures were then converted into monetary form. The project will be continued in 2020, and the goals will be even more ambitious.

IMPROVING CHILD SAFETY

A range of safety activities for students of local schools was held in Udomlya (Tver Region) at the initiative of Kalinin NPP; the events were attended by more than 500 school students. A series of demonstration lessons on safety for high school students were organized in the education and training department (ETD) of the NPP. The main objective of the course is to provide school students with practical skills in the field of occupational safety and health required to ensure safety and protect their life and health. The students received basic first aid training and practised their skills using robotic simulators during these demonstration lessons. ETD instructors gave the children a practical demonstration of the rules of safe behaviour when working at heights and in storage tanks, the use of dosimeters and personal protective equipment (PPE).

SAVING WILD HORSES IN THE ARCTIC

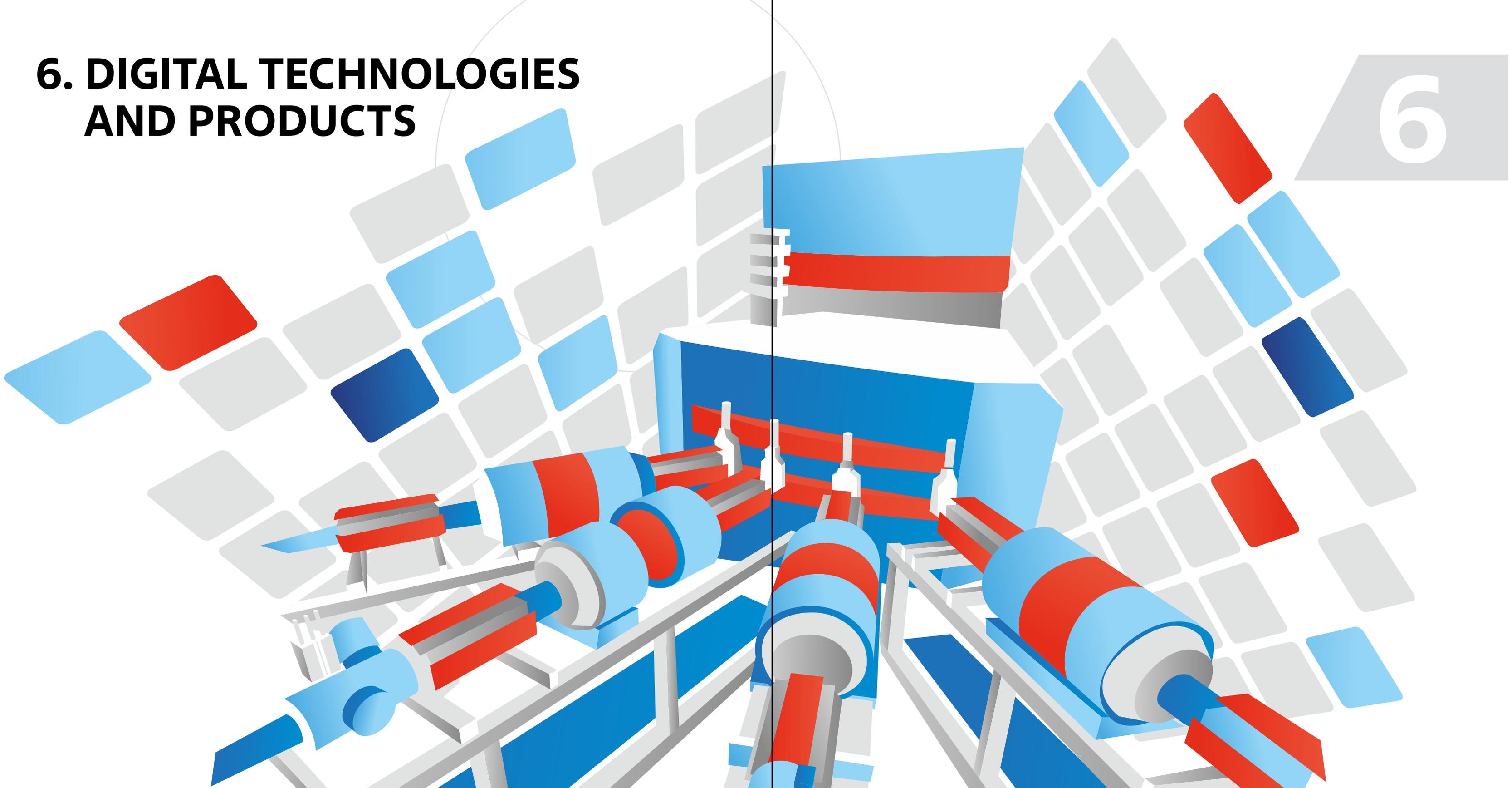
Employees of Kola NPP helped to save wild horses on the Tersky Coast from starving. 1.4 tonnes of oats and mixed feed were delivered to the village of Kuzomen, where a small herd of horses live; the feed was purchased using funds collected during a charity event held by Kola NPP. According to local residents, thanks to assistance from employees in the nuclear industry, the winter of 2019 was the first one when the horses were not starving. One theory is that several horses were brought from Yakutia by a local collective farm in the late 1980s. The native Yakutian horse breed was able to adapt to the Arctic climate of the Kola Peninsula. Eventually the horses became a real tourist attraction of the Tersky Coast. Hundreds of tourists from Russia and abroad come here specifically to see them.

ENVIRONMENTAL PROJECT IN THE SPHERE OF WATER DECONTAMINATION

In late 2019, one of the largest water consumers in the Murmansk Region, Kola NPP, started pilot operation of a new system for UV decontamination of wastewater without the use of chemicals. As part of an environmental programme, two modern ultraviolet decontamination units with a throughput of up to 400 m³ of water per hour enabling 24-hour wastewater treatment were installed at the NPP's wastewater treatment facilities. Their operation does not involve the use of any additional chemicals. Water withdrawal for operational needs at Kola NPP exceeds 1 billion m³ per year, with about 700,000 m³ of water treated at the NPP's wastewater treatment facilities. High water quality at the NPP location is confirmed by the fact that a trout farm has been in operation near the process water discharge outlet of the plant for more than 20 years, and in 2002, Lena sturgeon breeding was started at the farm. Lake Imandra, which is situated in the vicinity of Kola NPP, is the only place in the European North where it has been possible to domesticate sturgeons and successfully breed them on a commercial basis.

6. DIGITAL TECHNOLOGIES AND PRODUCTS

6



6.1. KEY ACHIEVEMENTS IN THE SPHERE OF DIGITIZATION

1. 12 pilot projects were launched as part of the Digitization Programme, and five projects were completed.
2. 24 IT projects were completed (information systems, security, infrastructure, digital products).
3. Revenue from the data centre totalled RUB 522 million in 2019.
4. An infrastructure site was launched in the vicinity of the core data centre to accommodate modular/containerized data centres and computing equipment of commercial customers.
5. The first digital content product, the Technical Documentation E-Shop, was created and launched on the market.
6. The Digital Energy Association was created. A practical industry-wide dialogue on digitization was started (between the Generating Company, the Networks and the System Operator).
7. A Digital Technology Centre and an import substitution office were created.
8. The IT functions of NPPs were standardized.
9. A procedure for the launch of digital projects comprising the Testing, Pilot and Roll-Out stages was adopted.
10. A digital transformation portal and community were created.
11. A portfolio of proposals and initiatives put forward by NPPs was formed.

6.2. INFORMATION SYSTEMS

Implementation of an automated system for repairs and maintenance management	The project was completed at Balakovo NPP, and the system was migrated to a single installation server, IBM Maximo
Video analytics system for the monitoring of compliance with occupational and fire safety rules	The pilot project was completed at Kola NPP. To be rolled out at other NPPs and in other enterprises in the Division and in the industry

Unstructured data analytics system	Implemented in the Central Administration and at operating NPPs
Creation of a consolidated reporting system, second stage	Process quality was improved, and steps were taken to enable continuous exchange of accounting information within the Division and with industry regulators (ROSATOM, the Ministry of Energy)
Functional module of an automated engineering documentation management system (AEDMS) for the management of regulations and guidelines	The module was developed and started commercial operation in the Central Administration and at all NPPs
Second stage of the automated system for construction cost and schedule management (based on TCM NC methodology adapted to Russian construction projects)	Implemented. The first stage of interdivisional integration between Rosenergoatom and ASE EC was completed as a part of the Kursk NPP-2 construction process; it involves exchanging financial information in the digital format
Development of an application for the analysis of NPP operation experience	The development was completed (including searching for trends and patterns in anomalies at NPP, and visual observation of implementation of corrective measures stipulated in anomaly investigation reports)
Planning modules for scheduling physical and psychological examinations of NPP personnel and preserving critical knowledge	The modules were developed and started commercial operation

6.3. INFRASTRUCTURE AND SECURITY

Migration of the System of Technical Users of IT Services to the Naumen Service Desk platform	Migration to the Russian-designed platform was completed. Trial runs of configuration and IT asset management, change management and service catalogue management subsystems were completed
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Testing of wireless data transfer technologies (Wi-Fi and LTE)

Testing was completed at power unit No. 1 of Leningrad NPP

Implementation of information security systems on schedule	■ Security information and event management (SIEM) systems (8 NPPs),
	■ Cyberattack detection and prevention systems (9 NPPs),
	■ Sensitive data loss prevention (DLP) system (Central Administration).

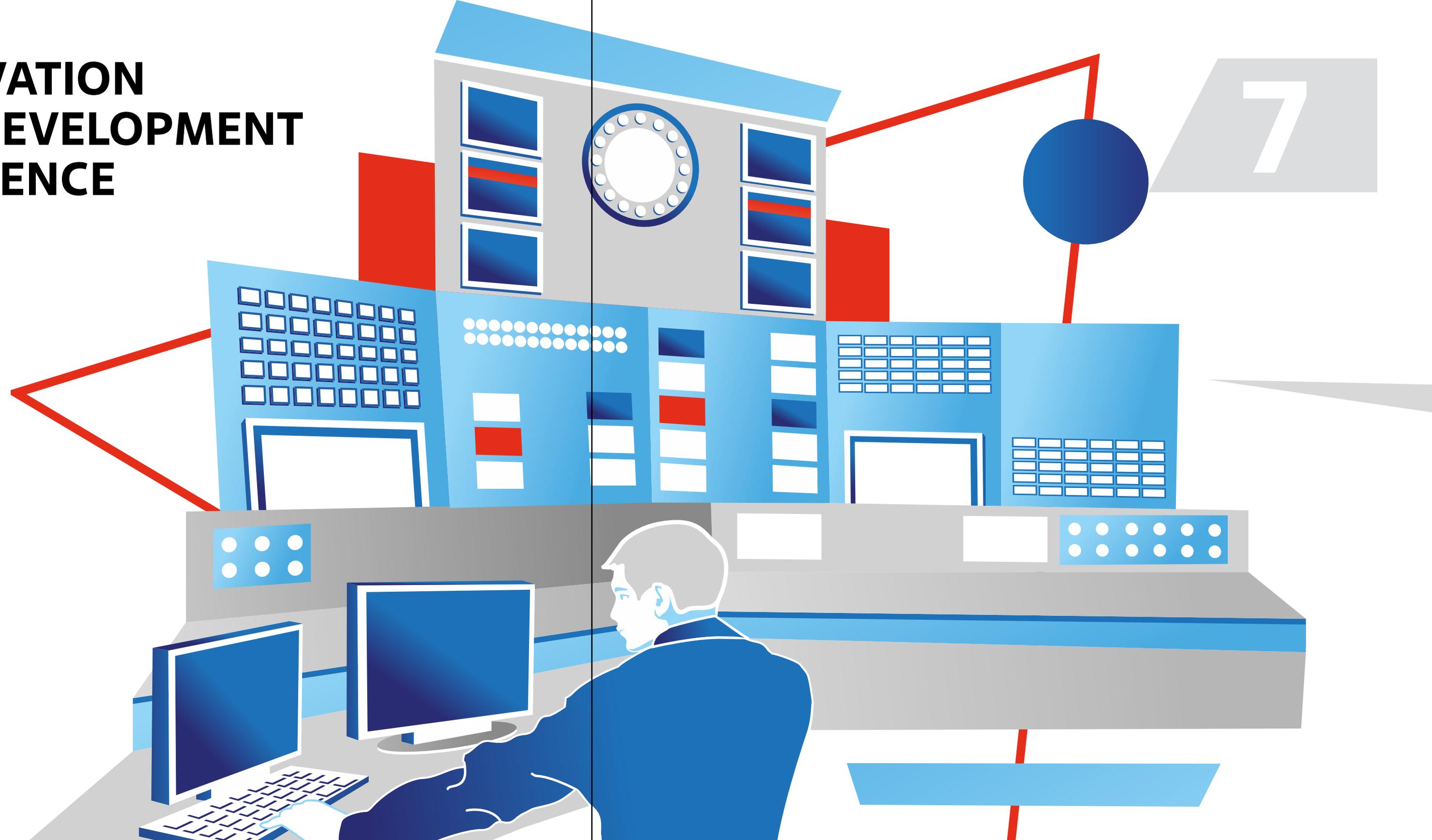
6.4. DIGITAL ENERGY

Development of synchronized phasor measurement technology	A detailed design for system modernization was developed for 8 NPPs and the Central Administration
Digital substation	Project launch; the design SOW was developed
Introduction of smart algorithms for commercial electricity metering	Completion stage, pilot operation
Creation of a Decision-Making Centre in the Division	Pretesting of information content
Demand response as part of the distribution business	Standard form contracts were drafted and approved; selection was made with consumers; technical specifications were drafted
Collaboration	The Digital Energy Association was created

6.5. DATA CENTRES AND DIGITAL PRODUCTS

Revenue from contracts signed and services provided by the Division	RUB 522 million
Phase 2 of the first stage of the project to build the core data centre of the Division at Kalinin NPP	The third building of the data centre (phase 2 of the first stage of the core data centre) was commercially leased out to PJSC Rostelecom
Development of partnerships	A Memorandum of Partnership was signed with Innopolis SEZ (Republic of Tatarstan) and the High Technology Park IT Park for the construction of data centres for government agencies and commercial customers in Tatarstan
Creation of an infrastructure site to accommodate modular/containerized data centres	A 32 MW infrastructure site was commissioned in the vicinity of the core data centre to accommodate modular and containerized data centres and computing equipment of commercial customers
Database of the Division's technical documentation for the sales support system	A database of 702 documents and 370 R&D reports was created and uploaded
Launch of a cloud-based platform	The first commercial contract for the provision of cloud capabilities was signed
Development of a geographically distributed network of ROSATOM's data centres	Design concepts for the construction of data centres in Moscow, Saint Petersburg and Innopolis were developed

7. INNOVATION AND DEVELOPMENT OF SCIENCE



The main innovation management tool is the Innovative Development and Technological Modernization Programme of ROSATOM until 2030 (in the civilian sector) approved by the Supervisory Board of ROSATOM.

The Division's R&D plans are prepared in accordance with the Strategy for the Development of the Nuclear Power Industry until 2050 and in the Long Term until 2100 (hereinafter referred to as the Strategy) approved by ROSATOM in 2019, which involves developing the Russian nuclear power industry as a two-component nuclear power system based on thermal and fast neutron reactors with a centralized closed nuclear fuel cycle (CNFC). The pressurized water-cooled reactor (VVER) technology provides a practical basis for the nuclear power industry in the coming decades and will remain its integral part until the end of the century both in Russia and in terms of promoting the Russian reactor technology on the international market.

2019 saw the start of implementation of the Programme for the Improvement of Design Solutions Using Conventional VVER Technology; it includes a range of R&D initiatives to further improve VVER technology taking into account lessons learnt from the construction, commissioning and operation of new power units. The Division has also initiated pilot studies of another promising technological solution: VVER based on spectral regulation, which enables full involvement in the CNFC through the use of MOX fuel along with fast neutron reactors.

The Division continued to implement the Integrated Programme of R&D and Measures Ensuring Hydrogen Explosion Safety and Enabling the Management of Severe Accidents at NPPs with VVER Reactors. Intermediate results were reviewed by the Scientific and Technical Council (STC) of Ros-tekhnadzor, which provided recommendations for revising and expanding the scope of work to be performed.

The development of a Virtual NPP software and hardware system was completed.

R&D aimed at transitioning a pilot VVER-1200 power unit (power unit No. 6 of Novovoronezh NPP) to extended (18-month) fuel cycles was completed; it will enable an increase in annual electricity output. The possibility of transitioning NPP power units equipped with VVER-1000 and VVER-1200 reactors to extended fuel cycles of up to 24 months was studied.

The Division developed a new technological solution based on the application of the acoustoelasticity method. This technology makes it possible to detect and measure tension in the pipelines of the primary circuit of an NPP, which will help to prevent excessive tension in the metal, especially in the seams of the primary reactor coolant system, which may lead to defects, during the construction of new and operation of existing units.

A number of systems for diagnostic assessment of electric motors and diesel generators were developed and piloted at NPPs to enable automation, reduce the amount of time and effort spent by personnel, and find defects at an early stage. The work will be continued in 2020.

As a part of the work to provide a rationale for a two-component nuclear power system, the first commercial batch of 18 fuel assemblies for the BN-800 reactor based on mixed oxide (MOX) fuel consisting of a blend of uranium and plutonium was delivered to Beloyarsk NPP in August 2019. In the future, the Division plans to fully load the core of the BN-800 reactor with this fuel and to start using MOX fuel in fast reactors on an industrial scale as a basis for the initial stage of the CNFC.

The Division is working to extend the fuel cycles of fast neutron reactors by using new materials for the cladding of nuclear fuel elements. Analytical and experimental research

and technological analysis has made it possible to use new radiation-resistant steel for the cladding of nuclear fuel elements in the BN-600 reactor and implement measures aimed at extending the reactor fuel cycle. Similar research is being performed for the BN-800 reactor in order to introduce new structural materials for cladding and prove the operability of nuclear fuel elements if the fuel cycle is extended.

A 3D version of COREMELT3D computer code was developed; it is used to validate the safety of power units with fast neutron reactors. Calculations and experiments were performed to validate the use of MOX fuel in fast neutron reactors. Safety cases were prepared as a part of engineering design for the BN-800 reactor core, the reactor and the power unit as a whole for intermediate core loading as part of the transition to operating with the core fully loaded with MOX fuel.

The Division is developing and verifying an MNT-CUDA high-precision software package designed for the calculation of reactor core characteristics using the Monte Carlo method; these calculations involve the use of new-generation computing techniques, namely parallel computing using graphics processing units.

Feasibility studies are underway for the development of technological solutions for small nuclear power plants. The Division is also developing atomic hydrogen chemical engineering clusters with high-temperature gas-cooled reactors (HTGRs) to enable efficient and environmentally friendly processing of natural gas into pure hydrogen, highly efficient hydrogen-based energy sources and chemical products.

Overall, expenditure on research and development under the 2019 R&D plan totalled RUB 1.92 billion.

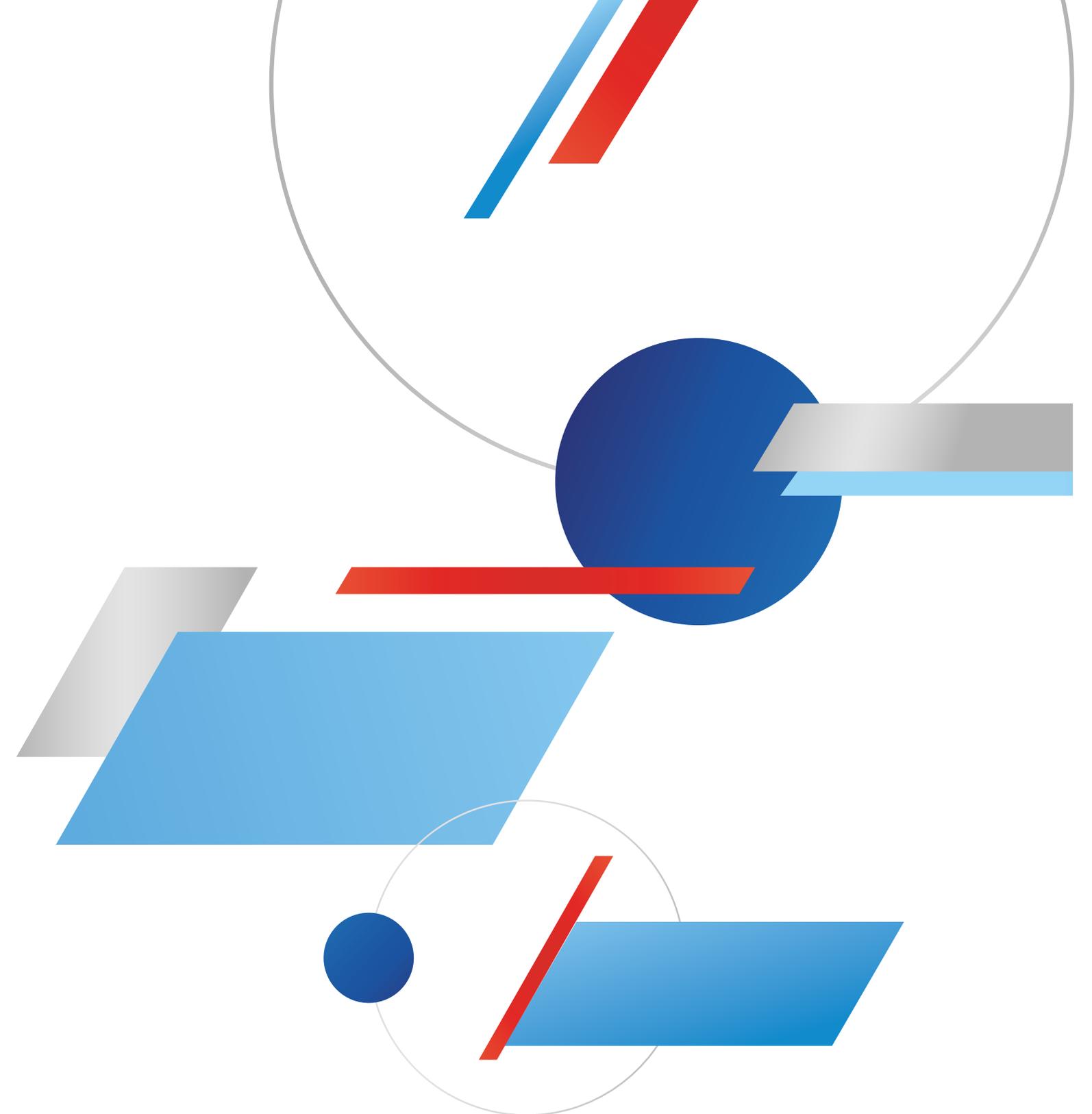
PROTECTION OF INTELLECTUAL PROPERTY IN 2019

Applications filed / patents for inventions obtained in Russia	4/8
Applications filed / patents for utility models obtained in Russia	2/1
Applications for registration / trademark registration certificates	9/4
State registration of computer software (applications filed / registered)	23/23
Trade secrets (know-how) registered by order of Rosenergoatom	30

Rosenergoatom's intellectual property (IP) portfolio includes exclusive rights over 395 intellectual property items, including 64 patents for inventions and 12 patents for utility models, 257 computer software programs and databases, including 49 computer software programs and 3 databases issued with official registration certificates from the Federal Service for Intellectual Property (Rospatent).

Rosenergoatom also has 9 registered trademarks and 53 trade secrets (know-how).

To promote ROSATOM's strategic interests, Rosenergoatom is implementing a programme for legal protection of intellectual property abroad. In 2019, Rosenergoatom prepared six applications for inventions under the PCT (Patent Cooperation Treaty) procedure and five national applications for obtaining patents in foreign countries. These activities are carried out in cooperation with the industry-wide competence centre for intellectual property management, which acts as the IP operator (JSC Science and Innovations).



8. NEW PRODUCTS AND BUSINESSES



Development of new businesses and an increase in the international market share are strategic goals of ROSATOM and the Power Engineering Division.

8.1. INTERNATIONAL PROJECTS

The product portfolio targeted at international markets includes a wide range of services and work covering the entire NPP life cycle, from assessing and developing key nuclear infrastructure components in the customer country to NPP decommissioning.



THE LARGEST INTERNATIONAL PROJECTS OF THE DIVISION INCLUDE:

- Construction of Akkuyu NPP (Turkey) and Hanhikivi NPP (Finland);
- Provision of the Owner's Engineer services⁸ for Akkuyu NPP;
- Commissioning of the Belarusian NPP, Akkuyu NPP and Rooppur NPP;
- Personnel training, provision of equipment for personnel training centres and servicing of Akkuyu NPP;
- Technical support for operation;
- Supplying spare parts;
- Maintenance;
- Issuing repair documentation, and maintenance personnel training at El Dabaa NPP;
- Extending the service life of power unit No. 2 of the Armenian NPP;
- Supplying spare parts to China and other countries;
- Provision of maintenance services in Hungary, India, etc.

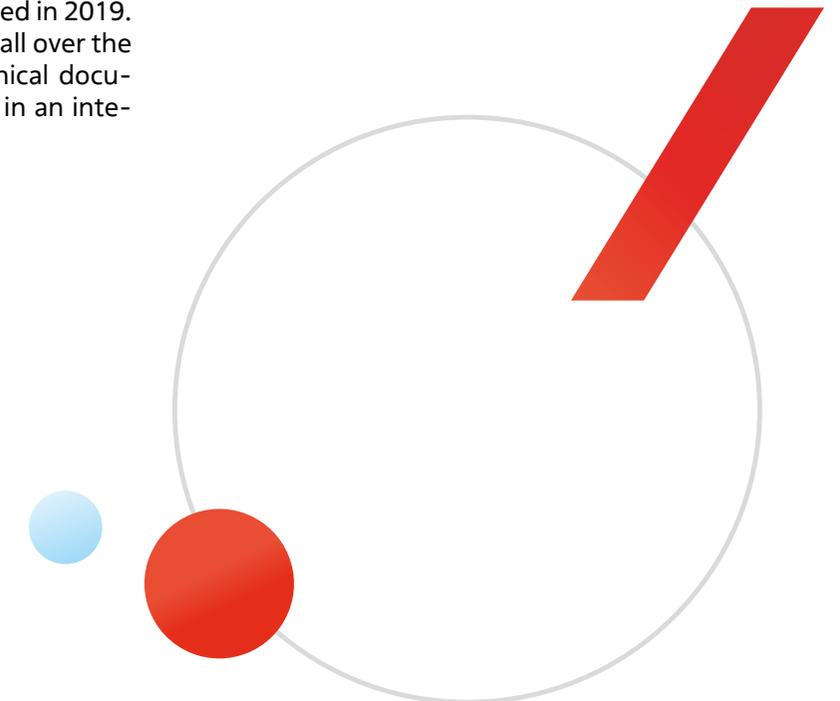
⁸ An Owner's Engineer is an engineering (consulting) company representing the interests of the Customer (the Owner of a facility) and providing professional advice, expert assistance and support to the Customer during the entire period of construction of the facility in areas determined by the Customer under the signed contract.

IN 2019, ABOUT 1,000 FOREIGN SPECIALISTS UNDERWENT TRAINING UNDER LONG-TERM AND SHORT-TERM TRAINING PROGRAMMES FOR THE PERSONNEL OF FOREIGN NPPS, INCLUDING:

NPP specialists	Number of people provided with training
Rooppur NPP (Bangladesh)	284
Belarusian NPP	169
Akkuyu NPP (Turkey)	72
Other	475

8.2. NEW PRODUCTS

The Technical Documentation E-Shop was launched in 2019. The E-Shop will enable potential customers from all over the world to find any required regulatory and technical documents on the operation of Russian-design NPPs in an integrated database and order them online.



CONSTRUCTION



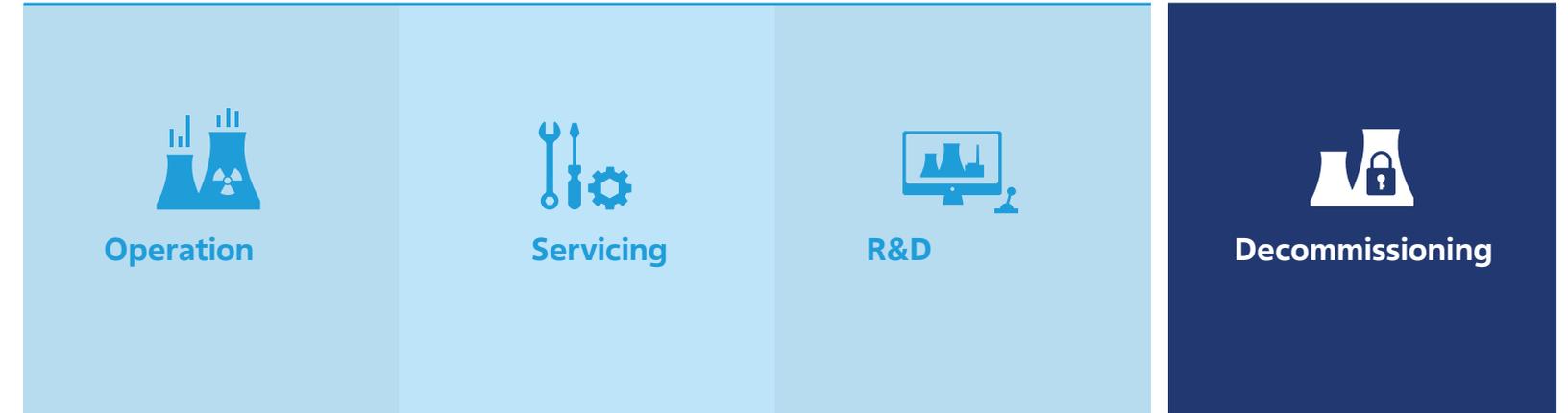
Existing projects

<ul style="list-style-type: none"> • Bolivia • Egypt • Bangladesh 	<ul style="list-style-type: none"> • Bangladesh • China • Turkey 	<ul style="list-style-type: none"> • Republic of Belarus • Finland • Slovakia
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Short-term and medium-term

<ul style="list-style-type: none"> • Zambia • Turkey 	<ul style="list-style-type: none"> • Hungary • Egypt 		
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OPERATION



Existing projects

<ul style="list-style-type: none"> • Armenia • India • Slovakia • Egypt 	<ul style="list-style-type: none"> • Bulgaria • Czech Republic • Finland 	<ul style="list-style-type: none"> • Hungary • China
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Short-term and medium-term

<ul style="list-style-type: none"> • Bangladesh • Republic of Belarus 	<ul style="list-style-type: none"> • Uzbekistan 	<ul style="list-style-type: none"> • Lithuania • Bulgaria
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8.3. BUSINESS LABORATORY

As part of the Business Laboratory pilot project, in 2019, the Division prepared a pool of 150 ideas, with 8 project initiatives selected for detailed review and implementation. The Director General of Rosenergoatom signed an order to scale up the project; it is intended that in 2020, all NPPs and the Division's subsidiaries will participate in the project.

8.4. ISOTOPE BUSINESS

The isotope business is a promising area of development for the Division, as it has all required competences and sufficient technical and economic capabilities for its development.

To date, the Division has started the production of cobalt-60 (Co-60) for sterilization in RBMK reactors as part of a large-scale project to produce Co-60 on an industrial scale. This isotope is used for sterilization in agriculture, healthcare and industry, and for material modification.

Cobalt-60 is produced at seven power units equipped with RBMK reactors at Smolensk, Kursk and Leningrad NPPs. In late 2019, the loading of the first batch of cobalt absorbers was completed at Kursk and Smolensk NPPs. In addition, the Division started to produce medical isotopes (molybdenum-99 produced by neutron activation, iodine-131 and iodine-125) in RBMK reactors.

Reactors at the Division's NPPs are used for neutron transmutation doping of silicon, primarily to meet the needs of Russian manufacturers of power electronics.

The Division plans to develop isotope production by increasing the output and expanding the range of its isotope products, switching to downstream products, efficiently using available competences, human resources and technical capabilities, and expanding cooperation both within the industry and with external organizations.

8.5. ELECTRICITY SALES AND DISTRIBUTION

Atomenergoby JSC (a subsidiary of JSC Rosenergoatom) is the power supplier of last resort in the Kursk, Tver, Smolensk and Murmansk Regions.

Its customers include more than 50,000 legal entities and more than 2 million households.

In 2019, electricity sales totalled 15.7 billion kWh, down by 1.3% compared to 2018 (15.9 billion kWh). The decrease was due to an overall reduction of electricity consumption by large enterprises (implementation of energy conservation programmes) and the fact that some customers entered the wholesale electricity and capacity market.

Net electricity supply to households in 2019 remained unchanged year on year at 4.1 billion kWh. Revenue from the sales of complementary products (B2B and B2C) totalled RUB 171.9 billion in 2019, up by 39% year on year.

8.6. NON-NUCLEAR MARKETS

THE LARGEST PROJECTS OF THE DIVISION IN NON-NUCLEAR MARKETS INCLUDE:

- Construction and installation work at Primorskaya TPP;
- Modernization and pre-commissioning of the PIK reactor (a nuclear research reactor at Petersburg Nuclear Physics Institute named after B.P. Konstantinov);
- Pre-commissioning of an LNG plant in Vysotsk;
- Construction of a volleyball centre in Sosnovy Bor.

The Division leverages its competences and references to service customers in markets related to the nuclear power industry.

9. DEVELOPING THE HUMAN CAPITAL

9



The objective of the Division's human resource policy is to provide the business in a timely and cost-effective manner with the required number of employees who are engaged and have appropriate qualifications.

The Division's personnel management system is based on shared industry-wide values of ROSATOM and its organizations, which all employees are required to know and adhere to.

AVERAGE HEADCOUNT IN 2019

Affiliate / subsidiary	Average headcount, people	Employee turnover rate
Balakovo NPP	3,216	5.57
Beloyarsk NPP	2,555	5.4
Bilibino NPP	694	8.79
Kalinin NPP	3,226	5.92
Kola NPP	2,102	2.76
Kursk NPP	4,329	2.8
Leningrad NPP	5,661	4.42
Novovoronezh NPP	3,890	4.09
Rostov NPP	3,053	6.58
Smolensk NPP	3,631	2.48
Central Administration	835	7.78
Technology Branch Office	156	10.24

Affiliate / subsidiary	Average headcount, people	Employee turnover rate
Capital Projects Implementation Branch Office	236	12.68
Directorate for Construction and Operation of FTNPPs	311	14.81
Directorate of Voronezh Thermal Nuclear Power Plant (under construction)	27	7.42
Directorate of Kostroma NPP (under construction)⁹	14	208
Directorate of Baltic NPP (under construction)	54	24.29
PDEC	332	6.62
Akkuyu Engineering Centre	24	8.51
Total in JSC Rosenergoatom	34,346	4.87
Atomenergoremont JSC	9,286	10.83
JSC CONCERN TITAN-2	4,361	68.19
Atomenergobyty JSC	2,143	10.82
AtomTechEnerg JSC	2,128	13.82
JSC CONSYST-OC	856	8.06
VNIIAES JSC	535	11.96
JSC ZAES	221	12.66

⁹ The affiliate was closed in 2019.

Affiliate / subsidiary	Average headcount, people	Employee turnover rate
Rusatom Service JSC	212	23.07
Atomtekhexport JSC	173	34.23
C-plus LLC	95	65.44
TITAN2 IC	56	35.82
Total in the Power Engineering Division¹⁰	54,412	12

¹⁰ Entities included in the consolidated budget of ROSATOM.

9.1. OCCUPATIONAL SAFETY AND HEALTH

THE DIVISION'S OCCUPATIONAL SAFETY AND HEALTH POLICY IS AIMED AT:

- Giving priority to protecting employees' health and life in the workplace;
- Consistently and continuously implementing measures to prevent accidents, workplace injuries and occupational diseases, including occupational risk management;
- Promoting social partnership with regard to occupational safety matters;
- Planning, funding and implementing measures to reduce injury and occupational disease rates.

One of the strategic goals of the Division is to prevent workplace fatalities at NPPs.

INJURY RATES

In 2019, there was one accident involving the Division's employees at operating facilities/NPPs (a minor accident at Beloyarsk NPP). No accidents occurred in 2019 involving employees working at power units under construction.

The LTIFR (Lost Time Injury Frequency Rate) in the Division stood at 0.02 in 2019 (0.03 in 2018) against a KPI limit of 0.15.

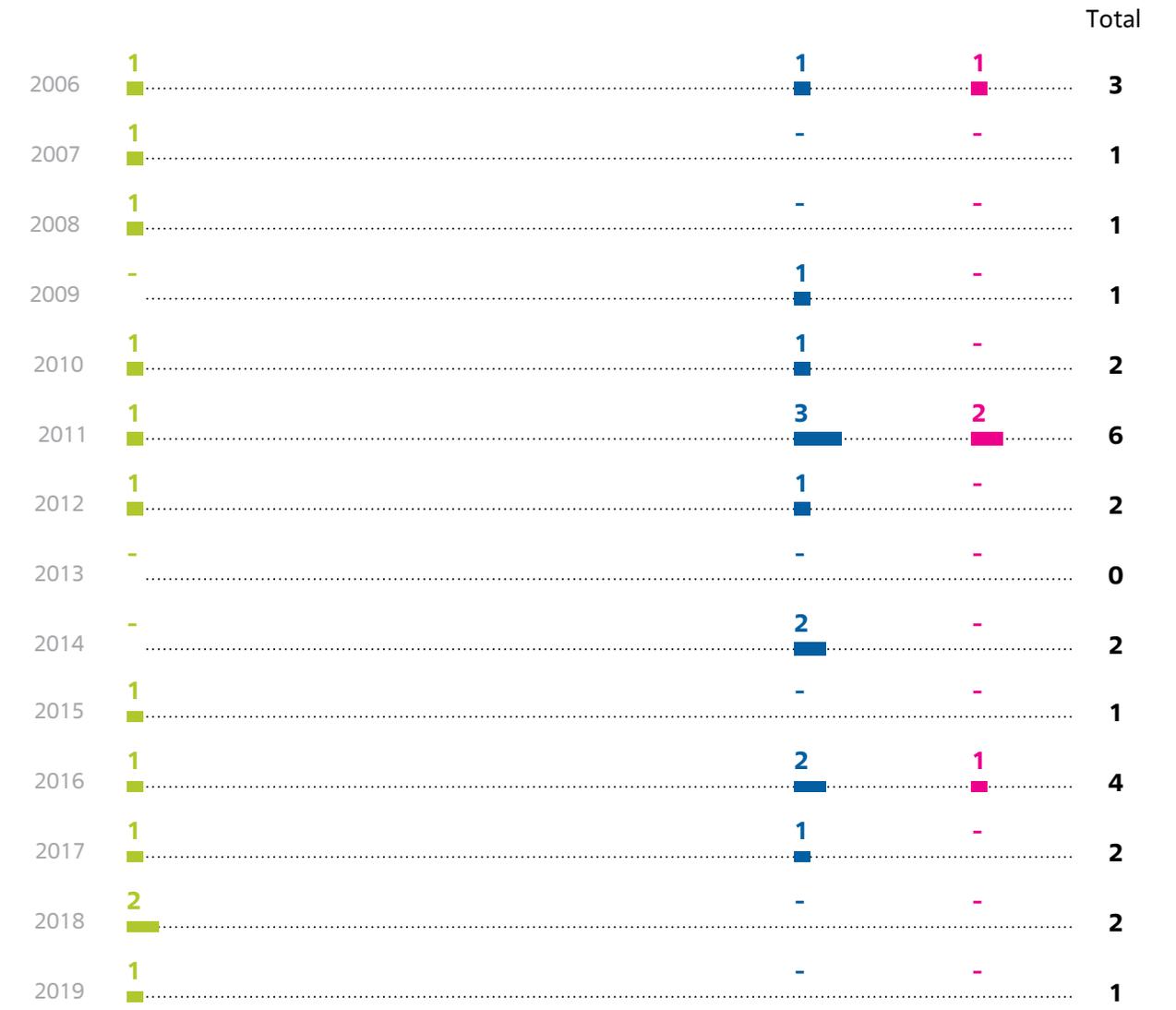
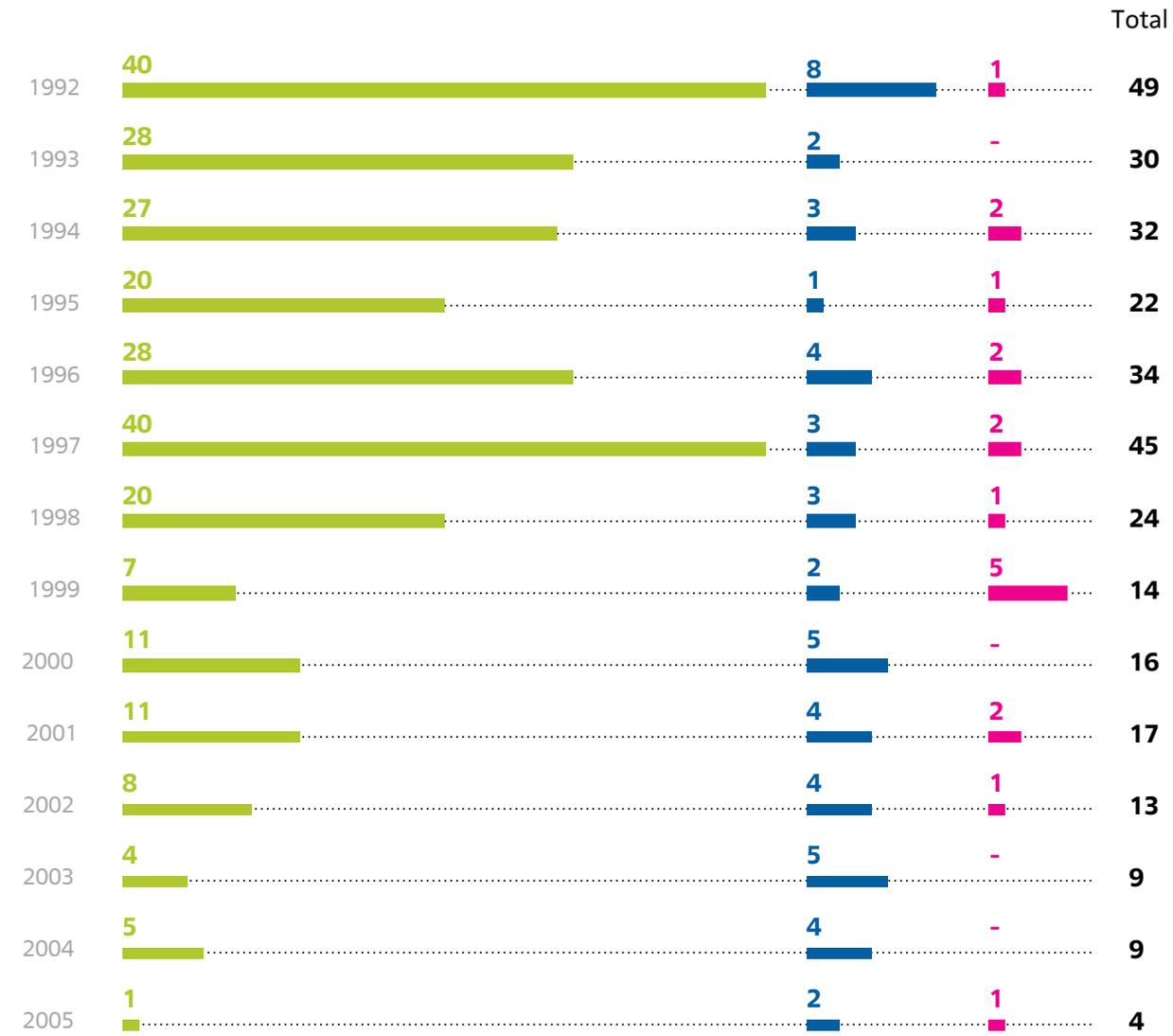
NUMBER OF ACCIDENTS AT OPERATING NPPS BETWEEN 2017 AND 2019

NPP	2017	2018	2019
Balakovo NPP	—	—	—
Beloyarsk NPP	—	—	1
Bilibino NPP	—	—	—
Kalinin NPP	—	—	—
Kola NPP	2 (1 + 1)	1	—
Kursk NPP	—	—	—
Leningrad NPP	—	—	—
Novovoronezh NPP	—	—	—
Rostov NPP	—	—	—
Smolensk NPP	—	1	—
Total	2 (1 severe, 1 minor)	2 (2 minor)	1 minor

■ fatal ■ severe ■ group ■ minor

The accidents were caused by negligence on the part of the injured persons.

CHANGES IN INJURY RATES AT OPERATING NPPS BETWEEN 1992 AND 2019



■ fatalities ■ severe injuries ■ minor injuries

STATISTICS ON INJURY RATES AMONG CONTRACTOR PERSONNEL

NPP	TOTAL NUMBER OF ACCIDENTS		
	2017	2018	2019
AT OPERATING NPPS OF THE DIVISION			
Balakovo NPP	1	—	1
Beloyarsk NPP	—	—	—
Kalinin NPP	—	1	—
Kola NPP	—	—	—
Kursk NPP	1	1	—
Leningrad NPP	1 (1 + 1)	—	—
Rostov NPP	—	1 (3) and 1	—
Smolensk NPP	—	1	—
Total	3	5	1
AT THE DIVISION'S NPP CONSTRUCTION SITES			
Kursk NPP-2	—	1	1 and 1 and 2
Leningrad NPP-2	1 (1 + 1)	—	1
Total	1	1	4
Overall total	4 (2 group accidents, 1 severe accident, 1 minor accident)	6 (1 group accident, 2 fatal accidents, 1 severe accident, 2 minor accidents)	5 (2 fatal accidents, 3 severe accidents, 1 minor accident)

■ fatal ■ severe ■ group ■ minor

THE CAUSES OF ACCIDENTS INCLUDED:

- Poor work management;
- Non-compliance with work procedure;
- Insufficient control over construction and installation management and compliance with construction and installation procedures on the part of the executives responsible for construction management and performance.

MEASURES FOR PREVENTING INJURIES AND ELIMINATING THE CAUSES OF ACCIDENTS INCLUDED:

- Improving the risk management system;
- Setting occupational health and safety targets: the employer's HSE policy statement and the programme for the achievement of policy objectives were updated; individual safety goals and performance targets were set for functional managers at NPPs; progress in the implementation of programmes and achievement of goals is monitored;
- Implementing a monitoring plan covering the focus area 'Ensuring Contractors' Compliance with Safe Work Procedures at NPP Sites'.

There were no employees newly diagnosed with occupational diseases in the Division in 2019.

RUB 3,863.174 million – occupational safety and health costs in 2019

KEY OCCUPATIONAL HEALTH AND SAFETY MEASURES IN 2019 INCLUDED:

- Occupational health and safety training for NPP directors and chief engineers;
- Occupational health and safety audits at NPPs in accordance with the schedule of safety inspections.

9.2. SYSTEM FOR ATTRACTING HIGHLY QUALIFIED YOUNG PROFESSIONALS

Timely provision of Rosenergoatom with highly qualified personnel is one of the key prerequisites for the achievement of the Division's strategic objectives and its economic sustainability.

Nuclear Classes with a special focus on physics in their curriculum have been formed in towns and cities where NPPs are located; academic competitions in physics and mathematics are held for school students in these Classes.

An Engineering Competition for School Students was held once again in 2019 with support from Rosenergoatom in its host towns and cities. Prize-winners are given special privileges in terms of admission to specialized universities and additional points in entrance examinations when they enrol on employer-sponsored educational programmes relevant to the NPPs.

Leading universities training prospective employees for the Division traditionally include NRNU MEPhI and its branches in Volgodonsk and Obninsk, Ivanovo State Power University (Ivanovo), Tomsk Polytechnic University (Tomsk), Ural Federal University (Ekaterinburg) and Nizhny Novgorod State Technical University (Nizhny Novgorod). Agreements on cooperation are signed with key universities to enable collaboration in all focus areas. In 2019, the relevant agreements were signed with Tomsk Polytechnic University, Ural Federal University and Nizhny Novgorod State Technical University.

The Division annually participates in career guidance events for students of leading technical universities. In 2019, all of Rosenergoatom's affiliates, including operating NPPs and organizations managed by Rosenergoatom (AtomTechEnergo JSC and Atomenergoremont JSC), participated in traditional ROSATOM's Career Days in Ekaterin-

burg (Ural Federal University), Moscow (NRNU MEPhI), Tomsk (Tomsk Polytechnic University) and Nizhny Novgorod (Nizhny Novgorod State Technical University); they also participated in Career Fairs held by universities (Ivanovo State Power University, Moscow Power Engineering Institute, Volgodonsk Engineering and Technical Institute of NRNU MEPhI, etc.).

In 2019, the Division held the third contest for corporate scholarship awards for students and grants for university professors for the 2018/2019 academic year.

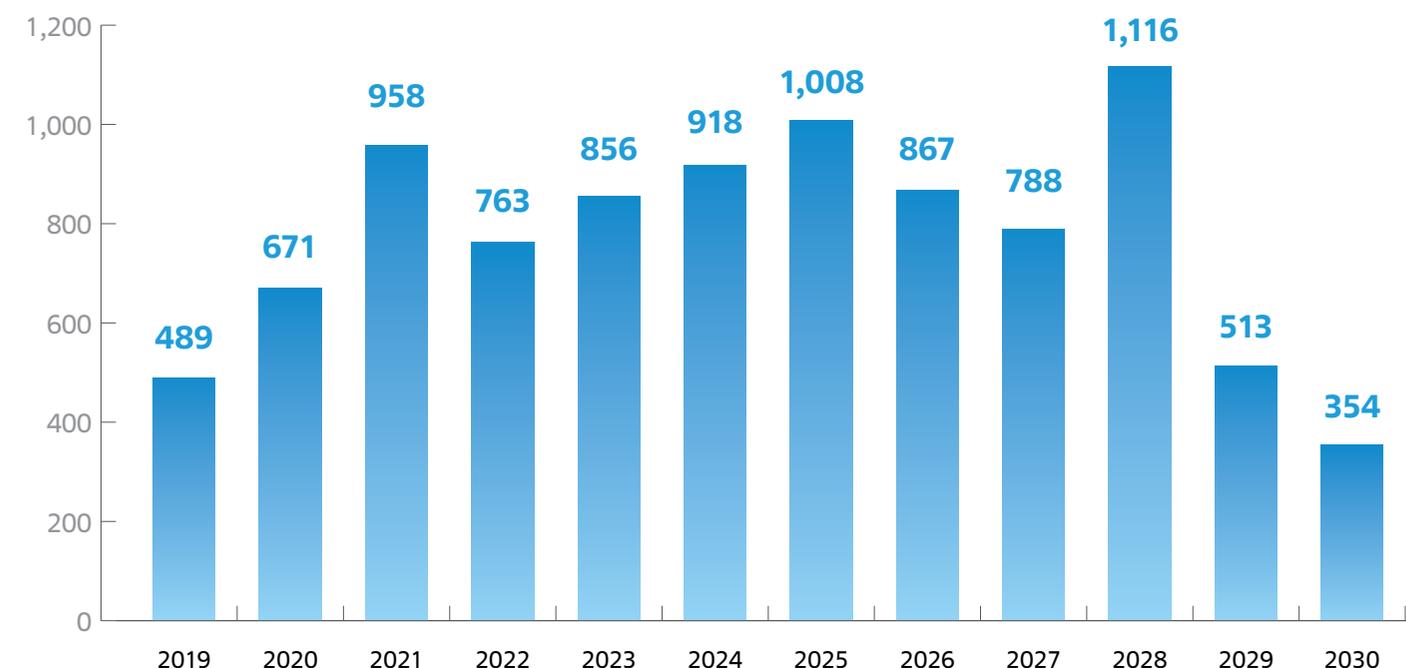
Following the contest, the best professors (23 people) and 55 students were awarded grants totalling RUB 200,000 and scholarships totalling RUB 100,000 respectively for the academic year.

1,700 students did an internship in the Division's enterprises in 2019, with the grade point average of graduates totalling 4.33.

NUMBER OF UNIVERSITY GRADUATES HIRED BY THE DIVISION

2017	2018	2019	2020 (target)	2030 (target, total)
189	289	489	670	9,000

PROJECTED DEMAND FOR UNIVERSITY GRADUATES IN THE DIVISION, PEOPLE¹¹



¹¹ The 2030 indicator may be revised as input data on the construction of new power units is updated.

PERSONNEL TRAINING AND DEVELOPMENT¹²

NUMBER OF TRAINING HOURS PROVIDED TO THE DIVISION'S EMPLOYEES IN 2019

Indicator	Number of training hours, total	Number of training hours per employee
In-house training (in NPP ETDs and divisions)	3,377,049	97.45
Training provided by external organizations	926,205	26.73
Total number of training hours, including:	4,303,254	124.2
Executives	926,529	172.4
Specialists and white-collar workers	1,612,741	101.4
Blue-collar workers	1,763,984	131.9

¹² For more details on the Division's personnel training and development and psychological support system, see section 4.4 of the 2018 Annual Report.

Expenditure on training and certification of the Division's employees in external organizations in 2019 totalled RUB 362.014 million (an average of RUB 10,500 per person per year).

As a part of the E-Learning 2020 strategy, the Division continued to introduce e-learning; the share of e-learning in 2019 exceeded 12%. The Record Mobile application was created for remote training and development of employees.

As part of its personnel training programmes, the Division places a special emphasis on topics related to Safety Culture. The following training programmes were developed and implemented in 2019: Behaviour Pattern of a Leader-Manager in Safety Culture Development; Self-Assessment of the Safety Culture Status in Nuclear Enterprises and Organizations; educational materials: Behaviour Pattern of a Leader-Manager in Safety Culture Development; Psychological Training: Psychological Aspects of Managerial Work with NPP Personnel; an e-course in Safety Culture. 18,823 employees underwent training in Safety Culture in 2019.

In 2019, training was provided under both industry-specific programmes, such as a programme for the development of

leadership capabilities (development of the executive succession pool), Global Professionals, New Products, the HR School and the Project Management School, and other programmes aimed at promoting corporate values and English language learning.

In order to develop employees' managerial skills and roll out the RPS methodology, an institute of in-house coaches has been created and operates in the Division. In 2019, in-house coaches provided training to 2,320 employees; 53 in-house coaches underwent certification.

NPP personnel is provided with professional training by the Division's education and training departments (centres) (ETDs). A schedule for equipping (upgrading, modernization) ETDs with technical training aids to provide employees with professional training in the safe operation of power unit equipment and balance-of-plant systems was introduced and implemented in 2019.

3,128 educational materials, 1,300 training programmes for specific positions and 52 digital educational materials were developed and updated in the Division in 2019.

The implementation of the Visualization Software and Hardware in VR project was continued as a part of the digitization programme.

ETD training is provided by instructors and certified coaches with appropriate work experience, who have received special psychological and teacher training. In order to standardize the approach to professional training for personnel, a School for Instructors has been established in the Division. 312 NPP instructors completed professional development courses in 2019.

NPP personnel training includes psychological training provided by specialists from a psychophysiological laboratory. 14,389 NPP employees underwent psychological training totalling 20,000 hours in 2019.

All NPP positions subject to certification are filled by employees holding the required permits from Rostekhnadzor: a total of 1,813 employees of the Division had the relevant permits in 2019. In order to improve professional training

for NPP executives required to have Rostekhnadzor permits, training programmes, educational materials and e-courses were developed and launched in 2019.

The Division continued to develop and promote the industry-wide system of professional qualifications:

- 44 professional standards were developed for the nuclear power industry;
- 3 audits of qualification assessment centres in the nuclear power industry were carried out;
- 20 educational programmes for employees in the industry were accredited.

To provide a practical solution for a range of tasks related to improving and maintaining the required level of human reliability, including psychological and teaching assistance in professional training, psychophysiological laboratories (PPLs) have been established at NPPs. In 2019, psychophysiological examination of NPP personnel was carried out by PPL specialists in full and covered 9,259 employees; 508 opinions were issued in order to obtain and renew permits from Rostekhnadzor.

SOCIAL POLICY

The Division develops its social capital and regions of operation in accordance with the Division's strategy and the Uniform Industry-Wide Social Policy of ROSATOM in order to make it more attractive as an employer on the labour market, enhance employee loyalty and increase the efficiency of social expenses, and to attract and retain competent young specialists.

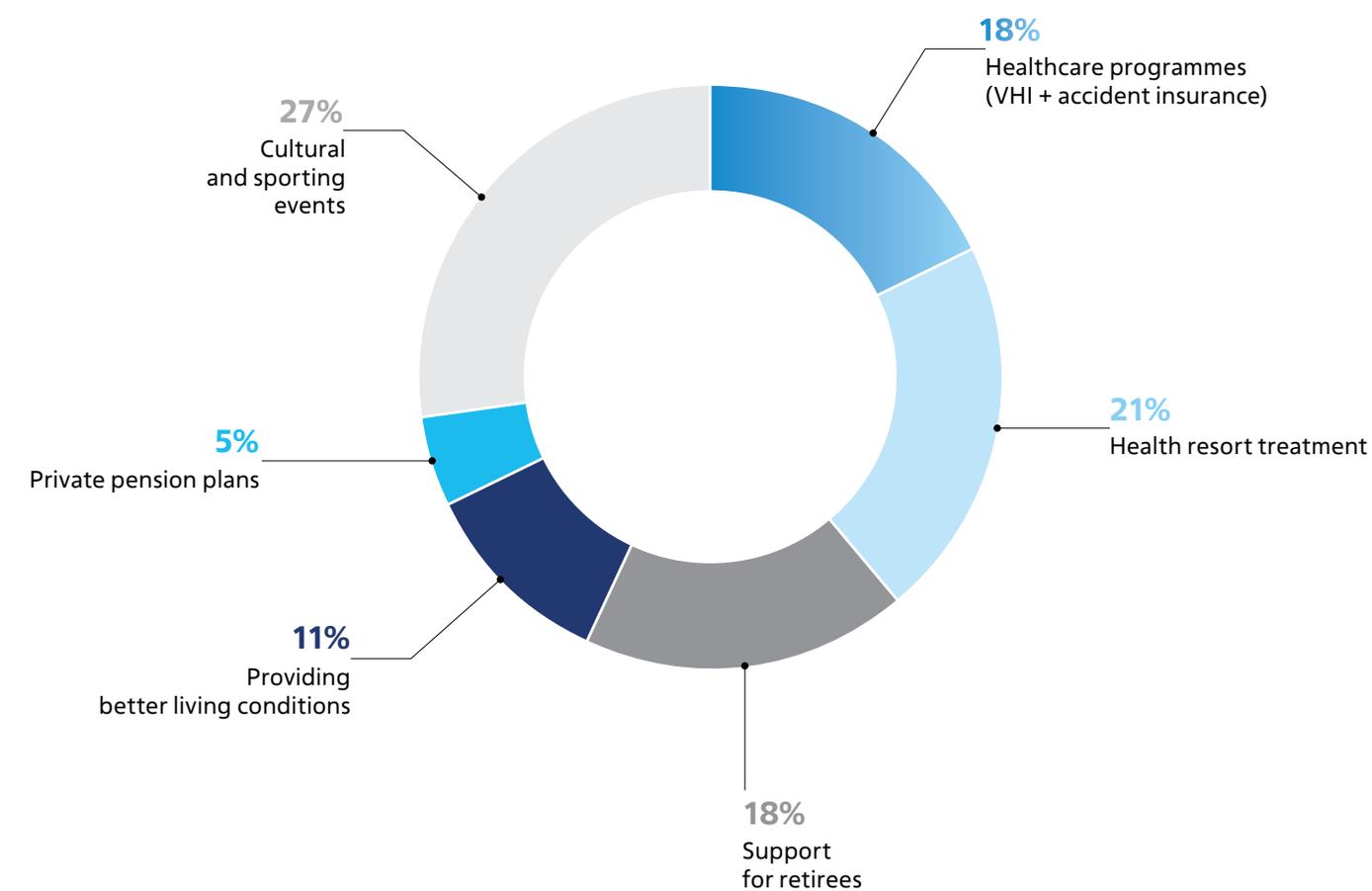
SOCIAL EXPENSES BETWEEN 2017 AND 2019, RUB '000

Social expenses	2017	2018	2019
Expenses per employee	78.07	80.85	78.28
Total expenditure on the implementation of the social policy	2,645,342	2,742,767	2,795,444
including key programmes:			
Healthcare programmes (VHI + accident insurance)	358,318	359,387	410,009
Private pension plans	116,553	128,559	114,000
Health resort treatment and wellness	342,496	422,246	495,496
Support for retirees	351,296	396,556	411,034
Providing better living conditions for employees	277,887	230,531	261,241
Cultural and sporting events	558,150	588,230	628,365

9.3. VOLUNTARY HEALTH INSURANCE (VHI)

VHI covers the provision of specialized information, consultations and medical care for employees and their family members not only in regional healthcare institutions but also in Moscow and Saint Petersburg. Employees can obtain insurance for their family members at a discount.

STRUCTURE OF SOCIAL EXPENSES UNDER KEY PROGRAMMES IN 2019



9.4. HEALTH RESORT TREATMENT FOR EMPLOYEES

The Division annually implements measures to improve employees' health in healthcare centres affiliated with the industry and in Russian health resorts. In 2019, 14,445 employees received health resort treatment in 10 healthcare centres affiliated with NPPs, and 7,937 employees received treatment in 34 health resorts on the Black Sea coast, in the Caucasian Spas and Central Russia.

9.5. PROVIDING BETTER LIVING CONDITIONS FOR EMPLOYEES

The Division builds housing and assists employees in buying a permanent home as part of a housing programme approved in 2017.

Construction of a nine-floor residential building in Desnogorsk was started in 2019 (to be completed in 2020).

More than 200 employees were given interest-free loans to make a down-payment on mortgages; more than 3,100 people receive compensation for interest on mortgage loans, and more than 700 people living in temporary housing are provided with assistance.

In accordance with a Comprehensive Housing Programme for Employees, the Division plans to build housing with a total area of more than 50,000 m² (about 850 apartments) between 2017 and 2021.

9.6. SPORTS AND CULTURAL PROJECTS

The most significant cultural and sporting events held for the Division's employees in 2019 included:

- The Megawatt of Health sports and wellness project: six orphanages in the Division's regions of operation were provided with financial support;

- The 10th Winter Sports Competition 'NPP Sports 2019' (Kola NPP);

- The 1st Summer Sports Competition for Young Employees (Kalinin NPP);

- The 11th Folk Art Festival and Contest 'Live Spring 2019' marking the 65th anniversary of the nuclear power industry and the start-up of the world's first nuclear power plant, Obninsk NPP;

- The 5th Open Children's and Youth Art Festival 'Russia, We Are Your Children'.

9.7. PRIVATE PENSION PLANS

The Division offers private pension plans for employees through the industry-wide Non-State Pension Fund Atomgarant. Pension obligations are covered in full using the Division's shared resources under a retirement benefit scheme; the value of obligations in 2019 was estimated at RUB 114 million (RUB 129 million in 2018).

Upon retirement of an employee of the Division, the scope of their participation in the pension plan is determined based on the length of employment in the nuclear power industry, which must total at least 15 years at the time of achieving the retirement age.

	2018	2019
Total number of the Division's retirees who receive private pension through the Non-State Pension Fund Atomgarant	14,189	13,687
Number of employees participating in co-financed pension plans	8,178	8,428

9.8. VETERANS' MOVEMENT

In 2019, the actual number of retirees participating in the Inter-Regional Public Organization of the Division's Veteran Employees (IRPODVE) totalled 18,318 people (18,222 people in 2018).

Using funds allocated by Rosenergoatom under the Charitable Contribution Agreement, IRPODVE provided retirees in need with:

- Financial assistance totalling RUB 92.6 million (RUB 77.2 million in 2018);
- Subsidies for health resort treatment and rehabilitation totalling RUB 81.6 million (RUB 85.4 million in 2018);
- Funding for health and wellness and cultural events totalling RUB 15.5 million (RUB 23.9 million in 2018).

Financial assistance was provided to a total of 44,327 retirees (48,621 in 2018).

Veterans are provided with home care.

10. DEVELOPING THE REGIONS OF OPERATION

10



The Division's investment programmes generally include the construction of community facilities in its host towns and cities. Key infrastructure facilities are built as part of the NPP construction process. At present, the Division seeks to maintain a balance between the rate of development of its main production facilities and that of the regions where they are located.

In 2019, measures aimed at developing a social assistance system for local communities in the regions where NPPs are located included modernization of a number of community facilities:

- Renovation of a health and fitness centre affiliated with Kalinin NPP in Udomlya (Tver Region) was completed, with the relevant investments exceeding RUB 30 million;
- Modernization of a demonstration hall of the Information and Communication Centre at Smolensk NPP in Desnogorsk (Smolensk Region) is nearing completion (more than RUB 120 million);
- The first stage of modernization of wastewater treatment facilities at the Kopanskoye health resort of Leningrad NPP in Sosnovy Bor (Leningrad Region) was completed (more than RUB 160 million).

In order to promote the development of its regions of operation, ROSATOM is implementing seven-year agreements on cooperation with federal subjects of Russia. Enterprises pay taxes as part of a consolidated taxpayer group. The funds are allocated for the improvement of social and utilities infrastructure, construction of sports facilities and urban improvement in ROSATOM's host towns and cities.

Under the agreements, additional tax payments to regional budgets totalled RUB 23.17 billion in 2019 (RUB 26.18 billion in 2018), with RUB 2.59 billion spent on municipal initiatives (RUB 2.11 billion in 2018).



10.1. KEY MEASURES IMPLEMENTED IN 2019 UNDER AGREEMENTS WITH REGIONS

Territory (NPP)	Total amount, RUB million	Activities
Novovoronezh District, Voronezh Region (Novovoronezh NPP)	363.4	<ul style="list-style-type: none"> ■ Construction of a sports and fitness centre ■ Documentation for the construction of a roller ski track ■ Renovation of kindergartens, schools and community facilities, urban improvement
Zarechny District, Sverdlovsk Region (Beloyarsk NPP)	300.0	<ul style="list-style-type: none"> ■ Renovation and provision of equipment for educational institutions ■ Sports competitions, overhaul of sports grounds ■ Road repairs, street maintenance and improvement ■ Construction of a municipal industrial park ■ Renovation of the Beloyarsk Reservoir embankment ■ Renovation of a municipal boiler house, facilities and power supply networks ■ Environmental measures
Polyarnye Zori, Murmansk Region (Kola NPP)	140.8	<ul style="list-style-type: none"> ■ Construction of a health and fitness centre, overhaul of a swimming pool ■ Urban improvement; renovation of the Severnoye Siyanie ('Polar Lights') Avenue ■ Road repairs ■ Purchase of buses for the transportation of children
Volgodonsk, Rostov Region (Rostov NPP)	174.0	<ul style="list-style-type: none"> ■ Construction of a martial arts centre ■ Purchase of low-floor buses ■ School renovation

Territory (NPP)	Total amount, RUB million	Activities
Desnogorsk, Smolensk Region (Smolensk NPP)	74.9	<ul style="list-style-type: none"> Renovation of kindergartens Support for non-governmental and non-profit organizations
Roslavl District, Smolensk Region (Smolensk NPP)	356.7	<ul style="list-style-type: none"> Renovation of water conduits and a water well in Roslavl Renovation and purchase of equipment for educational institutions Purchase of playground equipment
Kurchatov, Kursk Region (Kursk NPP)	125.4	<ul style="list-style-type: none"> Construction of an overpass Road repairs and urban improvement, renovation of educational and cultural institutions
Sosnovy Bor District, Leningrad Region (Leningrad NPP)	525.4	<ul style="list-style-type: none"> Construction of a volleyball centre Renovation of Koporskoye Highway Construction of a rehearsal hall in the Baltika Children's Art School
Udomlya District Tver Region (Kalinin NPP)	–	<ul style="list-style-type: none"> A new agreement with the region is scheduled to be signed in 2020

In 2019, the Association of the Nuclear Power Plant Locations (ATR AES) Fund held an annual contest of important social projects among non-profit organizations in the Division's regions of operation. 64 projects worth a total of RUB 60 million were implemented.

In 2017, ROSATOM and the Federal Biomedical Agency (FMBA) of Russia initiated the Lean Polyclinic project aimed at improving the quality of healthcare services in adults' and children's outpatient clinics in all towns and cities where NPPs are located (except for Bilibino, Chukotka Autonomous District).

The Division allocated RUB 120 million for the project in 2019.

In order to provide the medical personnel of the FMBA of Russia with housing in its regions of operation, the Division donated 33 apartments with a total area of 2,800 m² with residual value exceeding RUB 109 million to the Federal Treasury of Russia.

In 2019, a cooperation agreement was signed between the Russian National TOS Association and the ATR AES Fund in order to develop local public self-government in those municipalities where NPPs are located. In addition, a contest of socially important local public self-government projects was conducted in Desnogorsk (Smolensk Region), with a prize fund of RUB 1 million allocated for the implementation of the projects.

The 100 City Leaders initiative was implemented in 2019 in partnership with the Agency for Strategic Initiatives.

Targeted selection of projects was made (154 towns and cities in 74 federal subjects of Russia); as a result, 25 towns and cities were selected, including 6 NPP satellite towns (Zarechny, Kurchatov, Sosnovy Bor, Udomlya, Polyarnye Zori and Desnogorsk). The budget of the projects to be implemented in these towns will exceed RUB 700 million.

10.2. COMMUNICATION WITH STAKEHOLDERS

When planning operations which can have a significant environmental and social impact, the Division initiates public consultations. Six public consultations (involving more than 2,800 participants) were held in 2019 in the Division's regions of operation. More than 100 events involving the general public, government agencies and the media are held as part of each consultation in order to provide explanations concerning the planned operations and their safety for people and the environment.

The Division's approach to media relations is based on a policy of transparency and openness. Information on NPP operation and radiation levels in the towns and cities where NPPs are located is available on the official website of Rosenergoatom (www.rosenergoatom.ru), where press releases and announcements are posted in a timely manner. Furthermore, the findings of radiation monitoring at Russian NPPs are published at www.russianatom.ru in real time.

In 2019, six media tours of Russian nuclear power plants were conducted for journalists and bloggers (more than 100 participants).

More than 1,500 press releases were published on Rosenergoatom's website. In 2019, the total number of Rosenergoatom's followers on social media (VKontakte, Facebook, Instagram), excluding the pages of NPPs, tripled compared to 2018 and exceeded 43,000 people (14,000 people in 2018).

Rosenergoatom annually holds the Energetic People creative contest of regional media in the regions where NPPs are located to choose the best media coverage of the nuclear power industry. The 2019 contest results were announced during the Energetic People Regional Mass Media Festival in the Leningrad Region. About 200 representatives of print and online media, radio and TV channels, as well as media offices of Russian, Belarusian, Armenian, Hungarian and Kazakh entities participated in the festival.

New 'nuclear classes' at schools in Pevek (Chukotka Autonomous District) and Ostrovets (Belarus) and a Competence Centre in Udomlya (Tver Region) were opened.

An international environmental expedition was conducted on May 15-17, 2019 at Paks NPP (Hungary). Its participants included members of the Federation Council and the State Duma of the Russian Federation, representatives of the Hungarian government, ROSATOM's Public Council, JSC Rosenergoatom, Paks NPP, environmental organizations Green Cross and Oka, and ecologists from Hungary. The results of the expedition were presented at a press conference in Paks.

11. SAFETY OF NUCLEAR TECHNOLOGIES AND NFC PRODUCTS

11



11.1. POLICY AND FUNDAMENTAL PRINCIPLES UNDERLYING SAFE NPP OPERATION

Safety is the top priority for the Division as an operator.

Rosenergoatom carries out its operations only if safety is guaranteed; this is its highest business priority. In the course of its operations, the Division is committed to fulfilling its obligations under the Convention on Nuclear Safety and complies with the recommendations given in the IAEA safety regulations and guidelines, as well as the provisions and principles set out in the documents of the International Nuclear Safety Advisory Group (INSAG), such as Basic Safety Principles for Nuclear Power Plants and Safety Culture.

Rosenergoatom ensured sustainable and safe operation of Russian NPPs in 2019.

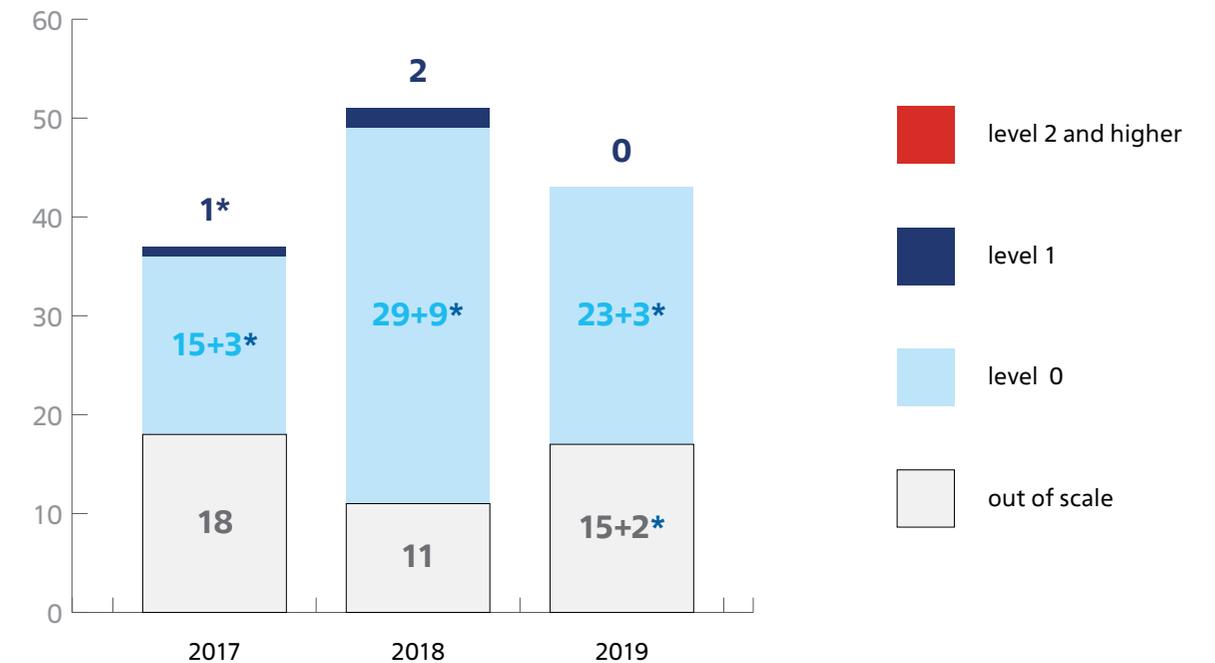
Over the past 21 years, no incidents rated above Level 1 (Anomaly) on the International Nuclear and Radiological Event Scale (INES) were recorded at Russian NPPs.

Deviations		Unscheduled automatic shutdowns		Accidents		Fires / instances of ignition	
2018	2019	2018	2019	2018 / 2019		2018 / 2019	
42+9*	38+5*	5+1*	7+3*	2	1	0	0

*Events related to low-power testing of power units during their commissioning.

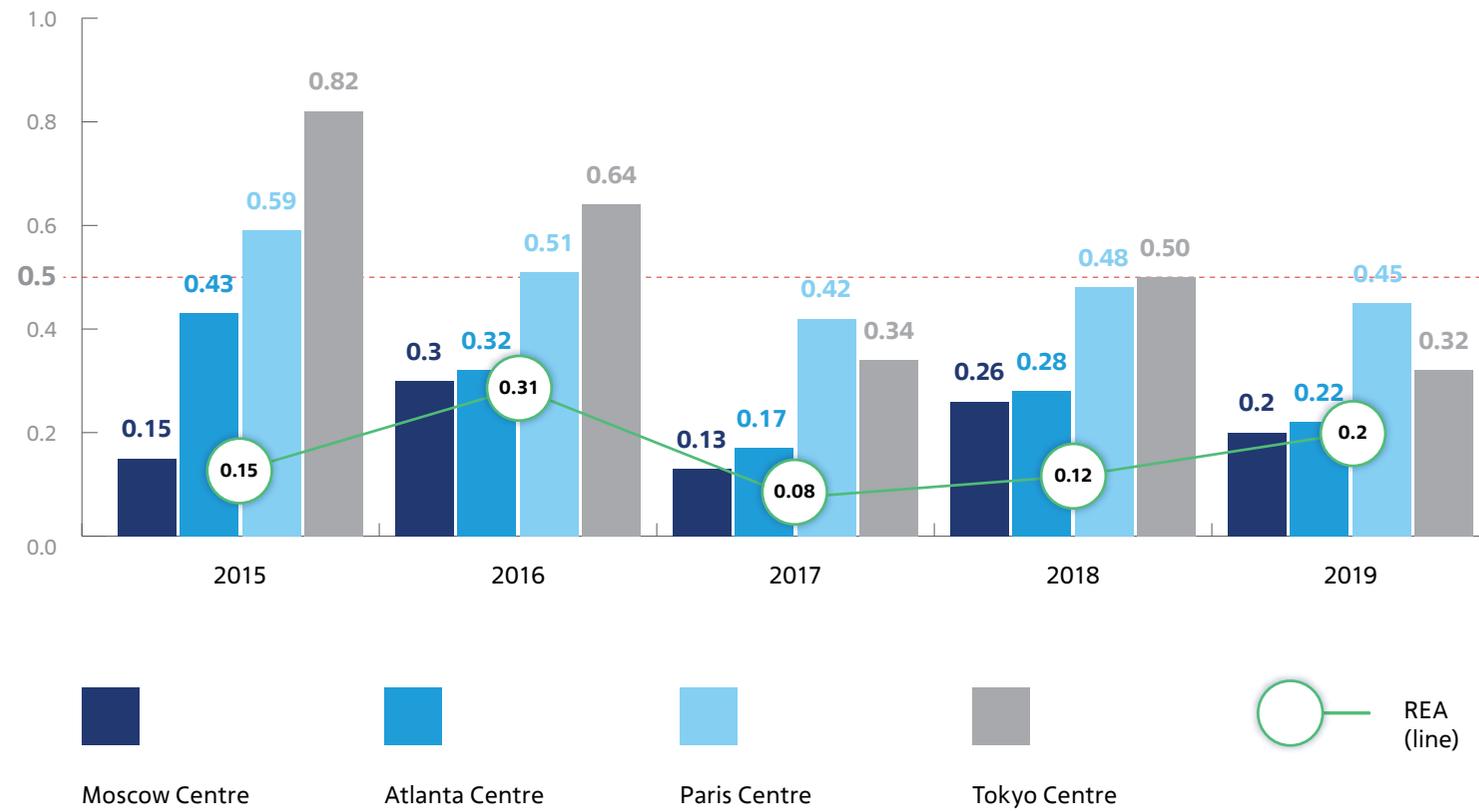
In 2019, there were no incidents rated at Level 1 on the INES scale, no fires or instances of ignition at operating NPPs, no accidents or incidents posing a risk to the life or health of personnel or a direct threat of an accident at the Division's production facilities.

CHANGES IN THE NUMBER OF INES INCIDENTS AT NPPS



*Events related to low-power testing of power units during their commissioning.

CHANGES IN THE NUMBER OF UNPLANNED AUTOMATIC SCRAMS BETWEEN 2015 AND 2019 (ANNUAL AVERAGE UNPLANNED AUTOMATIC (UA7) SCRAMS PER 7,000 HOURS CRITICAL)



The average number of reactor shutdowns per 7,000 hours of critical operation at Russian NPPs (benchmarked against the average data of WANO regional centres in Moscow, Atlanta, Paris and Tokyo) between 2015 and 2019 was lower than at NPPs in other regions of the world.

Seven international WANO peer audits were carried out at the Division's NPPs (Balakovo, Bilibino, Novovoronezh, Kola, Kursk and Smolensk NPPs and the FTNPP) in 2019. A high level of safety performance at these NPPs was highlighted.

Based on the findings of analysis of NPP safety performance and trends, the safety performance of operating NPPs was assessed as acceptable; however, it was considered necessary and advisable to implement corrective measures in a number of functional areas both at individual NPPs and at the corporate level.

11.2. NPP SAFETY MONITORING

The Division implements a wide range of internal and external measures to verify compliance with both Russian and international requirements for NPP safety.

NPP safety monitoring includes comprehensive and targeted audits performed by Rosenergoatom's divisions; they are aimed primarily at:

- Assessing the current safety status of NPPs and detecting any possible common problems and negative tendencies during NPP operation;
- Developing and implementing corporate-level measures and recommendations for improving NPP safety;
- Efficient monitoring of timely implementation of measures to improve NPP safety and resilience;
- Identifying and analysing best practices and efficient work methods implemented at NPPs in order to improve safety performance;
- Assessing NPP preparedness for emergencies caused by seasonal adverse weather conditions.

Rosenergoatom's committees performed 42 scheduled safety audits (process audits and inspections) at operating NPPs and NPPs under construction in 2019. Based on the audit findings, improvement measures were developed, and their efficiency is monitored.

The findings of safety audits at operating NPPs and monitoring of implementation of corrective measures lead to the conclusion that the safety performance of the Division's NPPs meets the current requirements of Russian regulations and standards governing the use of nuclear power, as well as international requirements and standards.

NPPs are audited in accordance with the annual work plan, the inspection schedule and instructions from the management of the Division and ROSATOM. If NPP safety performance deteriorates, or if there is an increase in the equipment failure rate or in the number of deviations in NPP operation, targeted audits are conducted to examine the root causes of deterioration in safety performance and implement the necessary corrective measures to eliminate them.

11.3. IMPROVEMENT OF NPP SAFETY AND RESILIENCE TO EXTREME EXTERNAL IMPACTS

In response to events in Japan which led to the Fukushima Daiichi nuclear disaster, the Division analysed scenarios of how an accident may occur at Russian NPPs under extreme external impacts and identified measures to mitigate the impact on local communities and the environment. Measures to improve the resilience of NPPs to the impact of natural and man-made disasters are implemented in three stages:

<p>1. SHORT-TERM (2011–2012)</p> <p>COMPLETED</p> <p>Aimed at minimizing man-made hazards.</p> <p>All NPPs were supplied with additional portable emergency response equipment; backup (additional) process water sources were identified; technical specifications were drafted for additional design solutions.</p>	<p>2. MEDIUM-TERM (2012–2014)</p> <p>COMPLETED</p> <p>Aimed at supporting vital NPP functions.</p> <p>Preparation of design documentation; calculations, analysis and feasibility studies; delivery of additional equipment and materials meeting design specifications.</p>	<p>3. LONG-TERM (2014–2021)</p> <p>IN PROGRESS</p> <p>Aimed at minimizing man-made hazards.</p> <p>Implementation of additional design solutions at NPPs; amendments to accident prevention documentation.</p>
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All measures scheduled for 2019 were implemented.

11.4. SAFETY CULTURE

Safety culture is a fundamental principle of NPP safety management. The Division’s safety culture policy defines the objective of safety culture initiatives: to shape and develop such features of the organization’s activities and employees’ behaviour which help to prevent safety deterioration and enable continuous improvement of NPP safety performance.

Rosenergoatom has established a Safety Culture Council chaired by the Director General and Councils chaired by NPP directors at each NPP. During their meetings, the Councils review the performance of NPP managers and the Central Administration in terms of safety culture development, assessment and continuous monitoring of safety performance as part of NPP audits.

The Division has introduced the practice of holding a safety culture round-up day, which includes expert assessment of safety culture and measures implemented at NPPs, identifying achievements and problems and sharing the experience of plants acknowledged as the top performers following the expert assessment.

Balakovo and Kola NPPs were acknowledged as the top performers in terms of safety culture development during the safety culture round-up day in 2019.

Safety culture is a set of characteristic features of organizational activities and individual behaviours which determine that matters related to NPP safety are given priority in accordance with their significance (NP-001-15).

11.5. FIRE SAFETY

All measures scheduled for 2019 under the 2018-2022 Action Plan for Fire Safety Improvement and Modernization of Fire Protection Systems at NPPs were implemented. As a result of preventative measures implemented at Russian NPPs currently in operation and under construction, there were no fires or instances of ignition.

Fire safety measures aimed at eliminating the shortcomings identified by national fire safety authorities were implemented in full in 2019.

11.6. INDUSTRIAL SAFETY

The Division attaches special importance to ensuring industrial safety of hazardous production facilities (HPFs) at NPPs. As at December 31, 2019, the divisional (industrial) section of the State Register of HPFs included 73 HPFs insured in accordance with the Federal Law on Compulsory Liability Insurance of an Owner of a Hazardous Facility Against Damage Resulting from an Accident at a Hazardous Facility.

In accordance with regulatory requirements, industrial safety declarations were developed for hazard class 1 and 2 HPFs. The Division's employees involved in HPF operation undergo training and certification in industrial safety carried out by the relevant committees of Rostekhnadzor, Rosenergoatom's Central Administration and NPPs.

The Division has in place an industrial safety management system to prevent industrial accidents and incidents, plan and implement prioritized and long-term measures to improve industrial safety performance of HPFs, and ensure that the Division's personnel is prepared for emergency and incident containment and response.

No accidents at hazardous production facilities were recorded in 2019.

11.7. ENSURING THE NON-PROLIFERATION OF NUCLEAR MATERIALS

The non-proliferation of nuclear materials is ensured by the Division's Nuclear Materials Accounting and Control System, which is operated in full compliance with international and Russian regulations under the supervision of ROSATOM and Rostekhnadzor. In order to account for and monitor nuclear fuel at the sites where fuel assemblies are stored and used, an inventory of nuclear materials is taken annually.

Since the start of operation of the Division's NPPs, there have been no incidents involving the loss, theft or unauthorized use of nuclear materials.

11.8. EMERGENCY PREPAREDNESS AND RESPONSE¹³

In order to schedule, prepare for and implement measures aimed at protecting NPP personnel and local communities against natural and man-made emergencies, the Division has established and operates the Emergency Prevention and Response System (EPRS), which is a subsystem of the Industry-Wide Emergency Prevention and Response System of ROSATOM and is aligned with regional and municipal subsystems of the Integrated State System for Emergency Prevention and Response.

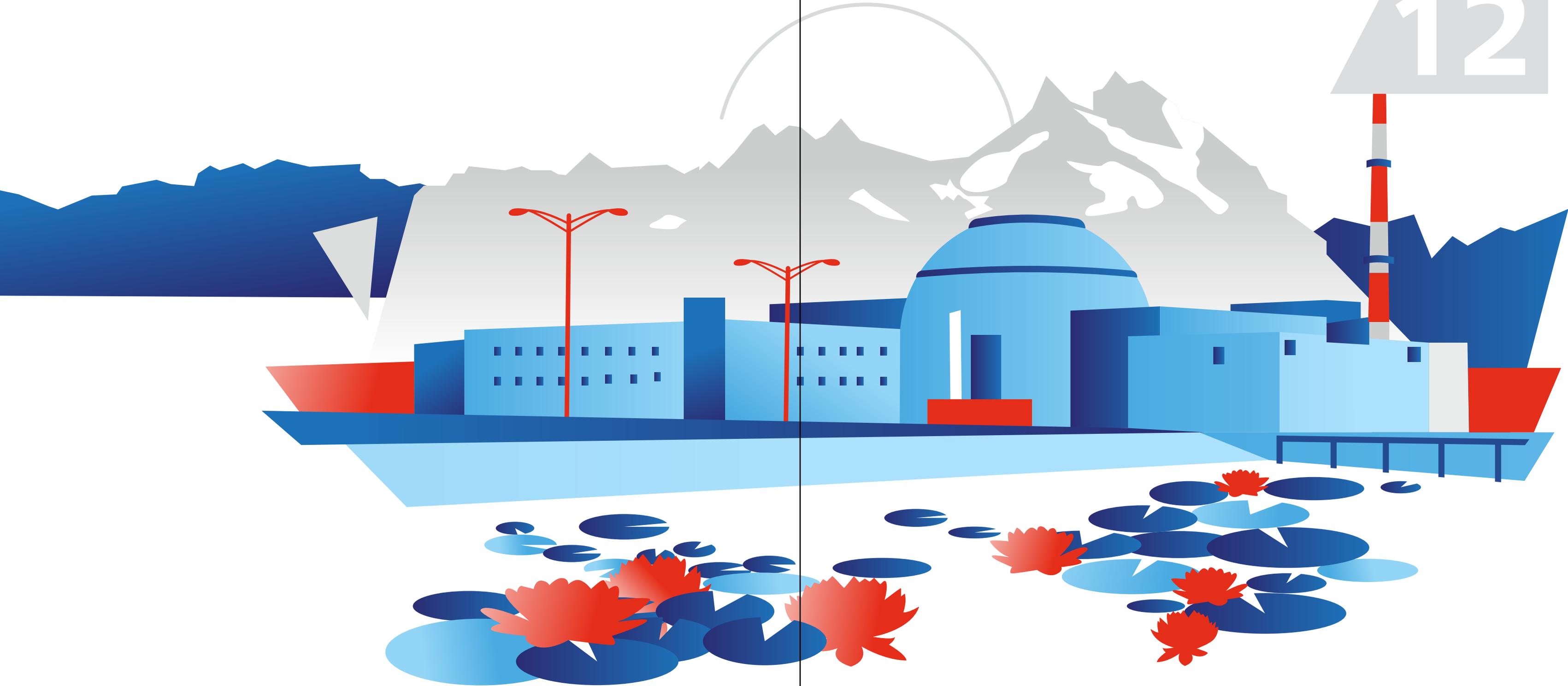
Comprehensive emergency response drills (CERDs) aimed at coordinating and supporting cooperation between all personnel and equipment involved in case of emergency at an

NPP were carried out in 2019 at Smolensk NPP under a scenario closely imitating a real-life accident. The emergency response team supporting nuclear power plants (NPPER), the Rosatom Emergency Response Centre, representatives of local executive authorities, EMERCOM and the Ministry of Defence of the Russian Federation participated in CERD-2019; mobile emergency response equipment was used in full. In 2019, the NPPER team and technical support centres participated in eight emergency response drills and exercises carried out at the Division's NPPs, which involved practising emergency response activities under a scenario similar to the Fukushima Daiichi nuclear disaster.

¹³ Detailed information on the emergency response system is provided in Section 3 of the 2018 Annual Report of JSC Rosenergoatom.

12. ENVIRONMENTAL SAFETY

12



The Division's environmental safety policy is aimed at ensuring sustainable environmentally friendly development of the nuclear power industry and maintaining NPP safety performance at a level where its impact on the environment, personnel and local communities ensures long-term and short-term conservation of natural ecosystems, their integrity and life-supporting functions.

In 2019, NPPs were operated in strict compliance with environmental safety standards and regulations. NPPs operated in a reliable and safe way, making a minimal environmental impact.

The Division's industrial environmental monitoring system is developed and improved year by year, which is confirmed by the year-on-year reduction of NPPs' environmental footprint.

POLLUTANT EMISSIONS INTO THE ATMOSPHERE

NPPs' contribution to air pollution remains negligibly small compared to other power generation facilities using fossil fuels.

The level of pollutant emissions into the atmosphere does not exceed permitted limits and is significantly below the limits established by environmental agencies. The major share of pollutant emissions is produced by auxiliary boiler houses, the boiler houses of health centres and backup diesel generator units, which are started up periodically for routine testing.

Total pollutant emissions into the atmosphere from all NPPs did not exceed the prescribed limits. 1,070 tonnes of pollutants were released into the atmosphere in 2019, which amounted to 16.86% of the limit established in the reporting year (6,345 tonnes).

For many years, NPPs account for less than 0.01% of the total volume of pollutant emissions into the atmosphere from Russian enterprises.

Despite the progress that has been made, NPPs continue to regularly implement measures to reduce the man-made impact on the atmosphere: the Division is improving technological solutions to increase fuel combustion efficiency at operating plants; high-quality fuel oil (with lower sulphur content) is used; painting techniques are improved; efficient gas scrubbers and dust collectors are commissioned.

DISCHARGE OF POLLUTANTS INTO WATER BODIES

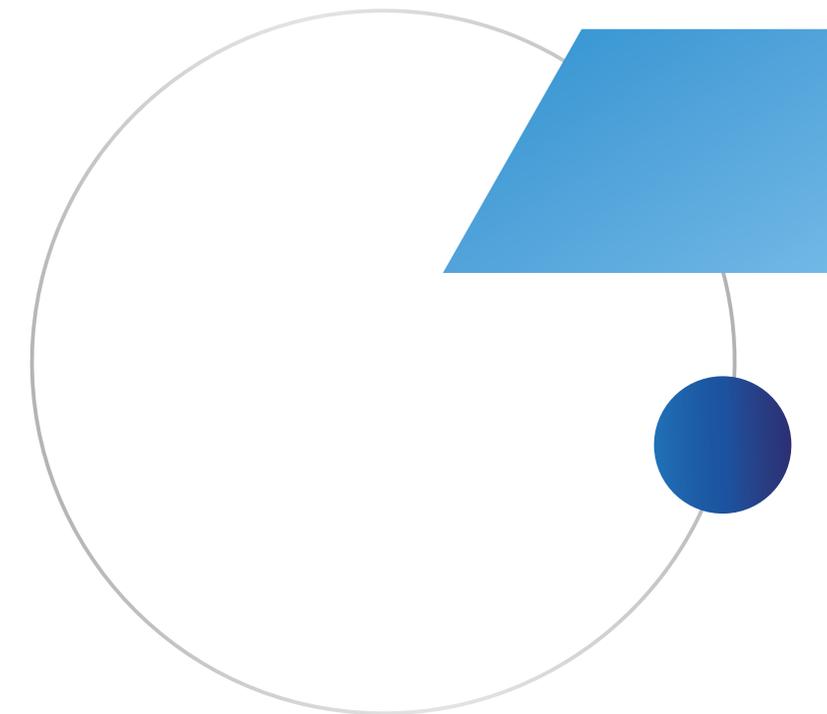
NPPs are large water consumers; accordingly, matters related to water consumption and water discharge are central to environmental management.

Almost all water withdrawn from water bodies (5,880.3 million m³, or more than 99%) was used for cooling the process medium in turbine condensers and heat exchangers and was returned to water bodies without additional pollution. Water consumption is kept within the limits established by environmental agencies.

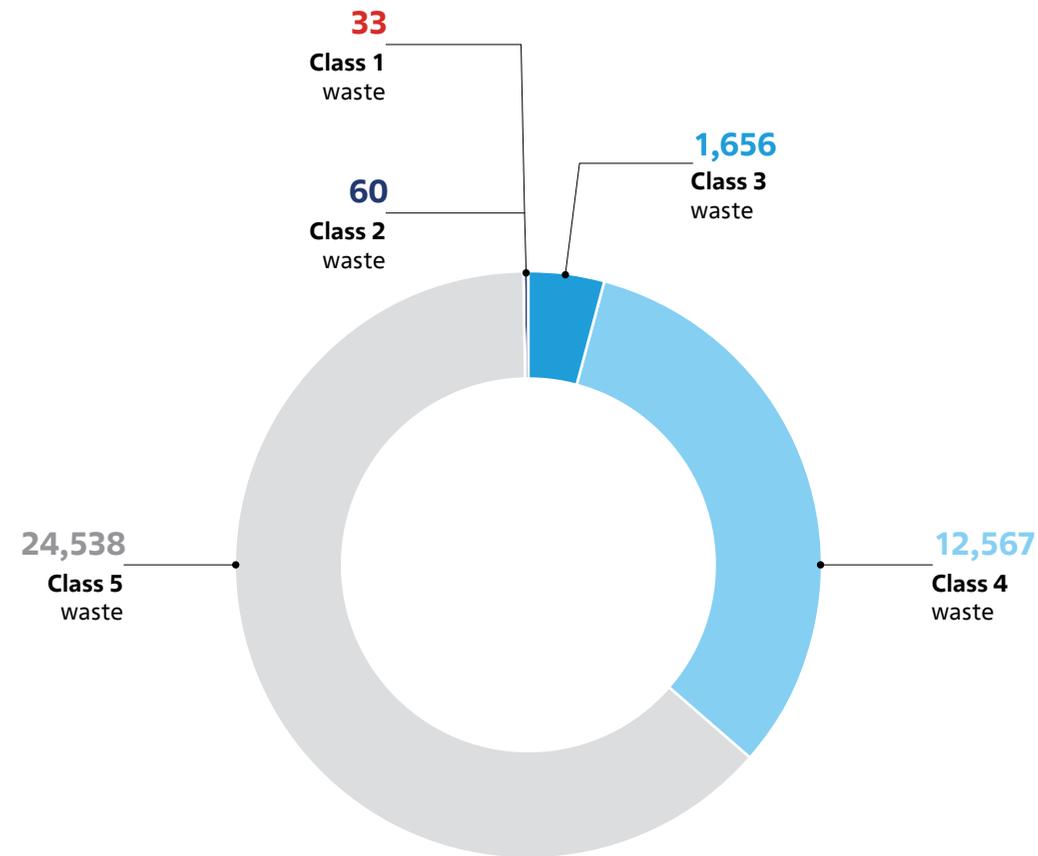
In 2019, water discharge from NPPs was consistent with the water balance and electricity output and totalled 5,441.9 million m³, or 92.4% of water consumption (5,889.6 million m³), which indicates efficient water management. The share of contaminated wastewater totalled 0.035% (1.9 million m³).

The volume of contaminated wastewater discharges is gradually decreasing as wastewater treatment systems at NPPs are systematically upgraded and renovated.

In 2019, industrial and consumer waste (hereinafter referred to as waste) at NPPs was managed in accordance with environmental legislation. Environmental aspects (industrial processes) leading to waste generation include maintenance and repairs of buildings, structures, equipment, tools, machines, other installations and mechanisms, water preparation for production and process needs, production of steam and hot water for heating and other needs of NPPs, services provided to NPP personnel, wastewater treatment, metal and wood treatment, removal of petroleum products from tanks, oil purification and regeneration, replacement of light bulbs, etc.



IN 2019, NPPS PRODUCED 38,854 TONNES OF WASTE, INCLUDING:



The major share (95.5%) of waste produced in 2019 was class 4 (low-hazard) and class 5 (practically non-hazardous) waste.

THE VOLUME OF WASTE AT THE BEGINNING AND AT THE END OF 2019 TOTALLED 26,867 TONNES AND 30,217 TONNES RESPECTIVELY

Amount of waste transferred from NPPs to other organizations for:	2019, tonnes
processing	4
decontamination	1,687
disposal	12,171
recycling	17,881

Rosenergoatom is committed to adopting and using the best practices in the sphere of environmental management in accordance with the international ISO 14001:2015 standard and the local GOST R ISO 14001-2016 standard.

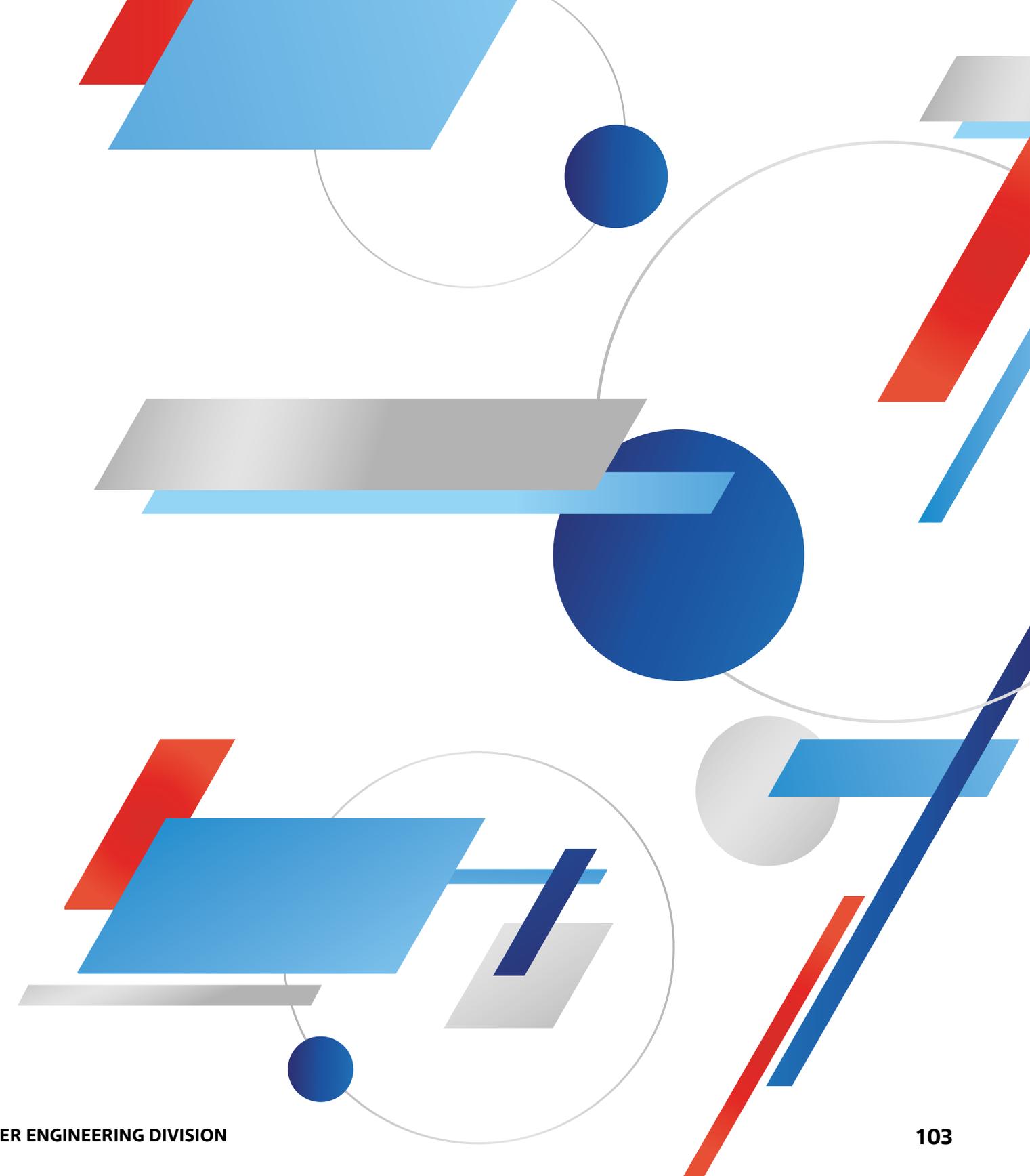
3,282 tonnes of municipal solid waste were handed over to the regional operator. All industrial and consumer waste is stored at properly equipped sites and in special storage facilities, and its disposal is monitored by environmental departments of NPPs.

In 2019, certified environmental management systems (EMSs) of Rosenergoatom and its NPPs successfully underwent inspection (recertification audits); the findings of the audits confirmed efficient operation and continuous improvement of EMSs and their full compliance with environmental standards.

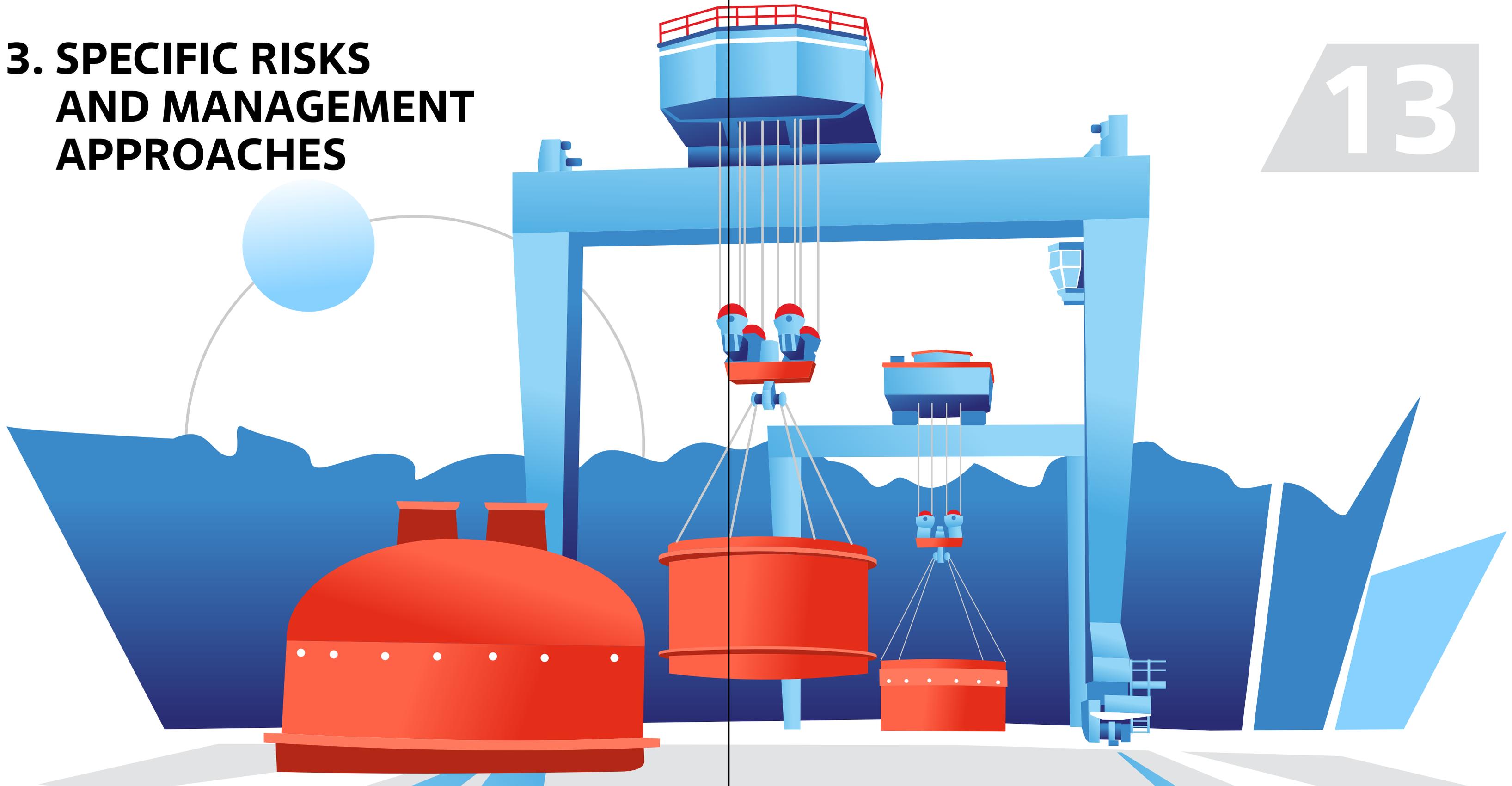
As part of its environmental safety initiatives, the Division implemented measures scheduled for 2019 under the Comprehensive Environmental Policy Implementation Plan of ROSATOM and its Organizations for the Period from 2019 through 2021 and the industry-wide Plan of Prioritized Measures for Reducing the Negative Environmental Impact of ROSATOM's Organizations until 2020 (within the scope related to the Division).

IN 2019, THE FOLLOWING SIGNIFICANT ENVIRONMENTAL SAFETY MEASURES WERE IMPLEMENTED AT NPPS:

Balakovo NPP	<ul style="list-style-type: none"> ■ Modernization of ventilation systems; ■ Installation of automatic gas analysers and alarm sensors detecting explosive concentrations of hydrocarbons and petroleum products in the fuel and lubricant storage facility; ■ Commissioning of an industrial waste sorting plant at the landfill site for NPP waste with radionuclide content within permitted limits;
Beloyarsk NPP	<ul style="list-style-type: none"> ■ Modernization of chemical water treatment facilities (the weight of discharged pollutants was reduced by 27% compared to 2017);
Kalinin NPP	<ul style="list-style-type: none"> ■ Power unit No. 4: modernization of a fuel oil pumping station, pumps at a deep repository for industrial waste, an open-air lubricant storage facility and a sewage pump station; ■ Modernization of sites for special vehicles; pumping equipment modernization;
Kola NPP	<ul style="list-style-type: none"> ■ Organization of full-cycle household waste sorting; ■ Installation of gas analysers; ■ Modernization of wastewater treatment facilities;
Leningrad NPP	<ul style="list-style-type: none"> ■ Modernization of wastewater treatment facilities at the Kopanskoye health resort; ■ Laying of non-pressure sewerage, surface run-off and drainage pipes;
Rostov NPP	<ul style="list-style-type: none"> ■ 478,000 young grass carp and 1.4 million young wild carp were bred and released into Tsimlyansk Reservoir; ■ A positive opinion was issued following state environmental expert review for the operation of power unit No. 3 in 18-month fuel cycles at 104% of rated capacity with mechanical draft cooling towers.



13. SPECIFIC RISKS AND MANAGEMENT APPROACHES



In 2019, the Division experienced no significant adverse effects of risk materialization. Given the nature of its business, the Division pays special attention to nuclear, radiation, technical and fire safety risks and risks related to NPP security; accordingly, any decisions related to the operation of the Risk Management System are determined primarily by the need to comply with all types of current safety standards and ensure continuous operation and improvement of the safety management system, which forms part of the Division's overall management system.

In 2019, as throughout its entire history, the Division prevented any significant adverse effects of risk materialization.

Strategy implementation risks remain minimal. At the same time, production targets and key financial and economic performance targets for 2019 were exceeded.

As in previous years, **risks related to climate change** had no impact on the Division's performance in 2019; accordingly, they are not considered significant.

Insurance as one of the methods for the management of certain risks continues to be used successfully in practice.

13.1. MANAGEMENT OF KEY RISKS

RISK OF A DECREASE IN POWER GENERATION DUE TO EQUIPMENT SHUTDOWNS OR UNAVAILABILITY

The key driver of the year-on-year increase in nuclear power generation in 2019 was the commissioning of new power units (power unit No. 1 of Novovoronezh NPP-2 and the FTNPP) and the operation of the new power unit No. 1 at Leningrad NPP-2. Key factors behind power generation shortfalls include irregularities and equipment failures resulting in unscheduled load shedding, shutdowns and unscheduled repairs. All irregularities and failures are investigated; based on the findings of investigations, corrective and preventative measures are developed, including industry-wide measures to mitigate the impact and prevent similar irregularities at other NPPs.

RISKS RELATED TO FLUCTUATIONS IN MARKET PRICES FOR ELECTRICITY AND NPP CAPACITY

In 2019, as in previous periods, key contributing factors included electricity consumption in the first pricing zone, indexation of gas prices (with gas being the main type of fuel used by thermal power plants in the first pricing zone) and competition between power generation companies. There were no significant changes in the impact of these factors on electricity and capacity prices in 2019 compared to 2018.

CREDIT RISK

The key risk factor is non-payment on the wholesale electricity and capacity market. In order to minimize adverse impacts, the Action Plan for the Reduction of Accounts Receivable was implemented in 2019. Current risk management programmes include developing and implementing measures for communication with delinquent payers as part of participation in working groups and committees under the Ministry of Energy and the Council of Power Producers and Power Industry Strategic Investors, and considering sanctions to be used against delinquent payers in accordance with the regulatory framework governing the wholesale electricity and capacity market.

Medium-term measures for mitigating (preventing) negative impacts include:

- Introducing a debt restructuring mechanism in 2020;
- Improving payment discipline among state-owned enterprises in the North Caucasus.

CURRENCY RISK (low risk level)

The share of foreign revenue in the total revenue is negligible (less than 2-3%). Expenses denominated in foreign currencies are comparable to foreign currency revenue. Natural hedging against currency risks is used as a risk management tool. The Division's overall exposure to this risk is insignificant.

INTEREST RATE RISK (medium level)

Rosenergoatom has achieved a balanced financial position through a combination of short-term deposits and long-term borrowings, which enables a significant reduction in the risk of negative consequences in case of sharp changes in interest rates. In 2019, the actual average interest rates on borrowings and deposits were 1.0% and 0.5% below the target (8.5% and 7.5% respectively). The risk depends on a large number of external factors beyond Rosenergoatom's control. The risk can be hedged using financial instruments, but this requires an in-depth review and approval of such costs by regulators. The credit and deposit portfolio of Rosenergoatom and its subsidiaries is balanced to minimize the risk.

LIQUIDITY RISK (low risk level)

High net profit in 2018 and availability of financial reserves guarantee financial stability. Risk management measures include creating a liquidity cushion, improving the accuracy of liquidity forecasts, process automation, obtaining information on unplanned expenses in a timely manner, and having a short-term credit source (a pool leader) in accordance with the financial policy.

SOCIAL AND POLITICAL RISK IN THE REGIONS OF OPERATION

In 2019, there were no social or political factors posing a risk of significant changes in business project parameters at the regional or municipal levels in the Division's regions of operation. In 2019, there were no instances of significant social and political or social and economic risks in the Division's regions of operation. Risk prevention measures included:

- Measures to promote social, economic and infrastructure development in the regions and support local communities;
- Monitoring the social and political climate in the regions of operation, and developing remedial measures;
- Independent opinion surveys (twice a year);
- Organizing technical tours of NPPs, round-table discussions and training seminars for the relevant audiences;
- Implementing industry-wide projects to provide organizational and technical support for government initiatives in the regions of operation; aligning municipal development strategies with the Division's development strategies.

Systematic work aimed at preventing these risks makes it possible to expect that they will not affect the Division's business projects in 2020.

REPUTATIONAL RISK

In 2019 (as in 2018), no false, negative or unauthorized information damaging the Division's reputation was circulated in the media or among the general public. Risk prevention measures included:

- Ensuring that the operations and operational achievements of the Division and NPPs receive continuous media coverage;
- Media space monitoring, crisis PR and communications;
- Independent opinion surveys to assess public attitude to the industry, the Division and its projects; analysis of survey findings (twice a year);
- Timely provision of up-to-date and accessible information at the request of stakeholders;
- Providing full information about events at NPPs that have safety relevance to local community through the media and social media.

14. ADDITIONAL INFORMATION

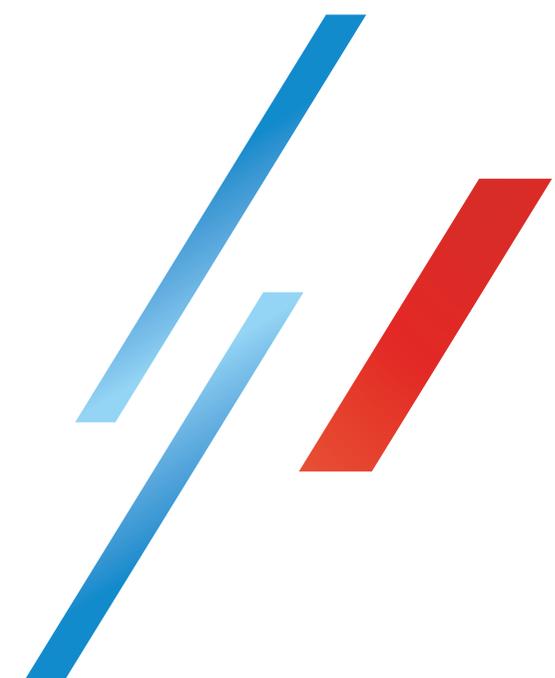
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GRI Content Index for the Core 'in accordance' option of the Global Reporting Initiative Sustainability Reporting Standards (GRI Standards).

GRI Standard	GRI Standards index	Report chapters	Page in the report and/or URL	Comments
GRI 403: Occupational Health and Safety 2016				
GRI 103: Management Approach 2016	103-1, 103-2, 103-3	9. Developing the Human Capital	58–77	
GRI 403: Occupational Health and Safety 2016	403-3	9. Developing the Human Capital	58–77	The Division has employees involved in professional activities entailing a risk of occupational diseases. These employees are categorized based on working conditions.
GRI 413: Local Communities 2016				
GRI 103: Management Approach 2016	103-1, 103-2, 103-3	10. Developing the Regions of Operation	78–85	
GRI 413: Local Communities 2016	413-1	10. Developing the Regions of Operation	78–85	In accordance with Russian legislation, Rosenergoatom participates in public consultations and discussions in 100% of cases.
GRI 416: Customer Health and Safety 2016				
GRI 103: Management Approach 2016	103-1, 103-2, 103-3	9. Developing the Human Capital	58–77	
GRI 416: Customer Health and Safety 2016	416-2	9. Developing the Human Capital	58–77	There were no incidents of non-compliance with regulations or voluntary codes in the reporting period.
Topics specific to the Division				
Safe NPP operation	103-1, 103-2, 103-3	11. Safety of Nuclear Technologies and NFC Products 12. Environmental Safety	86–103	
Reliable electricity supply to consumers	103-1, 103-2, 103-3	3. Key Results and Performance Indicators	22–29	
New products and services, including on the market outside the scope of the industry	103-1, 103-2, 103-3	8. New Products	50–57	
Communication and cooperation with government oversight bodies and non-governmental organizations	103-1, 103-2, 103-3	10. Developing the Regions of Operation	78–85	

GRI Standard	GRI Standards index	Report chapters	Page in the report and/or URL	Comments
Public acceptance	103-1, 103-2, 103-3	10. Developing the Regions of Operation	78–85	
The Company's impact on regional social and economic development	103-1, 103-2, 103-3	10. Developing the Regions of Operation	78–85	
Outcomes of strategy implementation, contribution of performance during the year to the achievement of strategic goals	103-1, 103-2, 103-3	3. Key Results and Performance Indicators	22–29	
Ensuring nuclear and radiation safety in the course of operation of nuclear facilities	103-1, 103-2, 103-3	11. Safety of Nuclear Technologies and NFC Products 12. Environmental Safety	96–103	



15. INFORMATION ON THE REPORTING PROCESS

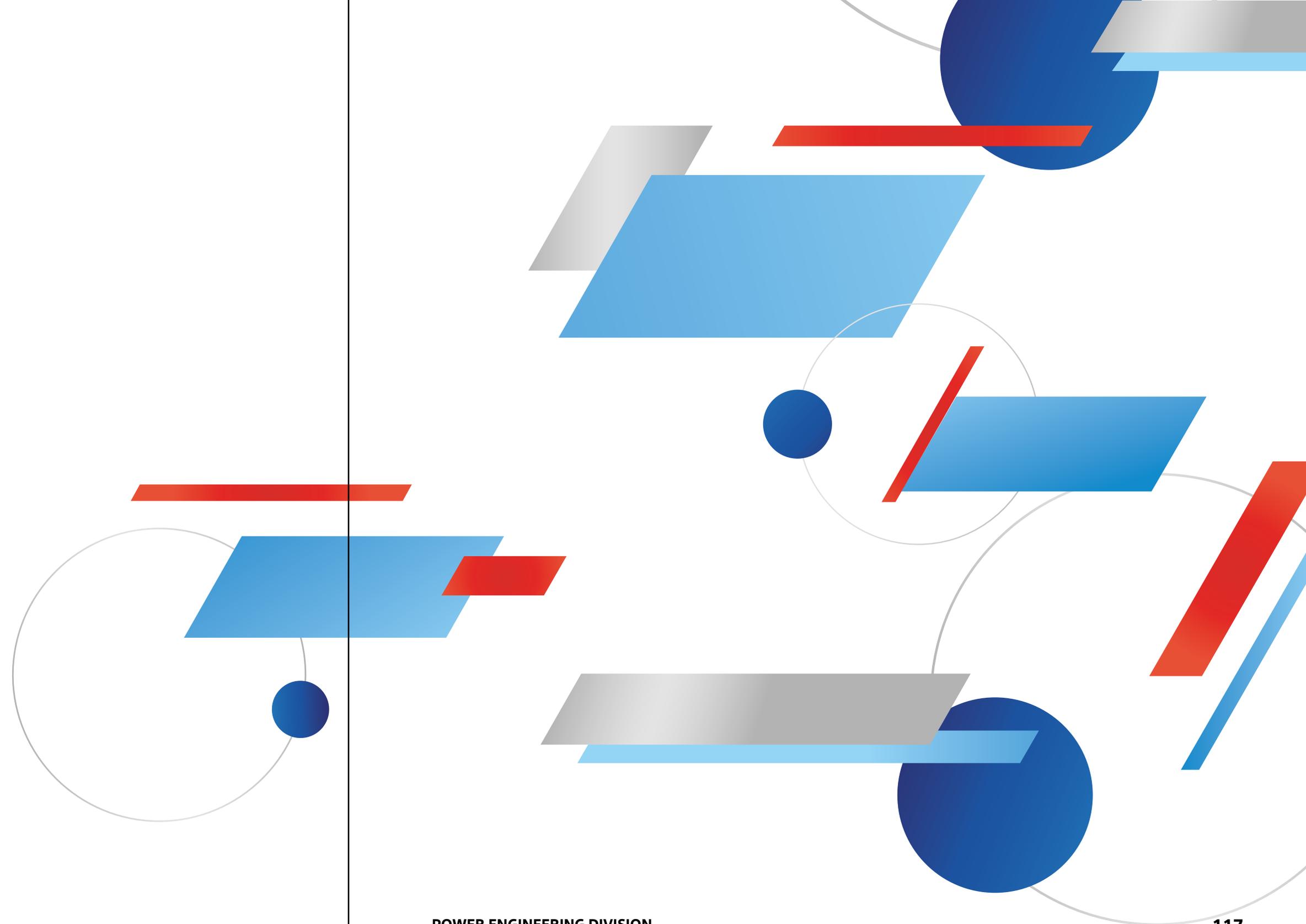
15

The background features a series of parallel diagonal stripes in various shades of blue and red, creating a sense of movement and depth. The stripes are of varying widths and are layered, giving the impression of a 3D architectural or industrial design. A thin vertical line runs down the center of the page, separating the text area on the left from the graphic area on the right.

The preparation of reporting materials for 2019 (hereinafter referred to as the reporting materials) involved a review of the Company's performance in 2019 and a questionnaire survey among stakeholders to amend the list of material topics to be disclosed in the reporting materials.

As in the past, safe NPP operation remains the prioritized topic for the Division. The reporting materials have been prepared in accordance with the Core option of the GRI Standards.

The reporting materials provide information about the performance of JSC Rosenergoatom and its affiliates. They also provide information about the Power Engineering Division, including its subsidiaries. The reporting materials disclose performance indicators of JSC Rosenergoatom for the period from January 1, 2019 through December 31, 2019 and information on long-term development areas and measures providing a framework for long-term sustainable development. Draft reporting materials were approved by stakeholders during remote discussions (which involved circulating the materials, collecting, analysing and incorporating comments).



15.1. CONTACT DETAILS

ROSENERGOATOM, JOINT-STOCK COMPANY (JSC ROSENERGOATOM)

Postal address: 25 Ferganskaya Street, Moscow, 109507

Phone number: +7 (495) 647-41-89

Fax: +7 (495) 926-89-30

E-mail: info@rosenergoatom.ru

Corporate website: www.rosenergoatom.ru

JSC Rosenergoatom on social media:

Facebook: www.facebook.com/rosenergoatom.ru/

Instagram: www.instagram.com/rosenergoatom_ru/

Twitter: www.twitter.com/Rosenergoatom/

Vkontakte: www.vk.com/rearu/

Telegram: www.t.me/spark_news

YouTube: www.youtube.com/c/RosenergoatomOfficial/

