State Atomic Energy Corporation
Rosatom

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REPORT PROFILE

The Public Report of State Atomic Energy Corporation Rosatom (hereinafter referred to as the Corporation or ROSATOM) for 2018 (the Report) has been prepared on a voluntary basis and is intended for a broad range of stakeholders.

The Report focuses on the contribution of Russian nuclear technology to improving the quality of people’s lives and preserving the environment; this topic has been selected by the top management and representatives of key stakeholders.

STANDARDS AND REGULATORY REQUIREMENTS

The Report has been prepared in accordance with:

— The Public Reporting Policy and the Public Reporting Standard of ROSATOM and its organizations;
— The International Integrated Reporting Framework (International <IR> Framework);
— The Global Reporting Initiative Sustainability Reporting Standards (GRI SRS, Core option);
— The AA1000 AccountAbility Standards (AA1000 AP 2018, AA1000 SES 2015);

STAKEHOLDER ENGAGEMENT

To improve transparency and accountability and to determine the materiality of information to be disclosed, the Report was prepared in cooperation with stakeholders in accordance with international standards (AA1000SES, the GRI Standards and the International <IR> Framework). To identify material topics to be disclosed in the Report, a poll was carried out and two dialogues with stakeholders were held, including public consultations on the draft Report. The Report incorporates key recommendations and requests voiced by stakeholder representatives during these dialogues.

For details on the Report and the process of determining its content, see Appendix 1.
ROSATOM is Russia’s largest power generation company and a leading player on global markets for nuclear technologies. It is developing new businesses in order to improve the quality of people’s lives.
ROSSATOM TODAY

**No. 1** in the world in terms of the number of NPP power units in the portfolio of foreign projects (36 power units)

**No. 1** in the world in terms of uranium enrichment (36% of the global market)

**No. 2** in the world in terms of uranium resources (520,700 tonnes in Russia and 197,100 tonnes abroad) and production (7,289 tonnes)

**No. 3** in the world in terms of nuclear fuel fabrication (17% of the global market)

**RUB 9.2 bln** expenditure on corporate social programmes for employees in 2018

**RUB 24.2 bln** expenditure on environmental protection in 2018

**255,400** employees

**335** organizations and enterprises within the Corporation

**18.7%** share in power generation in Russia

**The world’s only nuclear-powered icebreaker fleet**

ROSSATOM’S VALUES

EFFICIENCY

ONE STEP AHEAD

ONE TEAM

SAFETY

RESPECT

RESPONSIBILITY

FOR THE RESULT

ROSSATOM IN 2018

No. 1 in the world in terms of the number of NPP power units in the portfolio of foreign projects (36 power units)

No. 1 in the world in terms of uranium enrichment (36% of the global market)

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255,400 employees

335 organizations and enterprises within the Corporation

18.7% share in power generation in Russia

**The world’s only nuclear-powered icebreaker fleet**
**KEY RESULTS IN 2018**

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2018 vs 2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusted free cash flow of ROSATOM, RUB billion</td>
<td>263.6</td>
<td>308.7</td>
<td>321.5</td>
<td>+4.1%</td>
</tr>
<tr>
<td>Increase in consolidated labour productivity vs 2011 (in current prices, excluding the Nuclear Weapons Division), %</td>
<td>110.9</td>
<td>134.3</td>
<td>150.4</td>
<td>▲</td>
</tr>
<tr>
<td>Power generation, billion kWh</td>
<td>196.4</td>
<td>202.9</td>
<td>204.3</td>
<td>+0.7%</td>
</tr>
<tr>
<td>Unit semi-fixed costs (as a percentage of revenue), %</td>
<td>27.0</td>
<td>24.9</td>
<td>24.6</td>
<td>▼</td>
</tr>
<tr>
<td>Performance against the targets of JSC Rosenergoatom Concern’s 10-year portfolio of orders for new products (outside the scope of the Corporation), RUB billion</td>
<td>133.4</td>
<td>133.5</td>
<td>133.2</td>
<td>▲</td>
</tr>
<tr>
<td>Revenue from new products (outside the scope of the Corporation), RUB billion</td>
<td>692.8</td>
<td>814.1</td>
<td>1,082.6</td>
<td>+33.0%</td>
</tr>
<tr>
<td>Integrated innovation KPI, %</td>
<td>111.7</td>
<td>106.6</td>
<td>114.4</td>
<td>▲</td>
</tr>
<tr>
<td>Fulfilment of government orders, %</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>▲</td>
</tr>
<tr>
<td>Number of events rated at level 2 or higher on the INES scale</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>▲</td>
</tr>
</tbody>
</table>

**KEY EVENTS IN 2018**

- Under a newly adopted federal law, ROSATOM was assigned the functions of the infrastructure operator of the Northern Sea Route.
- A Uniform Digital Strategy and a Road Map for the Digital Transformation of the Russian Nuclear Industry were approved. The first replicable digital product was unveiled: Logos Aero-Hydro, an industrial 3D modelling tool.
- A concession agreement was signed on the construction and operation of the radiology department building of the East Siberian Cancer Centre in Irkutsk.
- A single industry-wide plan of R&D topics was drafted in order to accelerate scientific research and development in high-priority areas.
- The team of the Russian nuclear industry finished first in the unofficial team standings of the WorldSkills Hi-Tech 2018 National Competition of cross-industry skilled professions for workers in high-technology industries.
- No events rated at level 2 or higher on the international INES scale were detected at nuclear facilities (level 1 and 0 deviations do not pose a risk to employees operating the facilities, local residents or the environment).

**PERFORMANCE OF STATE ATOMIC ENERGY CORPORATION ROSATOM IN 2018**

- Power unit No. 4 of Rostov NPP and power unit No. 1 of Leningrad NPP-2 started commercial operation.
- Electricity output at 37 power units of 10 operating NPPs totalled 204.3 billion kWh, reaching a new all-time high in the history of Russian nuclear power generation. The share of NPPs in Russia’s energy mix totalled 18.7%.
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Dear colleagues,

2018 marked yet another important milestone in the development of the Russian nuclear industry. ROSATOM achieved all key performance targets set by the Supervisory Board.

The peaceful use of nuclear energy has traditionally been a safe and affordable source of energy driving the country’s economic development. Nuclear power plants make up a significant portion of power generation in Russia. At the same time, nuclear technologies introduced by ROSATOM provide unprecedented opportunities for the development of unique materials and products, digital and infrastructure solutions and their wider use. Nuclear technologies play an increasingly important role in healthcare, agriculture, mechanical engineering, transportation and the development of natural resources. ROSATOM actively cooperates with its partners and offers them reliable high-quality solutions.

Today, in order to be successful, a global organization should not only maintain a strong operating and financial performance, but also contribute to improving the quality of people’s lives and addressing environmental problems. These guiding principles are reflected in the Sustainable Development Goals set by the United Nations. The nuclear industry has a potential to play a major role in the achievement of these goals, as, in addition to a reliable source of clean energy that makes an important contribution to the fight against climate change, the Russian nuclear industry also provides a whole ecosystem of technologies that promote people’s well-being and help to preserve the environment.

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In 2018, ROSATOM was set a new major task of developing the Northern Sea Route. The Corporation is currently upgrading and modernizing its icebreaker fleet; the construction of three new multipurpose nuclear icebreakers is underway. These icebreakers will escort vessels as part of Russia’s major projects in the Arctic. At the same time, our global aim is to transform the Northern Sea Route into an international transport corridor that will provide new opportunities for international trade and mutually beneficial exchange of goods between different nations.

For us, 2018 was a year of well-coordinated and fruitful work, whose outcomes are presented in this report.

We continued to increase power generation at nuclear power plants in Russia, reaching 204.3 billion kWh. This growth was driven, among other things, by the launch of new capacities. 2018 saw the start of operation of power unit No. 4 of Rostov NPP and power unit No. 1 of Leningrad NPP-2. Later, in April 2019, we began the power start-up of power unit No. 2 of Novovoronezh NPP-2, which will be the third generation of power unit meeting the latest technological standards. The highlight of the year was the first criticality stage at the reactor units of the Akademik Lomonosov floating nuclear power plant (FNPP), followed by their ramp-up to a level sufficient for power generation. The FNPP is an innovative Russian solution that is unparalleled in the world. It is designed to provide power supply in the Far North, on islands and in other remote areas. After it is put into operation, the floating FNPP will supply electricity and heat to 50,000 people and to industrial enterprises in Chukotka.

ROSATOM continued to fulfill its contractual obligations related to overseas projects. The power start-up of power unit No. 4 was completed at Tianwan NPP. Concreting started at the sites of power unit No. 2 of Rooppur NPP in Bangladesh and power unit No. 1 of Akkuyu NPP in Turkey. ROSATOM’s portfolio of overseas projects helps it to assert its global leadership in the sphere of technologies for VVER reactors and for the entire NPP life-cycle.

At the same time, we have set ourselves an ambitious goal of becoming a world leader not only in the nuclear power segment, where ROSATOM has a long-standing presence, but also in a number of other areas that are relatively new to us. These include the manufacture of composite materials, such as carbon fibre, with ROSATOM already having extensive expertise in this field. Our key aim in this area is to create a complete production chain in Russia to ensure import substitution at all processing stages and for all types of materials. Environmental projects may become another major area. In 2018, ROSATOM was appointed as federal operator responsible for the management of hazard class 1 and 2 industrial waste in Russia, and we will develop capabilities enabling us to be competitive not only on the national level but also globally.

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We work continuously to improve our business processes and adopt new technologies, including digital solutions. In 2018, ROSATOM was the first among state-owned corporations and partially state-owned companies to develop a unique Digital Strategy. The aim of the strategy is to improve ROSATOM’s internal performance, develop new digital products and put them on the market, and contribute to the digitization of the Russian economy.

A vital prerequisite for achieving these ambitious goals is to unlock the potential of our human resources and support continuous development of professional and personal capabilities of employees of our organizations and enterprises. ROSATOM has become a national partner of WorldSkills, an international movement whose aim is to support professional development of blue-collar workers and engineers. A personnel development, continuous training and career management system is in place in the industry. As part of our international projects, we take active steps to export Russian nuclear education to partner countries. I am convinced that by continuing its focused efforts in this area, ROSATOM will become a leader in terms of unlocking the potential of its employees.
ADDRESS BY A STAKEHOLDER REPRESENTATIVE

Dear colleagues,

I welcome the publication of ROSATOM’s latest public annual report.

As far back as a decade ago, ROSATOM launched a voluntary initiative to disclose information on its operations in line with national and international best practice. This enables a wide range of ROSATOM’s stakeholders to obtain complete and reliable information on its performance, analyse changes in its indicators and gain an understanding of the development prospects of the Russian nuclear industry.

The launch of a number of national projects was one of the highlights of 2018, and I am happy to note that ROSATOM has become their active participant. The report for 2018 is focused on the contribution of Russian nuclear technology to improving the quality of people’s lives and preserving the environment. This topic is closely aligned with the goals and objectives of the national projects, whose primary aim is to promote the well-being of Russian people.

In the context of results presented in the report, I would like to highlight ROSATOM’s commitment to developing the regions of its operation, including closed administrative and territorial formations. ROSATOM works continuously and successfully towards establishing priority social and economic development areas in ‘nuclear’ towns and cities in order to support the launch of new manufacturing enterprises and job creation and encourage investment in these regions.

Special mention should be made of the Lean Polyclinic. This project is aimed at improving the quality of healthcare services in the towns and cities of ROSATOM’s operation through the use of lean techniques. The success of the project is clearly reflected by the fact that by now, it has been expanded beyond ‘nuclear’ towns and cities: it has received recognition on the federal level and is being implemented in dozens of regions across Russia.

Finally, I must mention a wide range of social, infrastructure and volunteer projects carried out by ROSATOM. These projects not only help to address issues faced by regions and individuals, but also reflect the commitment of ROSATOM as a major business to the standards of responsible and ethical conduct.

I would like to wish ROSATOM and its employees every success in achieving the goals and objectives set for 2019!

— ALEXEI DMITRIENKO
Member of the Council of the Federation Committee on Economic Policy

FINANCIAL AND ECONOMIC RESULTS

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2018/2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>878.1</td>
<td>967.8</td>
<td>1033.9</td>
<td>+6.8%</td>
</tr>
<tr>
<td>Assets</td>
<td>3,238.7</td>
<td>3,437.7</td>
<td>3,798.1</td>
<td>+10.5%</td>
</tr>
<tr>
<td>Intangible assets</td>
<td>117.6</td>
<td>103.5</td>
<td>194.0</td>
<td>+87.4%</td>
</tr>
</tbody>
</table>

A 6.8% increase in revenue compared to 2017 was driven mainly by an increase in overseas orders for NPP construction and growing revenue from sales of electricity and new products (including sales of composite materials, security systems and NPP maintenance services abroad).

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return on sales (ROS)</td>
<td>8.53</td>
<td>10.81</td>
<td>20.05</td>
</tr>
<tr>
<td>Return on assets (ROA)</td>
<td>2.34</td>
<td>3.04</td>
<td>5.46</td>
</tr>
<tr>
<td>Return on equity (ROE)</td>
<td>3.49</td>
<td>4.59</td>
<td>8.35</td>
</tr>
</tbody>
</table>

Profitability ratios increased in 2018 primarily due to a year-on-year increase in profit.

For more information on the financial and economic performance of the Corporation’s Divisions, see the 2018 annual reports of JSC Atomenergo Prom, JSC Atomredmetzoloto, JSC TVEL, JSC TENEX, JSC Atomenergomash, JSC ASE EC and JSC Rosenergoatom Concern.
In the course of its business, ROSATOM gives special focus to promoting long-term and sustainable development.
The trend towards a decrease in the weighted average cost of electricity for renewable energy sources will continue until 2025. Subsequently, the LCOE is projected to reach the following levels:

- USD 40-45 / MWh for onshore wind power plants;
- USD 60-63 / MWh for solar power plants;
- USD 70-79 / MWh for offshore wind power plants.

By contrast, the LCOE for conventional thermal power plants is expected to follow the opposite trend given the global efforts to reduce CO₂ emissions:

- An increase to USD 81-83 / MWh for coal-fired power plants;
- An increase to USD 86-88 / MWh for gas-fired power plants on the strategic horizon.  

### 2.1. BUSINESS STRATEGY UNTIL 2030

**IGOR ERMAKOV,**
Director of the Strategic Management Department

— Could you provide some details on the Corporation’s strategic priorities in 2018? What progress was made in achieving them?

— In 2018, ROSATOM set seven high-priority objectives that became a focus for the entire industry. These included improving the efficiency of NPP construction, enhancing horizontal cooperation, developing scientific research and technologies, ensuring safety, digitization, developing new businesses and accomplishing government objectives in the Arctic.

Over the past year, ROSATOM made significant progress in each of these areas. Here are some key examples: cargo transportation along the Northern Sea Route reached a record high; organizational transformation was launched in the Engineering Division; a Uniform Digital Strategy was developed and approved; a single industry-wide plan of R&D topics was drafted. These and numerous other achievements are crucial for further successful development of the industry, and we intend to continue working in these areas.

Our long-term objective is to remain a global technological leader in nuclear power generation and related sectors. At the same time, the key feature of a technological leader is that it outperforms its rivals in high-technology product segments. Therefore, we will focus on developing advanced technologies, including those that can shape major new markets and set new quality standards.

### 2.1.1. BUSINESS CONTEXT TRENDS IN THE DEVELOPMENT OF THE NUCLEAR INDUSTRY

The nuclear industry is influenced by a number of factors, including:

— Global population growth from 7.4 billion people in 2018 to 10 billion people in 2050 and an increase in the share of urban population from 54-55% to 68% by 2050;
— Steady increase in global GDP for about 3% per year;
— Growth of global electricity consumption. By 2035, global electricity consumption is expected to increase by 37 TWh. Asian countries will lead the growth, with electricity consumption in the region increasing by a factor of 1.7 (from 13 TWh to 22 TWh).

In Russia, electricity consumption is expected to grow by 1.4% per year until 2035; an increase to USD 86-88 / MWh for gas-fired power plants on the strategic horizon.

### 2.2. NUCLEAR POWER FACILITIES UNTIL 2035

Growth of global electricity consumption. By 2035, global electricity consumption is expected to increase by 37 TWh. Asian countries will lead the growth, with electricity consumption in the region increasing by a factor of 1.7 (from 13 TWh to 22 TWh). In Russia, electricity consumption is expected to grow by 1.4% per year until 2035:

— Increase in greenhouses gas accumulation. Global carbon dioxide emissions total about 33 billion tonnes per year and continue to grow. By 2035, carbon dioxide emissions are projected to exceed 35 billion tonnes per year. This drives active development of carbon-neutral electricity generation, which includes the nuclear power industry.

In recent years, environmental aspects of the electricity industry have come under closer scrutiny, which has resulted in an increase in the share of zero-carbon power in the global energy mix. In developed countries, the levelized cost of electricity (LCOE) for renewable energy sources has almost matched that of conventional power generation facilities, ranging from USD 60 to USD 80 per megawatt-hour.

The Fourth Industrial Revolution that is currently underway across the world makes a significant impact on both global and local businesses. Its key elements, which ROSATOM takes into account when updating its business strategy, include:

- Large-scale automation of production through active introduction of manufacturing solutions based on fully automated machine work;
- Customization of production in order to fully meet the customers’ individual needs;
- Consolidation of manufacturing enterprises into integrated ‘smart’ networks and the development of the Internet of Things in the manufacturing industry, which involves the fullest possible digitization of information exchange;
- Accelerated development and commercialization of technologies; a shorter life cycle of technologies and products;
- Development of flexible project management systems.

### 2.2.1. MARKET TRENDS IN THE NUCLEAR INDUSTRY

#### 2.2.1.1. BUSINESS CONTEXT

**TRENDS IN THE DEVELOPMENT OF THE NUCLEAR INDUSTRY**

- Growth of global electricity consumption. By 2035, global electricity consumption is expected to increase by 37 TWh. Asian countries will lead the growth, with electricity consumption in the region increasing by a factor of 1.7 (from 13 TWh to 22 TWh).
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RETAINING THE ROLE IN BASE LOAD GENERATION

Low concentration of capacity

<table>
<thead>
<tr>
<th>NPPs</th>
<th>1–3</th>
<th>10–160</th>
<th>670–930</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>0.1</td>
<td>0.03</td>
<td>0.2</td>
</tr>
<tr>
<td>Yield</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Value</td>
<td>0.3</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>Yield</td>
<td>10</td>
<td>9</td>
<td>8</td>
</tr>
</tbody>
</table>

The potential for the use of renewable energy sources in the power grid is limited by a number of fundamental factors

Source: WNA

These factors and trends, as well as a reduction of fossil fuel reserves, contribute to the long-term demand for nuclear energy. Leading global think tanks predict an increase in installed capacity in the nuclear power industry by 2030. The International Energy Agency, UxC consulting company and the World Nuclear Association expect to see an increase in the capacity of operating NPPs under the base case scenario to 450-500 GW, according to different estimates.

The global nuclear power industry will remain competitive in the long run compared to other energy sources. Thermal power generation will yield to nuclear energy primarily because of CO₂ emissions, which have a negative impact on the environment and drive up the cost of energy since many countries impose CO₂ emission fees. Unpredictable prices for raw hydrocarbons are yet another major disadvantage of thermal power generation.

Regarding renewable energy, even if energy generation becomes significantly cheaper, further traditional backup facilities or energy storage systems will need to be built to secure stable supplies of energy. This, in turn, will entail an increase in capital expenditure on the power grid.

RATIO’s COMPETITIVE POSITION

RATIO’s competitive advantages:

— Integrated offer for the entire NPP life cycle, which guarantees a competitive cost per kilowatt-hour (LCOE);
— Use of reference technologies with the highest possible safety level;
— Assistance in securing project funding (including under the BOO scheme) and building project infrastructure (legal framework, employee training, community relations, etc.).

The competitiveness of services provided by RATIO is based on unique facilities, technical capabilities and human resources, as well as the experience of coordinating R&D and design organizations. The Russian nuclear industry is one of the global leaders in terms of research and development in reactor design, capabilities and technologies in the nuclear fuel cycle and in the sphere of NPP operation. Russia has the most advanced enrichment technologies in the world; nuclear power plants with water cooled-water moderated power reactors (VVERs) have proved their reliability over one thousand reactor-years of fail-free operation. The high quality of products and services offered by RATIO is confirmed by successful participation in international tenders for the supply of nuclear fuel and construction of NPPs abroad. Currently, RATIO is the largest global player in terms of the number of approved NPP construction projects: its portfolio of overseas orders comprises 36 power units.

2.1.2. LONG-TERM STRATEGIC GOALS

RATIO’s strategy until 2030 was developed based on the goals set by the state for the civilian branch of the Russian nuclear industry and was approved by RATIO’s Supervisory Board on October 31, 2014.

The development of RATIO is based on the long-term technological policy, which involves mastering new-generation nuclear technologies (including fast neutron reactors and the closed nuclear fuel cycle), as well as strengthening the export potential of Russia’s nuclear technologies (construction of nuclear power plants abroad, rendering uranium and nuclear fuel enrichment services, etc.).

ROSATOM has set itself three long-term strategic goals to be achieved by 2030:
— To increase the international market share. To assert its leadership on the global nuclear power market, the Corporation is currently participating in international tenders for the supply of nuclear fuel and construction of NPPs abroad.
— To reduce production costs and the lead time. In order to develop the most competitive products, the Corporation will take further steps to reduce the duration of NPP construction and the leveled cost of electricity (LCOE).
— To develop new products for the Russian and international markets.

Given the accumulated knowledge and technologies of the ‘nuclear project’ in civilian sectors, the Corporation plans to increase the share of new businesses in revenue significantly by 2030.

In order to implement the strategy, the following objectives must be met:
— Ensuring safe use of nuclear energy;
— Non-proliferation of nuclear technologies and materials;
— Reducing the negative environmental impact to zero;
— Ensuring that the development of nuclear power is socially acceptable;
— Developing the Corporation’s innovative potential;
— Shaping a corporate culture focused on results and performance improvement;
— Ensuring that the state defence order is fulfilled;
— Ensuring full compliance with Russian legislation, including the Law on State Secrets.
2.1.3. CONTRIBUTION OF THE 2018 RESULTS TO THE ACHIEVEMENT OF STRATEGIC GOALS

STRAategic GOAL

Increase of the international market share

RESULTS AND KEY EVENTS OF 2018

The 10-year portfolio of overseas orders totalled USD 133.2 billion. The portfolio of overseas orders covering the entire NPP life cycle totalled USD 202.4 billion. Overseas revenue reached USD 6.5 billion.

Consolidated operational expenditure was offset partially by 10% of the cost of the nuclear fuel cycle product and service market and reputational risks; include:

— Operational risks (including the risk of losing critical knowledge of existing and newly created products);
— Political risks;
— Technical (project) risks;
— Technological risks (including the risk of shortcomings in technology).

Operational risks (including the risk of losing critical knowledge of existing and newly created products); include:

— Nuclear and radiation risks;
— Economic risks (including financial risks, such as currency, interest rate and credit risks, etc.);

Commercial risks (including risks associated with the nuclear fuel cycle product and service market and reputational risks).

2.2. SUSTAINABLE DEVELOPMENT AGENDA

KIRILL KOMAROV,
First Deputy Director General for Corporate Development and International Business

— The global business community has been working to incorporate the principles of sustainable development in its activities for quite a long time already, but for Russia this is a relatively new trend. Do you think that the global sustainable development agenda has any impact on ROSATOM’s business?

— Today, adherence to the principles of sustainable development is becoming a necessary prerequisite for operating on foreign markets. This includes, for example, contractual requirements for the sustainability of the supply chain set by our customers, or the opportunity to receive financing from organizations committed to supporting sustainable projects. Sustainable development has already become a kind of a criterion for the global competitiveness of a business.

Our foreign partners have been promoting corporate practices of sustainable development for as long as 15 to 20 years; moreover, in Europe, the basic requirements for businesses in this area have been reflected in legislation. Russia has not yet made much progress in introducing these requirements, but most industrial companies have already started working in this direction. These may be individual projects or business initiatives, such as reducing water and electricity consumption for operational needs. Companies are also actively adopting a practice of using indicators reflecting progress in sustainable development, such as the calculation of CO₂ emissions, the share of investments in innovation, indicators reflecting the level of social protection of employees and their families.

I am convinced that, as a global high-technology company and a leader in its sector, ROSATOM certainly needs to meet high standards of sustainable development. This will not only help to enhance its image, but also will give it a competitive edge in the industry. By consistently incorporating the principles of sustainable development into its business processes and strategic agenda, ROSATOM will be able to reach a new level of dialogue with stakeholders in Russia and abroad and to identify key areas for developing and strengthening its competences.

— How would you rate ROSATOM’s maturity in terms of sustainable development, and what international practices can be useful for developing its competences in this area?

— Sustainable development is a integral to ROSATOM’s business. Nuclear power generation intrinsically contributes to the implementation of the global sustainable development agenda, as it is a stable and environmentally friendly source of power. However, we are aware of the need to improve our sustainable development performance and are actively working to strengthen our practices in this area. Our foreign partners have been promoting corporate practices of sustainable development for as long as 15 to 20 years; moreover, in Europe, the basic requirements for businesses in this area have been reflected in legislation. Russia has not yet made much progress in introducing these requirements, but most industrial companies have already started working in this direction. These may be individual projects or business initiatives, such as reducing water and electricity consumption for operational needs. Companies are also actively adopting a practice of using indicators reflecting progress in sustainable development, such as the calculation of CO₂ emissions, the share of investments in innovation, indicators reflecting the level of social protection of employees and their families.
electricity and provides a foundation for long-term economic growth of a customer country as a whole. In addition to a full cycle of nuclear energy products, ROSATOM’s product portfolio includes such areas as nuclear medicine, solutions for water treatment and desalination, wind power and composite materials. Each of them contributes directly to the achievement of the relevant UN Sustainable Development Goals. A number of ‘sustainable’ policies and standards are in place in the industry: the Environmental Policy, the Social Policy, the Code of Ethics, the Procurement Policy, the Procurement Standard, etc.

Thus, ROSATOM has already accumulated significant capital in the field of sustainable development. In order to take the next step, it is important to systematize this experience and determine the focus of our future efforts. As we draw on the experience of our foreign colleagues and are aware of the fundamental prerequisites for compliance with ‘sustainability’ requirements, we attach special importance to monitoring progress on key indicators of ROSATOM’s ESG activities. These are activities in the fields of ecology and environment (E standing for Environment), social impacts (S stands for Social) and the quality of the governance system (G stands for Governance). ROSATOM works to improve its ESG profile and at the same time focuses on supporting an open dialogue with a wide range of stakeholders, including customers, financial institutions, business partners, employees in the industry, the local population and government representatives.

It is worth noting that, in its efforts to develop sustainability practices, ROSATOM is willing to share its experience with its Russian and foreign business partners, employees in the industry and the local population. The safety of technological solutions, working conditions and the environment is a priority for the industry.

The industry’s product portfolio comprises not only conventional solutions in the sphere of nuclear power but also new areas involving the use of nuclear technology, such as nuclear medicine, radiation processing facilities, nuclear research and technology centres based on research reactors, etc. In addition, the Corporation is developing its business in a number of related non-nuclear areas: water treatment, wind power, polymer composite materials, etc.

In general, ROSATOM’s activities have an impact on the implementation of all 17 Sustainable Development Goals (SDGs) adopted by the UN in 2015. Given the scope of the Corporation’s impacts and the special features of its business, the key SDGs are:

<table>
<thead>
<tr>
<th>SDG</th>
<th>Contribution of ROSATOM’s Technologies to the Achievement of the Sustainable Development Goals</th>
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<tr>
<td>3</td>
<td>Nuclear power generation is a source of clean energy that provides considerable environmental benefits. The operation of all Russian-design NPPs globally helps to prevent carbon emissions totaling about 560 million tonnes per year. According to the International Energy Agency, the global nuclear power industry as a whole accounted for 12.5% of the total amount of CO2 emissions prevented in 2018. ROSATOM also expands the carbon-free power generation chain and offers solutions in the wind power segment.</td>
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<td>9</td>
<td>The construction and operation of an NPP provides employment for several thousand people at a plant itself and the region. The development of nuclear infrastructure, and national companies in a customer country are guaranteed production capacity utilisation on more than a few decades. In addition, the relevant infrastructure is formed, and fundamental and applied science and a national personnel training system is developed.</td>
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<tr>
<td>17</td>
<td>In its production processes, the Corporation focuses on building a ‘sustainable’ supply chain. ROSATOM’s Production System has been developed and implemented in the industry. It is aimed at promoting a lean manufacturing culture. A quality management system has been introduced, and the ISO 14001 and ISO 9001 international standards are applied.</td>
</tr>
<tr>
<td>18</td>
<td>In NPP construction and operations projects, a special focus is given to the management of spent nuclear fuel (SNF), SNF processing products and radioactive waste (RAW) generated in the course of operation, as well as to the decommissioning of facilities posing nuclear and radiation hazards. The Corporation’s waste management efforts are focused on preserving the environment and improving environmental safety.</td>
</tr>
<tr>
<td>13</td>
<td>The sustainable development agenda is also actively discussed on specialized international platforms of the WNA and the IEA. In addition to traditional nuclear business platforms, ROSATOM is an active participant in the dialogue on sustainable development topics at the World Energy Council, the Clean Energy Ministerial (NICE Future), in the OECD, etc.</td>
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Area of Activity

**Sustainable Development Goals**

**Sustainable development**

**Contribution of ROSATOM’s Nuclear Technologies to the Achievement of the Sustainable Development Goals**

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For details, see the sections ‘Power Engineering Division’, ‘International Business’ and Markets Served by ROSATOM.

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For details, see the sections ‘International Business’, ‘Developing the Regions of Operation’ and ‘Implementation of the HR Policy’.

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For details, see the sections ‘International Cooperation’ and ‘Stakeholder Engagement’.

**2.2.1. Nuclear Technology for Sustainable Development**

Nuclear technology drives positive systemic changes in the quality of people’s life. As it develops its business in Russia and on foreign markets, ROSATOM is committed to promoting long-term and sustainable development taking into account the special characteristics of each region. The safety of technological solutions, working conditions and the environment is a priority for the industry.

The industry’s product portfolio comprises not only conventional solutions in the sphere of nuclear power but also new areas involving the use of nuclear technology, such as nuclear medicine, radiation processing facilities, nuclear research and technology centres based on research reactors, etc. In addition, the Corporation is developing its business in a number of related non-nuclear areas: water treatment, wind power, polymer composite materials, etc.

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- **SDG 3**: **Clean energy**
- **SDG 9**: **Industry, innovation and infrastructure**
- **SDG 13**: **Climate action**
- **SDG 17**: Partnerships for sustainable development
The economic impact of the nuclear industry consists primarily in providing electricity supply to households and enterprises in the regions, paying taxes and creating decent working conditions.

In 2018, NPPs accounted for 19% of the total electricity output in Russia as a whole and 25% in European Russia. In 2018, the Corporation and its organizations paid RUB 188.2 billion in taxes, including RUB 71.4 billion to the budgets of the federal subjects of Russia and local budgets. In 2018, the average salary in organizations of the industry amounted to RUB 76,000 (to compare, in 2018, the average salary in Russia totalled RUB 43,703).

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For details, see the section ‘Digital Products’.

For details, see the section ‘Developing the Regions of Operation’.

2.2.3. FULFILMENT OF GOVERNMENT PRIORITIES IN THE SPHERE OF SUSTAINABLE DEVELOPMENT

ROSTATOM, along with federal executive bodies, is committed to the achievement of national goals and priorities in the sphere of sustainable development, including those stipulated in Executive Order No. 324 of the President of the Russian Federation on National Goals and Strategic Objectives of the Russian Federation until 2024 dated May 7, 2018.

The Corporation is directly involved in work on four national projects: Ecology, Digital Economy, the Comprehensive Infrastructure Development Plan, and Increasing Labour Productivity; it is also a participant in individual initiatives forming part of the Education, International Cooperation and Export, and Healthcare national projects. All of these national projects are focused on fulfilling the priorities of sustainable development in Russia.

2.3. VALUE CREATION AND BUSINESS MODEL

ROSTATOM manages the assets of the Russian nuclear industry at all stages of the nuclear fuel cycle, the cycle of NPP construction, operation and decommissioning and in other segments related to the use of nuclear energy. Realizing the importance of its operations for the economy and society, ROSTATOM seeks to develop its business sustainably, including by increasing its total value for the Corporation and a wide range of its stakeholders.

The term ‘value’ refers not only to products created, services rendered and financial results achieved by ROSTATOM, but also to the combination of economic, social and environmental impacts of ROSTATOM on its stakeholders, society as a whole and the environment.

ROSTATOM defines the business model as a system that enables value creation in the short, medium and long term and is aimed at achieving strategic goals.

In the social sphere, the Corporation is implementing a wide range of projects aimed at supporting employees in the industry and residents of ‘nuclear’ towns and cities and promoting public initiatives.

Examples of such projects include:

— ROSTATOM’s School, which is aimed at providing children with first-class education regardless of where they live and preparing and developing the unique character of municipal education systems;

— The Lean Polyclinic project, which is aimed at improving the performance of healthcare institutions and the overall accessibility of healthcare services through the use of RPS tools;

— ROSTATOM’s Territory of Culture programme, which introduces the best works of art and supports local initiatives in the towns and cities where nuclear facilities are located.

The Lean Polyclinic project aimed at improving the quality of healthcare services in CATFs. For details, see the section ‘Developing the Regions of Operation’.

In 2018, the injury rate in nuclear organizations is almost 5 times lower than the national average.

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The business model gives special focus to the external environment because: (a) some of ROSATOM’s available capitals are obtained from the external environment, and many of its results are also related to it; (b) the external environment is a source of risks and opportunities.

The scheme represents an integrated process of value creation. ROSATOM’s business model is at the core of this process; it determines the set of different activities and results that contribute to the change in main types of capitals during the reporting period.

**ROSATOM’S CAPITALS**

ROSATOM’s capitals are one of the main elements of the value chain. In the course of commercial and other activities, they are changed (increased, reduced, transformed), which generally creates value in the medium and long term.

The Corporation defines capitals as specific resources (reserves) of tangible and intangible assets that ROSATOM uses in its operations. ROSATOM acknowledges that some of the available capitals are owned jointly with other stakeholders (e.g., natural resources or public infrastructure). Accordingly, it takes a responsible approach to handling them. ROSATOM identifies six types of capital it uses: financial, manufactured, human, intellectual, social and relationship, and natural. An integral increase or decline in capitals causes an increase or decrease in value; therefore, ROSATOM attaches great importance to managing the capitals available to it and using them more efficiently.
The diagram presents results for 2018 broken down by type of capital:

- **Nuclear-powered icebreaker fleet**
  - 331 VESSELS WERE ESCORTED ALONG THE NORTHERN SEA ROUTE

- **Electricity generation**
  - **ELECTRICITY OUTPUT:** 204.3 BILLION KWH
  - **Uranium Production:** 4,365 TONNES

- **Natural uranium mining (Uranium One)**
  - **URANIUM PRODUCTION:** 4,365 TONNES

- **Power machine engineering (Mechanical Engineering Division)**
  - **Electricity generation (Power Engineering Division)**
  - **ELECTRICITY OUTPUT:** 204.3 BILLION KWH

- **NPP servicing**
  - **Construction of small and medium-power reactors and research reactors**
  - **Services in the back-end segment**

- **Natural uranium mining (Mining Division)**
  - **URANIUM PRODUCTION:** 2,904 TONNES

- **Uranium enrichment and conversion and nuclear fuel production (Fuel Division)**
  - **SIMULTANEOUS CONSTRUCTION OF 6 NPP POWER UNITS AND A FLOATING NUCLEAR POWER PLANT**

- **Russian market**
  - **NEW BUSINESSES IN RUSSIA AND ABROAD**
  - **REVENUE FROM NEW BUSINESSES:** RUB 196.7 BILLION

- **International markets**
  - **10-YEAR PORTFOLIO OF OVERSEAS ORDERS:** USD 133.2 BILLION
  - **FOREIGN REVENUE:** USD 6.5 BILLION

- **Uranium production:** 2,904 TONNES

- **Revenues under IFRS:** RUB 1,033.9 billion

- **Increase in labour productivity compared to 2011 (excluding the Nuclear Weapons Division):** 150.4%

- **Average salary:** RUB 79,000

- **Other results**
  - **Taxes paid to Russian budgets:** RUB 188.2 billion
  - **Expenditure on corporate social programmes for employees:** RUB 9.2 billion
  - **Expenditure on environmental protection:** RUB 24.2 billion
  - **Number of events rated at level 2 or higher on the INES scale:** 0
  - **Internal R&D expenses:** 3% of revenue
ROSATOM defines its vision as a global technological leader and intends to take active steps towards entering new high-technology markets as a leading research and technology company.
3.1. MARKETS SERVED BY ROSATOM

In 2018, ROSATOM ranked:
- First in the world in terms of the number of NPP power units in the portfolio of foreign projects (36 power units);
- First on the global uranium enrichment market (36%);
- Second in the world in terms of uranium production (14% of the market);
- Third on the global nuclear fuel market (17%).

ROSATOM’s vision is to become a global technological leader. Accordingly, the Corporation intends not only to actively develop its business in traditional segments, but also to take active steps towards entering new high-technology markets as a leading research and technology company.

MARKETS SERVED BY ROSATOM AND VALUE CHAINS

One of the key priorities of ROSATOM’s business is to develop globally competitive products that are able not only to effectively replace imports, but also to become leaders on global markets.

3.1. TRADITIONAL MARKETS

NATURAL URANIUM MARKET

Forecast for changes in uranium demand by 2035

After 2011, there was a significant drop in prices on the nuclear fuel cycle front-end markets, including a long-term decline in quotations for natural uranium. Nevertheless, in 2018, there was a trend towards price recovery, which was primarily related to a reduction of uranium oversupply. In the reporting year, average spot market quotations reached USD24.6/lb of U3O8, which is 12% higher than in 2017.

In 2018, global reactor demand for uranium totalled 65,000 tonnes. At the same time, global demand taking into account commercial and strategic stockpiling not intended for current consumption is estimated at 73,000 tonnes.

The uranium market fundamentals remain favourable. In the medium and long term, demand for natural uranium is expected to increase due to the commissioning of new power units at NPPs in China, India and other countries. According to the baseline forecast of the World Nuclear Association (WNA), by 2035, global reactor demand for uranium will increase to 94,000 tonnes.

VALUE CHAIN ON THE MARKET FOR COMPOSITE MATERIALS

Composite materials market: Petrochemicals (acrylonitrile) PAN Carbon fibre Fabric

VALUE CHAIN ON THE MARKET FOR THE MANAGEMENT OF HAZARD CLASS 1 AND 2 WASTE

Waste-management market: Collection and logistics Disposal Treatment Recycling

VALUE CHAIN ON THE NUCLEAR MEDICINE MARKET

Nuclear medicine market: Equipment Isotopes and radiopharmaceuticals R&D

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PERFORMANCE OF STATE ATOMIC ENERGY CORPORATION ROSATOM IN 2018
Natural uranium market overview

In 2018, global production of natural uranium decreased by 9% compared to 2017 and totalled about 53,000 tonnes. Supply from secondary sources (inventories of energy companies and some states, repreparation of depleted uranium hexafluoride, reprocessed uranium, etc.) are estimated at 20,000 tonnes of natural uranium equivalent.

In the reporting year, major uranium producers continued to reduce output and optimize production amid continued market weakness. A number of mining assets were put on care and maintenance (including the McArthur River mine in Canada, which is the world’s largest enterprise with a capacity of about 7,000 tonnes of uranium per year, as well as the Langer Heinrich mine in Namibia). Production decreased in Kazakhstan, the US, Niger and other countries.

According to the UxC forecast, in 2019, global uranium production will total 54,500 tonnes, while supply from secondary sources will total about 19,000 tonnes. Global production of natural uranium is expected to increase by 2035 due to rising demand. Supply from secondary sources will total 6,000 to 7,000 tonnes of natural uranium equivalent in 2035.

A stable group of leaders has emerged on the natural uranium market. At year-end 2018, along with ROSATOM (14% of the global output), the group also comprised NAC Kazatomprom (Kazakhstan, 22%), Orano (France, 11%), an alliance of CNNC and CGN (China, 10%), Cameco (Canada, 7%), BHP (Australia – United Kingdom, 6%), Rio Tinto (Australia – United Kingdom, 5%) and Navoi Mining and Metallurgical Plant (Uzbekistan, 4%). The eight largest market players account for 79% of the total uranium output.

Products sold on the market include uranium hexafluoride (UF₆), uranium conversion services, enriched uranium product (EUP) and the uranium enrichment service measured in separative work units (SWU).

Forecast for changes in demand for uranium conversion services by 2035

According to the baseline scenario of the World Nuclear Association, in 2018, global reactor demand for uranium conversion totalled about 63,000 tonnes.

In 2018, average annual spot quotations on the North American and European markets increased by 90% and 81% respectively, while average annual long-term quotations on these markets increased by 2% and 3% respectively. This was caused by a reduction, suspension and curtailment of production by conversion service providers in response to low demand, as well as by considerable buying activity on the market.

The development of the nuclear industry until 2035 will have a positive impact on the market for uranium conversion services. According to the baseline scenario of the World Nuclear Association, global demand for conversion services will grow to 72,000 tonnes by 2025, 80,000 tonnes by 2030 and 89,500 tonnes by 2035.

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tions fell by 15% (since 2011, quotations for enrichment have dropped by 16% during the year, while long-term quotations declined by 15% in 2018. Given the current situation, the capacity of power generation equipment commissioned annually on the global market may almost double by 2035.

According to ROSATOM’s estimates, global reactor demand for uranium enrichment totalled about 11,000 tonnes of heavy metal (tHM). These include:

- Fuel for light-water reactors requiring uranium enrichment accounting for 7,000 tHM (including over 1,000 tHM of fuel for water-cooled water-moderated power reactors (VVERs));
- Fuel for heavy-water reactors accounting for 4,000 tHM.

As the reactor fleet will be expanding, the demand for fabrication services may increase to 12,000 tonnes by 2030.

According to ROSATOM, in 2018, the global nuclear fuel market capacity (totalled) about 11,000 tonnes of heavy metal (tHM). These include:

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Global suppliers on the fabrication market include Westinghouse, Framatome (formerly AREVA), Global Nuclear Fuel and ROSATOM. Entering new nuclear fuel markets

In 2018, the Corporation continued to take steps towards entering the markets for fuel for Western-design power reactors, and fuel and components for Western-design research reactors. A separate promising area is the manufacture of fuel for fast neutron reactors. In 2018, FSGE MOP completed the manufacture of the first batch of MOX nuclear fuel assemblies for the BN-800 reactor. A contract for the supply of uranium fuel for the Chinese CF6-600 unit was concluded.

The Corporation continues to implement the ‘Proximity’ (Breakthrough) Project. It involves building a fuel fabrication and refabrication module and the BWX-600 fuel neutron reactor, which will use mixed nitride uranium-plutonium fuel. See also the section ‘Research and Innovations’.

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POWER MACHINE ENGINEERING MARKET

The modern power machine engineering market is characterized by long lead times, high capital intensity and design for manufacturability. The global power machine engineering market is affected by the trends in the development of the global electricity industry (improved energy efficiency, environmental programmes, etc.) and the commissioning of new-generating capacities.

According to preliminary estimates, in 2018, the total volume of the global market for commissioned power generation equipment, including the volume of the modernized capacity market, increased by 10.4%. The shares of commissioned power generation equipment are distributed as follows: equipment for increasing the renewable energy capacity accounts for the largest share (57.4%), while the shares of equipment for thermal power generation, hydropower and the nuclear power industry stand at 33.8%, 6.5% and 2.3% respectively. Analysts estimate that if this growth rate is maintained, the capacity of power generation equipment commissioned annually on the global market may almost double by 2035.

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POWER MACHINE ENGINEERING MARKET

The modern power machine engineering market is characterized by long lead times, high capital intensity and design for manufacturability. The global power machine engineering market is affected by the trends in the development of the global electricity industry (improved energy efficiency, environmental programmes, etc.) and the commissioning of new-generating capacities.

According to preliminary estimates, in 2018, the total volume of the global market for commissioned power generation equipment, including the volume of the modernized capacity market, increased by 10.4%. The shares of commissioned power generation equipment are distributed as follows: equipment for increasing the renewable energy capacity accounts for the largest share (57.4%), while the shares of equipment for thermal power generation, hydropower and the nuclear power industry stand at 33.8%, 6.5% and 2.3% respectively. Analysts estimate that if this growth rate is maintained, the capacity of power generation equipment commissioned annually on the global market may almost double by 2035.
According to a survey conducted by the International Marketing Research Group 'Power Generation Equipment Market' in 2019, no fundamental changes are expected in the structure of energy consumption by type of fuel. Hydroelectricity will continue to dominate the fuel mix. In the coming years, the structure of the power engineering market is expected to remain largely unchanged, with thermal power generation equipment having a predominant share. If the share of equipment commissioned in the nuclear power industry increases by 2.3% per year, it may reach 9.9% by 2040 (given that the share of other types of commissioned equipment will grow at a faster rate).

The Russian power machine engineering industry depends on the global market trends. In 2018, the Russian power engineering market increased by 20.3% to 23.1 GW. Market growth was driven by an increase in the production of central heating boilers by 37% to 18.9 GW. At the same time, other segments of the market declined. For instance, the production of hydraulic turbines and water wheels decreased by 68.5% to 628 MW, while the production of gas turbines (except for turbines and turboprop) decreased by 12.8% to 334.4 MW. Meanwhile, the production of water steam turbines and other steam turbines increased by 1.5%.

In 2018, JSC Atomenergomash (the Mechanical Engineering Division of ROSATOM) remained an undisputed leader on the Russian power machine-engineering market, accounting for 33.9% of main power generation equipment produced in Russia. Equipment manufactured by the Division’s enterprises has been installed in over 20 countries at 14% of NPPs globally and 40% of thermal power plants in Russia, the CIS and the Baltic countries.

See also the report ‘JSC Atomenergomash for 2018’.

3.1.2. NEW MARKETS

Market for RAW and SNF management, processing and disposal

In 2018, the volume of SNF accumulated globally totalled 285,000 tHM. Most countries have chosen to postpone SNF management efforts, which necessitates long-term storage of SNF due to a lack of available permanent disposal facilities and processing capacities. Every year, around 10,000 tHM of SNF is produced globally, of which less than 2,000 tHM is sent for processing. An increase in the amount of accumulated SNF necessitates the development of the temporary waste storage market.

Key market players are Holtec, Orano, SKB and GNS. ROSATOM promotes its own RAW and SNF storage solutions as part of an integrated approach to decommissioning. Its development is hindered by strict requirements for a potential site for deep repositories and strong public opposition to such projects. There are no operating HLW disposal facilities at present. The possible use of deep repositories is actively examined by the countries that have chosen the policy of direct SNF disposal. The UK, Sweden, Finland and Canada.

NPP decommissioning market

By 2019, more than 170 power units had been shut down in the world. According to the Corporation’s estimates, by 2035, the number of shut-down power units will double the NPP construction activity peaked in the 1970s and 1980s, and by 2015 the service life of many units will have reached 60 years. Many countries prefer ‘postponed decommissioning’, maintaining the NPP in a safe condition for a long time in order to reduce radiation levels and improve the decommissioning technology. Only a few countries (such as the UK and Germany) have begun the decommissioning process immediately after the unit had been shut down. Some EU countries (for example, Belgium) also make statements about ‘accelerated decommissioning’.

Key market players include ROSATOM, Energy Solutions, Westinghouse, Orano, Bechtel, Studsvik, AECOM, SNF, Caverns Nuclear, North Star, Sippeckamp, Orin Tech and Holtec.
The Corporation is preparing to decommission power units of Novovoronezh, Leningrad and Beloyarsk NPPs and is participating in the decommissioning of PNKLippeburg NPP in Germany, Kozloduy NPP in Bulgaria and Ignalina NPP in Lithuania.

See also the section 'International Business'.

ELECTRICITY MARKET

ROSATOM operates power generation capacities only in Russia. The Corporation is a leader on the Russian power generation market, ahead of such players as PJSC Inter RAO, PJSC RussHydro and LLC Gazprom Energoholding.

The potential for the commissioning of new NPPs is limited until 2035 due to the growth rate of electricity consumption remaining moderate, combined with government support focused primarily on the thermal power plant modernization programme, as well as capacity surplus in European Russia.

COMPOSITE MATERIALS MARKET

Until 2035, the global carbon fibre market is expected to grow by 10% per year, while the growth rate of the Russian market is projected to grow by 1.6% per year (in 2018 dollars), while the growth rate of the Russian market is projected to grow by 0.5% (in 2018 dollars). The Russian nuclear medicine market lags behind the global market in terms of technological development and specific consumption of healthcare services, which determines its significant growth potential.

Further increase in the global use of composite materials is expected due to replacement of conventional materials and expansion of the areas of application.

ROSATOM is the key Russian manufacturer of carbon fibre.

See also the section 'Business Diversification'.

WIND POWER MARKET

The global wind power market is actively developing; installed capacity of wind power plants (WPPs) is expected to increase significantly, from 0.5 TW in 2018 to about 2.2 TW in 2035. The market is highly competitive, and the top 5 players account for 60% of the global installed capacity.

For the past ten years, ROSATOM has also been present on the electricity distribution market. As the Supplier of Last Resort in four regions of Russia, a subsidiary of the Corporation provides services to almost 50,000 legal entities and over 2 million individuals.

See also the report of JSC Rosenergoatom Concern for 2018.

NUCLEAR MEDICINE MARKET

In 2018, the global nuclear medicine market totalled USD 145 billion, while the Russian market exceeded USD 3 billion. The market is expected to actively develop until 2035. The global market will grow by 1.6% per year (in 2018 dollars), while the growth rate of the Russian market is projected to grow by 0.5% (in 2018 dollars). The Russian nuclear medicine market lags behind the global market in terms of technological development and specific consumption of healthcare services, which determines its significant growth potential.

As part of the Healthcare National Project, ROSATOM participates in programmes in the field of nuclear medicine, including the production of radiopharmaceuticals and the establishment of cancer centres.

MARKET FOR CARGO TRANSPORTATION ALONG THE NORTHERN SEA ROUTE (NSR)

Mineral extraction, oil and gas production in the Arctic are projected to surge from the current level of 16 million tonnes to 100-115 million tonnes between 2030 and 2035.

Global cargo traffic can become a key growth driver for cargo transportation along the Northern Sea Route on the strategic horizon after 2035. Cargo transportation along the Northern Sea Route provides logistical advantages compared to a number of traditional routes via the Suez and Panama Canals (the distance between Northern Europe and East Asia is reduced by up to 23%, while the distance between the western coast of North America and Northern Europe is reduced by up to 29%).

See also the chapter ‘Development of the Northern Sea Route’.

WASTE MANAGEMENT MARKET

For a long time, the issues of industrial and consumer waste management had been neglected in Russia, and the market has faced a shortage of capacity for the processing and storage of hazardous class 1 and 2 waste23. At present, only a small part of hazardous waste is treated and recycled by operators that have licences for the relevant operations and the required capacities.

To achieve a fundamental transformation in the sphere of hazardous waste management, a federal project titled ‘Infrastructure for the Management of Hazard Class 1 and 2 Waste’ has been approved and approved as part of the Ecology National Project. As the contractor for this federal project, ROSATOM is creating a federal scheme and implementing an integrated state information system for hazardous waste management. The required processing and disposal infrastructure is being created at ROSATOM; it consists of seven inter-regional specialized complexes incorporating the principles of the best available technology and international experience. A total of RUB 36 billion has been allocated for the federal project for the period from 2019 through 2024.

See also the section ‘Business Diversification’.
3.2. INTERNATIONAL COOPERATION

NIKOLAY SPASSKIV,
Deputy Director General for International Relations

– 2018 saw the conclusion of a variety of agreements with international partners. Which of them are the most important? What prospects do they offer to ROSATOM?

– Indeed, 2018 was marked by a number of significant events reflecting the expanded footprint of the Russian nuclear industry on global markets. Our agenda is discussed at almost all meetings and negotiations of Russian top officials with foreign leaders. We greatly appreciate this support and recognize our responsibility. Today, our projects really play a flagpole role in Russia’s cooperation with a number of key foreign partners.

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The ATOMEXPO Forum was held again; this is the first time that it was hosted by Sochi. It was a record-breaking event in terms of the number of official foreign delegations and ministerial level guests. The Forum was attended by the Director General of the IAEA Yukiya Amano, who was received by the President of Russia Vladimir Putin.

2018 saw the signing of 8 intergovernmental and 20 interdepartmental agreements, and they are not nominal, but have real substance. Some of them, for example, the agreement with Bangladesh on cooperation in the field of physical protection, were unprecedented.

But, of course, as in 2017, the main developments occurred in our cooperation with China. On June 8, 2018, during Vladimir Putin’s state visit to China, Russia signed a package of three intergovernmental agreements and four contracts. These documents provide for the construction of two new power units at the site of Tianwan NPP and two more (four under the option) at a new site earmarked for Xudabei NPP; cooperation in the construction of a 600 MW demonstration sodium-cooled fast reactor in China and the delivery of radioisotope thermoelectric generators (RTGs) to the country.

We immediately started the implementation of these projects. We signed a number of operational contracts, and one contract — the one for the delivery of RTGs — was carried out by our manufacturing plants in record-breaking time. And as early as in October 2018, in strict accordance with our contract obligations, we delivered the RTGs to China. It was our thermal units that helped the Chinese to launch the Chang’e 4 robotic space craft to the Moon in December 2018.

– What is the relevance of the sustainability agenda (the UN Sustainable Development Goals) to ROSATOM’s international activities?

– Recently, considerable emphasis has been placed on dramatic changes in the international business environment. But these changes affect not only the products and technologies that are the focus of this business, but also international communication tools and approaches to doing business. Moreover, these changes are fundamental: they involve a transformation in the mindset.

Let me give you an example. As recently as 20 or 30 years ago hardly anybody gave much thought to such requirements as gender equality and social responsibility when conducting transactions with foreign partners. But now these requirements are becoming mandatory and universal.

ROSATOM is a leader on global markets not only because it is the only company that can make an integrated offer and provide the necessary reference. Another reason for our leadership is that our international activities are underpinned by the philosophy of sustainable development. We work towards all 17 Goals set in the UN’s agenda, although, obviously, we do it in different ways.

That is why, when we come to our partner countries, especially newcomer countries, we start by helping them to create nuclear infrastructure, shape a positive public opinion with regard to the nuclear power industry (and when doing so, we take a different approach to different population groups) and provide personnel training, as required by the IAEA regulations. We can do that very well. And we intend to expand this area of our work.

On a global scale, ROSATOM aims to create a favourable international legal and political environment to promote Russian nuclear technologies on the global market, strengthen the nuclear safety and non-proliferation regimes and actively cooperate with international organizations and forums.

3.2.1. STRENGTHENING THE INTERNATIONAL LEGAL FRAMEWORK FOR COOPERATION

In 2018, expansion of the international legal framework for cooperation continued in order to promote Russian nuclear technologies in the world. 8 intergovernmental agreements (IGAs) and 20 major interdepartmental arrangements were signed (11 and 16 in 2017, 8 and 20 in 2016 respectively).

As of December 31, 2018, IGAs under which ROSATOM is an authorized body (a competent authority) or participates in their implementation were signed with 70 countries, including framework IGAs on the peaceful use of nuclear energy with 53 countries and IGAs on the construction of nuclear facilities with 18 countries.

Key results in 2018:

— A historic package of documents on four high-priority areas of cooperation in the nuclear power industry was signed with China.

— A legal framework was established at the intergovernmental level for NPP construction in Uzbekistan.

— A Memorandum on the Development of Cooperation was signed with the German Committee on Eastern European Economic Relations. It defines the areas of possible cooperation and prospects for the development of the existing potential between the two countries.

— The signing of a Strategic Document on Partnership gave new impetus to cooperation between Russia and France in the peaceful use of nuclear energy.

— A framework intergovernmental agreement was signed with Roscosmos, providing a foundation for bilateral cooperation with Russia in the nuclear industry.

— An intergovernmental protocol was prepared and signed with Bangladesh. It contains specific clauses on cooperation in the field of physical protection. This is the first international legal document of this kind in practice.

On a global scale, ROSATOM aims to create a favourable international legal and political environment to promote Russian nuclear technologies on the global market, strengthen the nuclear safety and non-proliferation regimes and actively cooperate with international organizations and forums.
LEGAL FRAMEWORK

COOPERATION WITH KEY PARTNERS IN STRENGTHENING THE INTERNATIONAL LEGAL FRAMEWORK

China
- A strategic package of documents was signed, including:
  - An intergovernmental protocol and a framework contract for the construction of power units No. 7 and 8 of Tianwan NPP;
  - An intergovernmental protocol and a framework contract for the serial construction of power units for Xudabao NPP;
  - An intergovernmental agreement and a framework contract for the construction of a Chinese demonstration fast neutron reactor;
  - A contract for the supply of fast neutron reactor units to China.

This package of agreements has become the largest one in the history of nuclear cooperation between Russia and China. Its uniqueness is due to the fact that it involves cooperation on several high-technology projects which are unparalleled in the global nuclear industry. Thus, a contract and legal framework has been formed for cooperation in the four high-priority areas outlined in the Joint Statement of the Heads of Government of Russia and China dated November 7, 2016.

Uzbekistan
- An IGA was signed on cooperation in the construction of a nuclear power plant in the Republic of Uzbekistan. The agreement provides for cooperation on the design, construction, commissioning and operation of a nuclear power plant in Uzbekistan; the power plant will consist of two power units equipped with a Russian-design water-cooled water-moderated power reactor, with the installed capacity of each unit totalling up to 1.2 GW.

Rwanda
- A framework IGA was signed providing a legal framework for nuclear cooperation with Rwanda. Conditions were created for promoting Russian nuclear technologies in this country and implementing specific nuclear projects.

Belarus
- A Protocol amending the IGA on the construction of a nuclear power plant in Belarus dated March 15, 2011 was signed.

Bangladesh
- A protocol to the IGA on the construction of Rooppur NPP was signed. The document provides for involvement of Belarusian companies in developing the physical protection system for Rooppur NPP, for which the Bangladeshi side is responsible.

A tripartite memorandum of understanding on cooperation in the implementation of the Rooppur NPP project was signed. The document provides for involving Indian companies in the project. In the future, this expertise can also be applied to other foreign projects.

India
- An Action Plan for Prioritization and Implementation of Cooperation Areas in the Nuclear Field Identified Jointly by Russia and India was signed. The document provides for selecting a new site for NPP construction, launching serial construction of Russian-design power units in India and increasing the degree of localization, as well as cooperation in third countries.

Vietnam
- The following interdepartmental agreements were signed:
  - Memoranda of cooperation on the peaceful use of nuclear energy with Congo and Rwanda;
  - Memoranda on shaping a positive public opinion on nuclear power with Vietnam, Sudan and Uzbekistan;
  - Memoranda on cooperation in the field of energy efficiency and renewable energy sources and to jointly implement industrial projects in third countries.

Congo
- Memoranda of cooperation on the peaceful use of nuclear energy with Vietnam, Sudan and Uzbekistan.

Cuba
- A memorandum on strategic partnership in the development and application of irradiation technologies with Cuba.

Mongolia
- A memorandum of cooperation in the establishment of a Nuclear Research and Technology Centre in Mongolia.

Rwanda
- The signing of these documents will enable the development of nuclear power infrastructure in these countries.

Sudan
- A contract for the supply of radionuclide thermal units to China.

Uzbekistan
- An intergovernmental agreement and a framework contract for the construction of a Chinese demonstration fast neutron reactor.

Argentina
- A strategic document on partnership between Russia and Argentina in the peaceful use of nuclear energy and a road map for cooperation on specific Russian-Argentine projects were signed. The documents are focused on expanding R&D and commercial cooperation.

France
- A strategic document on partnership between Russia and France in the peaceful use of nuclear energy was signed. The document outlines plans for the development of bilateral cooperation. It reflects the parties’ intention to develop cooperation in the field of energy efficiency and renewable energy sources and to jointly implement industrial projects in third countries.

Germany
- A Memorandum on the Development of Cooperation was signed with the German Committee on Eastern European Economic Relations. The document outlines various areas of possible cooperation and the prospects for the development of the existing cooperation potential in the following areas: nuclear safety, R&D cooperation, preservation and management of nuclear knowledge, decommissioning of German nuclear power plants (including spent nuclear fuel management); cooperation in third countries; the use of nuclear technologies in industry, healthcare, agriculture, etc.

Serbia
- A Statement on the Principles of Russian-Serbian Cooperation in the Field of Innovation and Technological Development in the Peaceful Use of Nuclear Energy was signed. The document provides for support for the creation and development of nuclear infrastructure and nuclear medicine in Serbia, as well as the use of radiation technologies in agriculture and industry.
3.2.2. SUPPORT FOR LONG-TERM INTERNATIONAL PROJECTS

In 2018, ROSATOM continued to provide support for the implementation of major projects, particularly for the construction of NPPs and Nuclear Research and Technology Centres (NRTCs) abroad, which are central to ROSATOM’s international activities.

This included work under the following arrangements:

Cooperation with China

ROSATOM continued to cooperate closely with the Atomic Energy Authority and the National Energy Administration of the PRC. The latest session of the Subcommission on Nuclear Issues and meetings of specialized working groups were held as part of the Commission for the Preparation of Regular Meetings of the Heads of State of Russia and China.

In pursuance of the strategic ‘package of documents’ signed by ROSATOM, radionuclide thermal units were delivered for the Chinese Lunar Exploration Programme in October 2018. Framework contracts necessary for the implementation of the strategic package were brought into force.

Kudankulam NPP construction project (India)

ROSATOM provided assistance in addressing issues related to the operation of the first stage of Kudankulam NPP (power units No. 1 and 2). Support was provided for the construction of the second stage of Kudankulam NPP (power units No 3 and 4). A credit protocol for the construction of the third stage of the NPP (power units No 5 and 6) was brought into force.

ROSATOM supported active negotiations as part of bilateral cooperation, including the development of an Action Plan, which was signed on the sidelines of the India-Russia Bilateral Summit in New Delhi on October 5, 2018. The document was prepared as part of strategic cooperation between Russia and India in the peaceful use of nuclear energy, which involves selecting a new site for NPP construction, launching serial construction of Russian-design power units in India, increasing the degree of localization and cooperating in third countries.

Rooppur NPP construction project (Bangladesh)

An official ceremony was held at the site of Rooppur NPP in July 2018 to mark the start of concreting of the foundation slab of power unit No. 2; it was attended by the Prime Minister of Bangladesh Sheikh Hasina. A regular working dialogue was established at various levels in order to address arising issues related to the project promptly and efficiently.

Akkuyu NPP construction project (Turkey)

In April 2018, a ceremony was held to mark the start of concreting of the foundation of the reactor building of power unit No. 1; it was attended by the Presidents of Russia and Turkey. Assistance was provided to the project company in obtaining documents required for the implementation of the project.

El Dabaa NPP construction project (Egypt)

Under the agreement reached by the President of Russia Vladimir Putin and the President of Egypt Abdel Fattah el-Sisi on October 19, 2018 in Sochi, financing was provided for the El Dabaa NPP construction project under the credit IGA. The development of a project to open a branch of the National Research Nuclear University MEPhI in Uzbekistan is nearing completion.

Cooperation with Vietnam

Given that in late 2016, the Vietnamese government decided to suspend the construction of Ninh Thuan 1 NPP, the joint statement made following the meeting between the President of Russia Vladimir Putin and the General Secretary of the Central Committee of the Communist Party of Vietnam Nguyễn Phú Trọng on September 8, 2018 included a provision that, if Vietnam resumed the implementation of the nuclear power project, Russia would be considered as its priority participant.

ROSATOM continued to implement the project to build a Nuclear Research and Technology Centre (NRTC) in Vietnam. On November 19, 2018, during a visit of the Prime Minister of Russia Dmitry Medvedev to Hanoi, the Vietnamese party reported that the Government of Vietnam had approved the materials of the pre-feasibility study for the NRTC project. This enabled ROSATOM to start the discussion of matters related to the implementation of the project with the Vietnamese customer, Vietnam Atomic Energy Institute (VINATOM).

See also the section ‘International Business’.

3.2.3. CIS INTERGOVERNMENTAL TARGET PROGRAMME (ITP) FOR REMEDIATION

At the meeting of the Council of Heads of the CIS Member States on November 2, 2018, amendments to the ITP prepared by ROSATOM were approved. They provide for an increase in the amount of financing for remediation work at facilities in Tajikistan.

As part of implementation of the ITP assistance was provided to Kyrgyzstan and Tajikistan in addressing issues related to uranium mining legacy. In Kyrgyzstan, the main remediation work was completed at the Kanty Say tailings facility, and preparation for the decommissioning of one of the most hazardous tailings facilities, Tyuyu Szu, was underway.

3.2.4. COOPERATION WITH INTERNATIONAL ORGANIZATIONS

In 2018, ROSATOM took part in all specialized international conferences and meetings held under the auspices of the IAEA and the OECD-NEA.

854 Russian experts participated in 334 events organized by the IAEA, and 85 specialists took part in 55 events held by the OECD-NEA. Over 60 events were held in Russia under the auspices of international organizations.

Close cooperation was established with the country’s newly created nuclear energy agency, Uzatom, and other government bodies of the Republic of Uzbekistan.

The development of a project to open a branch of the National Research Nuclear University MEPhI in Uzbekistan is nearing completion.

Nuclear Research and Technology Centre construction project in Bolivia

Assistance was provided for the signing of a contract for the development of nuclear infrastructure in Bolivia in April 2018. The document will enable the start of full-scale cooperation in this field.

Cooperation with Vietnam

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See also the section ‘International Business’.
Commission of the CIS Member States on the Peaceful Use of Nuclear Energy

ROSATOM drafted the Agreement on Cooperation between the CIS Member States on Preparatory for Nuclear or Radiation Accidents and Mutual Assistance in Accident Response and prepared it for signing at the meeting of the Council of Heads of the CIS Member States on November 2, 2018.

The following documents were signed at the meeting of the CIS Economic Council on March 2, 2018:

— The Regulations on the Basic Organization of the CIS Member States for Spent Nuclear Fuel and Radioactive Waste Management and Decommissioning of Facilities Posing Nuclear and Radiation Hazards;

— An updated Programme for the Joint Use of the Experimental Facility Based on the Kazakh Tokamak for Material Testing.

In order to achieve the objectives of the ATOM – CIS COOPERATION Framework Programme for Cooperation between the CIS Member States in the Peaceful Use of Nuclear Energy until 2020, ROSATOM provided support for the efficient work of the Basic Organization for Personnel Training (NRNU MEPhI) and the Basic Organization for the Safety of Nuclear Research Facilities (SSC RIAR).

3.2.5. Strengthening of the Nuclear Non-Proliferation Regime and Export Control

390 draft contracts (arrangements, agreements) were reviewed in accordance with the Uniform Industry-Wide Procedure for Organizing Export Control in ROSATOM. The findings of the review were sent to organizations in the industry.

Two workshop meetings were held for industry exporters on export control in ROSATOM (in Obninsk on May 22-24, 2018 and in Ekaterinburg on November 2-4, 2018). The workshops were attended by 83 participants from 52 organizations and 45 participants from 24 organizations respectively.

In October 2018, ROSATOM in cooperation with the Federal Service for Technical and Export Control (FSTEC) of Russia and the Federal Service for Intellectual Property (Rospatent) held a workshop meeting for Russian enterprises and organizations in order to share experience in the protection of competitive Russian technologies, scientific and technical developments against unauthorized use and reproduction.

The Russian-US programme to import highly enriched uranium (HEU) fuel from Russian-design research reactors from third countries into Russia continued.

In 2018, preparations were made for the import of spent nuclear fuel from IGS and IIR research reactors of the National Nuclear Centre of the Republic of Kazakhstan (Kurchatov) for reprocessing. The delivery of the fuel is scheduled for 2021.

3.2.6. Developing the Network of ROSATOM’s Representative Offices Affiliated with Embassies and Trade Missions Abroad

In 2018, ROSATOM expanded the geographic footprint of its representative offices abroad. In particular, its experts started working in Russian embassies in Armenia and Japan. As of the end of 2018, ROSATOM’s representatives worked in 13 countries around the world in embassies and trade missions of the Russian Federation, under the Permanent Mission of the Russian Federation to International Organizations in Vienna (Austria) and the Permanent Mission of the Russian Federation to the European Union.
3.2.7. MAIN CHALLENGES HAMPERING THE ESTABLISHMENT AND EXPANSION OF INTERNATIONAL COOPERATION IN THE REPORTING PERIOD AND MECHANISMS FOR ADDRESSING THEM

In the reporting period, the main challenges were related to the establishment and expansion of international cooperation. The Corporation faced difficulties in promoting its technologies and services in a challenging international environment. ROSATOM responded to these challenges by maintaining close contact with relevant ministries and agencies of the Russian Federation, including unconditional fulfillment of its obligations, including the supply of fuel, equipment, and services regardless of the current political situation and relations with individual countries.

3.3. INTERNATIONAL BUSINESS

In 2018, Russian nuclear power technologies had to be promoted on the global markets in a challenging international environment. ROSATOM responded to it by maintaining close contact with the relevant ministries and agencies of the Russian Federation, including unconditional fulfillment of its obligations, including the supply of fuel, equipment and services regardless of the current political situation and relations with individual countries.

3.3.1. PROMOTING ROSATOM’S TECHNOLOGIES ON FOREIGN MARKETS

In 2018, Russian nuclear power technologies were promoted on the global market amid increased competition on the international NPP construction and nuclear fuel cycle markets and an increase in the activity of other players in the global nuclear industry due to a growing number of countries expressing interest in projects related to the construction and operation of nuclear facilities.

The main focus of ROSATOM’s international business is the construction of Russian-design nuclear power plants abroad. ROSATOM promotes an integrated offer covering a wide range of areas, from uranium supply and NPP construction to project financing and personnel training. This approach is unique on the global market, which enables the Corporation to remain the only organization in the world capable of establishing a comprehensive technological partnership in the nuclear power industry.

Today, ROSATOM is actively promoting Russian nuclear technologies for energy- and non-energy applications both in countries that are beginning to develop nuclear power and in countries with a well-developed national nuclear power industry (including those based on Russian technology). A foreign regional network managed by Rusatom International Network has been established in order to increase international sales and promote the products of the Russian nuclear power industry. In 2018, the foreign regional network comprised 11 regional centres that operated in more than 60 countries around the world.

Key results in 2018:

- The 10-year portfolio of overseas orders totalled USD 133.2 billion (USD 133.5 billion in 2017).
- The portfolio of overseas orders covering the entire NPP life cycle totalled USD 202.4 billion.
- Revenue from overseas orders reached USD 6.5 billion (USD 6.1 billion in 2017).
- The overseas NPP construction project portfolio included 36 power units in 12 countries around the world.
- Projects were being implemented in over 50 countries worldwide.

ROSATOM regularly supports international multilingual camps for children of employees of partner organizations in the countries where the Corporation does business. The camp programme includes educational, sports and artistic events which enable the participants to deepen their knowledge of various areas of science and culture, perfect their cross-cultural skills and learn about the traditions and history of other countries. Special emphasis is placed on teaching foreign children about Russia, its traditions and its rich cultural heritage. 177 children from 12 countries attended multilingual camps in 2018.

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Key results in 2018:

- The 10-year portfolio of overseas orders totalled USD 133.2 billion (USD 133.5 billion in 2017).
- The portfolio of overseas orders covering the entire NPP life cycle totalled USD 202.4 billion.
- Revenue from overseas orders reached USD 6.5 billion (USD 6.1 billion in 2017).
- The overseas NPP construction project portfolio included 36 power units in 12 countries around the world.
- Projects were being implemented in over 50 countries worldwide.

Key results in 2018:

- The 10-year portfolio of overseas orders totalled USD 133.2 billion (USD 133.5 billion in 2017).
- The portfolio of overseas orders covering the entire NPP life cycle totalled USD 202.4 billion.
- Revenue from overseas orders reached USD 6.5 billion (USD 6.1 billion in 2017).
- The overseas NPP construction project portfolio included 36 power units in 12 countries around the world.
- Projects were being implemented in over 50 countries worldwide.
3.3.2. CHANGES IN THE PORTFOLIO OF OVERSEAS ORDERS AND REVENUE FROM OVERSEAS ORDERS

In the reporting year, ROSATOM’s portfolio of overseas orders reached USD 133.2 billion.

As of December 31, 2018, legally binding documents of various levels, including intergovernmental agreements, had been signed for 36 nuclear power units in 12 foreign countries. Russian-design nuclear reactors that are currently under construction fully meet international safety requirements.

At year-end, overseas revenue totalled USD 6.5 billion (USD 6.1 billion in 2017).

<table>
<thead>
<tr>
<th>CHANGES IN THE PORTFOLIO OF OVERSEAS ORDERS, USD BILLION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
</tr>
<tr>
<td>15-year portfolio of overseas orders, including</td>
</tr>
<tr>
<td>Construction of NPPs abroad</td>
</tr>
<tr>
<td>Uranium products</td>
</tr>
<tr>
<td>Nuclear fuel assemblies and other activities</td>
</tr>
</tbody>
</table>

3.3.3. CONSTRUCTION OF NPPS ABROAD

As of December 31, 2018, legally binding documents of various levels, including intergovernmental agreements, had been signed for 36 nuclear power units in 12 foreign countries. Russian-design nuclear reactors that are currently under construction fully meet international safety requirements.

<table>
<thead>
<tr>
<th>NPP, COUNTRY</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rooppur NPP, Bangladesh</td>
<td>Full-scale work started at the NPP site as part of the main stage of construction. Construction of main and auxiliary buildings of power units No. 1 and 2 was underway.</td>
</tr>
<tr>
<td>Kudankulam NPP, India</td>
<td>Long-lead equipment and high-priority equipment is being supplied for the construction of power units No. 3 and 4. The manufacture of critical equipment for power units No. 5 and 6 was started.</td>
</tr>
<tr>
<td>Tianwan NPP, China</td>
<td>The construction of the second stage of the NPP was completed. Power units No. 3 and 4 started commercial operation.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHANGES IN OVERSEAS REVENUE, USD MILLION</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
</tr>
<tr>
<td>Overseas revenue, including</td>
</tr>
<tr>
<td>Construction of NPPs abroad</td>
</tr>
<tr>
<td>Uranium products</td>
</tr>
<tr>
<td>Nuclear fuel assemblies and other activities</td>
</tr>
</tbody>
</table>

PERFORMANCE OF STATE ATOMIC ENERGY CORPORATION ROSATOM IN 2018
ROSATOM also continued to take measures to secure new orders for NPP construction abroad:

— A package of strategic documents was signed with China, including intergovernmental protocols and framework contracts for the construction of power units No. 7 and 8 of Tianan NPP and power units No. 3 and 4 of Kudankulam NPP (see also the section ‘International Cooperation’);

— Following the signing of an intergovernmental agreement on NPP construction in Uzbekistan, an official ceremony was held in October 2018 to mark the launch of the project. The event heralded the start of an engineering survey aimed at selecting the site for the construction of the future NPP. The project will involve building two power units equipped with VVER-1200 reactors.

— An Action Plan was signed with India; it involves signing a contract for the construction of six power units at a new site.

Active work continued with countries that are planning to implement projects involving the construction of nuclear power plants or other nuclear facilities: Argentina, Bulgaria, Brazil, Zambia, Kazakhstan, Saudi Arabia and the Czech Republic.

### 3.3.4. NPP SERVICING ABROAD

ROSATOM has established a Technical Academy. Its aim is to develop a new business area: training of engineers and technicians for foreign NPPs and projects involving the use of nuclear energy.

The Corporation finalized a rationale for extending the life of power unit No. 6 of Kozloduy NPP (Bulgaria) to 60 years.

As part of the project to extend the life of the Armenian NPP, the modernization of equipment at power unit No. 2 was completed, and scheduled preventive maintenance of the power unit was carried out.

The first contract for the servicing of power unit No. 1 of Kudankulam NPP in India was signed and carried out.

As part of the construction of the Belarusian NPP, the provision of technical support for commissioning began.

In 2018, uranium mining enterprises of Uranium One implemented the annual production programme in full. They produced 4,400 tonnes of uranium.

In 2018, uranium mining enterprises of Uranium One implemented the annual production programme in full. They produced 4,400 tonnes of uranium.

### 3.3.5 NATURAL URANIUM MINING ABROAD

In 2018, uranium mining enterprises of Uranium One implemented the annual production programme in full. They produced 4,400 tonnes of uranium.

URANIUM MINING BY URANIUM ONE ENTERPRISES, T

<table>
<thead>
<tr>
<th>Country</th>
<th>2018</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazakhstan</td>
<td>4,896</td>
<td>5,063</td>
<td>4,375</td>
</tr>
<tr>
<td>USA</td>
<td>23</td>
<td>39</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>4,919</td>
<td>5,102</td>
<td>4,385</td>
</tr>
</tbody>
</table>

### 3.3.6. EXPORT OF URANIUM PRODUCTS

JSC TENEX is ROSATOM’s main organization promoting uranium conversion and enrichment services and enriched uranium for power and research reactors on the global market. In 2018, JSC TENEX remained one of the leading suppliers of nuclear fuel cycle front-end products as it satisfied a significant share of the demand of Western-design reactors for uranium enrichment services.

All obligations under the current contracts in the reporting year were fulfilled by JSC TENEX on time and in full. The annual sales volume totalled about USD 1.7 billion.

In the reporting year, JSC TENEX signed major long-term contracts with Electricité de France SA (EDF) for the provision of a range of services related to processing French regenerated material and supplying the resulting uranium products to nuclear power plants in France.

The project to process Orano’s uranium composites of various shapes and degrees of enrichment was successfully completed. The final product of processing, uranium metal with a degree of enrichment of up to 19.75%, was supplied to France for the production of fuel assemblies for research reactors. The successful implementation of this technically complex project marked the launch of a new business area of JSC TENEX and provided a practical foundation for long-term mutually beneficial cooperation between ROSATOM’s organizations and Orano.

### PERFORMACE OF STATE ATOMIC ENERGY CORPORATION ROSATOM

As of December 31, 2018, the mineral resource base of Uranium One enterprises (including the 100% stake in Mantra Resources Pty Limited) under international reporting standards totalled 197,100 tonnes.

MINERAL RESOURCE BASE OF URANIUM ONE ENTERPRISES, KT

<table>
<thead>
<tr>
<th>Year</th>
<th>Measured + Indicated</th>
<th>Inferred</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>220.8</td>
<td>88.8</td>
</tr>
<tr>
<td>2017</td>
<td>216.2</td>
<td>88.8</td>
</tr>
<tr>
<td>2018</td>
<td>197.1</td>
<td>14.4</td>
</tr>
</tbody>
</table>

### REGIONAL SALES STRUCTURE OF URANIUM ONE

<table>
<thead>
<tr>
<th>Region</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia Pacific, Western</td>
<td>30.5%</td>
<td>30.5%</td>
<td>30.5%</td>
</tr>
<tr>
<td>Asia Pacific, Middle</td>
<td>23.5%</td>
<td>23.5%</td>
<td>23.5%</td>
</tr>
<tr>
<td>Europe</td>
<td>29.4%</td>
<td>29.4%</td>
<td>29.4%</td>
</tr>
<tr>
<td>Europe</td>
<td>36.3%</td>
<td>36.3%</td>
<td>36.3%</td>
</tr>
</tbody>
</table>

### REGIONAL SALES STRUCTURE OF JSC TENEX

<table>
<thead>
<tr>
<th>Region</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia Pacific, Middle</td>
<td>31.2%</td>
<td>31.2%</td>
<td>31.2%</td>
</tr>
<tr>
<td>Europe</td>
<td>29.4%</td>
<td>29.4%</td>
<td>29.4%</td>
</tr>
<tr>
<td>Europe</td>
<td>47.1%</td>
<td>47.1%</td>
<td>47.1%</td>
</tr>
</tbody>
</table>
3.3.8. NEW PRODUCTS FOR FOREIGN MARKETS

Life cycle back-end services
Preparations were made to ensure the safe handling of spent nuclear fuel from Akkuyu NPP.

A feasibility study of options for the handling of spent nuclear fuel from the Belarusian NPP was prepared at the request of the Joint Institute for Power and Nuclear Research — Sosny of the National Academy of Sciences of Belarus.

Construction of Nuclear Research and Technology Centres (NRTCs) abroad, nuclear infrastructure and personnel training

ROSATOM offers its foreign partners a product solution based on a research reactor and a set of additional elements for developing nuclear technologies for scientific research and practical applications. Nuclear Research and Technology Centres (NRTCs) are focused on both creating nuclear power capabilities in the customer country and developing nuclear medicine and radiation technologies for the national economy.

In 2018, the Corporation began to carry out the first contract for the construction of a facility of this kind in Bolivia. Engineering research and preparatory work were completed at the construction site, construction and installation work was carried out, and equipment was shipped for the NRTC. In addition, a contract was signed for the development of nuclear infrastructure in Bolivia.

A contract was signed for the construction of a Nuclear Research and Technology Centre in Zambia. The Centre will enable widespread use of radiation technologies in the country’s healthcare, industrial and agricultural sectors. The NRTC will also contribute to raising the standards in education and science by providing training for highly qualified professionals in various fields. Preliminary engineering surveys at the Centre’s site began in 2018. In addition, the Corporation provided services under the contract for the evaluation and development of nuclear infrastructure in the country.

A Memorandum of Understanding was signed with the Nuclear Energy Commission of Mongolia on the construction of a Nuclear Research and Technology Centre in the country.

Consultations are being held on the implementation of similar projects in Serbia and Rwanda.

3.3.7 SUPPLY OF NUCLEAR FUEL

The foreign revenue of JSC TVEL, which exports nuclear fuel, totalled USD 0.96 billion. The 10-year portfolio of overseas orders reached USD 13.3 billion.

In 2018:
— A contract was signed for nuclear fuel supply for the CFB 600 fast neutron reactor (China), which is currently under construction;
— A contract was signed for the supply of fuel pellets for Tarapur NPP (India) equipped with BWR reactors;
— A number of contracts for the supply of nuclear fuel components for a research reactor in Egypt were signed and carried out;
— Nuclear fuel was supplied for the restarted research reactor of the Institute of Nuclear Physics under the Academy of Sciences in Uzbekistan;
— An agreement was signed on the introduction of a new version of second-generation nuclear fuel for VVER-440 reactors at Loviisa NPP (Finland);
— Fourth-generation nuclear fuel, TVSA-T.mod.2, was supplied for the first time for a VVER-100 reactor at Temelin NPP (Czech Republic); the fuel assemblies are characterized by improved reliability and high uranium content.

Supply of isotope products

In 2018, revenue from the supply of isotope products exceeded USD 100 million.

ROSATOM is an active player on the international isotope market: in recent years, it has held about 11% of the market for cobalt-60 for industrial radiation facilities and 5% of the market for molybdenum-99 for radiological diagnosis.

In 2018, a contract was signed for regular deliveries of one of the most in-demand medical isotopes, iodine-131, through a joint Russian-Chinese enterprise.
Nuclear power generation is a source of clean energy that provides considerable environmental benefits.
4.1. MINING DIVISION

4.1.1. RESULTS IN 2018

The Division produced 2,904 tonnes of uranium, which totals 101% of the target volume.

At the largest production site of the Division, PJSC PIMCU, a programme of work on the project ‘Development of the Argunskoye and Zherlovoye Deposits (Construction of Mine No. 6)’ was completed.

Uranium production remains the main focus of the Division’s operations on the strategic horizon. The development of existing enterprises will be supplemented by new projects in the mining and related industries, which will help to expand the business and increase its social and financial sustainability.

KEY OPERATING RESULTS

<table>
<thead>
<tr>
<th>MINERAL RESOURCE BASE AND URANIUM PRODUCTION</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mineral resource base, kt</td>
<td>$179</td>
<td>$239</td>
<td>$307</td>
</tr>
<tr>
<td>Uranium production, t, including:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PJSC PIMCU</td>
<td>3,055</td>
<td>2,917</td>
<td>2,904</td>
</tr>
<tr>
<td>JSC Dalur</td>
<td>1,873</td>
<td>1,631</td>
<td>1,456</td>
</tr>
<tr>
<td>JSC Khiagda</td>
<td>92</td>
<td>92</td>
<td>90</td>
</tr>
<tr>
<td>JSC Krugol</td>
<td>540</td>
<td>694</td>
<td>858</td>
</tr>
</tbody>
</table>

Key results in 2018:
- Uranium resources totalled 520,700 tonnes.
- 2,904 tonnes of uranium were produced (the production programme was 101% completed).
- A programme of work on the project ‘Development of the Argunskoye and Zherlovoye Deposits (Construction of Mine No. 6)’ was completed.

The Division produced 2,904 tonnes of uranium, which totals 101% of the target volume.

At the largest production site of the Division, PJSC PIMCU, a programme of work on the project ‘Development of the Argunskoye and Zherlovoye Deposits (Construction of Mine No. 6)’ was completed. Auxiliary facilities were constructed.

The Division actively develops uranium mining using the most effective technique: drillhole in-situ leaching. In 2018, the share of uranium extracted through in-situ leaching at JSC Khiagda and JSC Dalur increased from 44% to 50% of the Division’s total output.

Production of coal with a high calorific value (sized coal) at PJSC PIMCU reached a stable level. A technology for producing ferrosilicon, which is in demand in the steel industry, from pyrite cinders was piloted as part of the diversification programme.

JSC Dalur (Kurgan Region) continues to produce scandium oxide and fluoride. These are by-products of uranium mining using the drillhole in-situ leaching technique.

As part of the implementation of the Uniform Digital Strategy of ROSATOM, JSC Khiagda commissioned the Smart Mine, a system for modeling and tracking mining processes in real time using video surveillance and smart sensors. JSC Dalur became the world’s first uranium mining enterprise to use computer-based environmental modelling, which enables it to assess the projected environmental impact of the development of a deposit with maximum accuracy.
KEY OPERATING RESULTS

In 2018, the Division fulfilled all of its obligations related to the supply of nuclear fuel to Russian and foreign customers.

JSC UEIP continued to introduce new sections of state-of-the-art technologies. LLC VNIImochtechnologiya began to produce new high-performance gas centrifuges for the separation of stable isotopes.

Mass production of MOX fuel for the BN-800 fast neutron reactor began.

The first Russian experimental fuel assemblies with accident tolerant nuclear fuel were manufactured.

Industry integrators were formed within the Division for the following areas: Additive Manufacturing Technologies and Energy Storage Systems.

The Fuel Division of ROSATOM (its holding company is JSC TVEL) is one of the leading players on the global nuclear fuel cycle front-end market. The Division comprises enterprises responsible for nuclear fuel fabrication, uranium conversion and enrichment and production of gas centrifuges, as well as research and design organizations.

In 2018, the Division supplied nuclear fuel for 76 power reactors in Russia, Europe and Asia (15 countries in total), Russian- and foreign-design research reactors in nine countries around the world, propulsion systems in the Russian nuclear-powered fleet and the world’s first generation research reactors.

In 2018, one in every six power reactors in the world runs on fuel produced in the Division; together they generate about 400 billion kWh of electricity annually.

SOCIAL PROJECTS TO IMPROVE THE QUALITY OF PEOPLE’S LIVES

Fostering self-employment in Krasnoyarsk

The Division holds an annual competition of charity and social projects in Krasnoyarsk and provides financial support (grants) to socially oriented small and medium-sized enterprises. The competition helps to promote urban improvement and the development of youth leisure and sports.

In 2018, the Division provided support for 25 important social projects, including:

— Provision of hairdressing services to retirees, disabled people, large families and other socially disadvantaged groups;

— The purchase of ice hockey gear, renovation and flooding of an ice rink for young patients of the regional children’s tuberculosis sanatorium;

— An open LEGO robotics festival and competition;

— Installation of vandal-proof outdoor fitness equipment.

NEW PRODUCTS

In 2018, a business accelerator for start-ups and new ideas was created in the Fuel Division (http://ba.tvel.ru). The business accelerator is focused on projects in high-priority non-nuclear business areas of the Division: chemistry, mechanical engineering, special metals, additive manufacturing and new energy. As part of the pilot acceleration cycle, 42 applications were submitted by the Division’s enterprises and external participants. After the selection, three projects entered the investment stage.

Contracts for the supply of large batches of calcium injection wire were concluded with leading Russian steel and rolled steel manufacturers.

Contracts for the supply of lithium to France, Korea and the US market were signed with global manufacturers of lithium products.

SOCIAL PROJECTS TO IMPROVE THE QUALITY OF PEOPLE’S LIVES

The Fuel Division supports social projects and initiatives in the towns and cities of its operation. These projects are typically focused on education and healthcare.

In 2018, a single industry integrator, LLC RusAT (Rosatom — Additive Technologies), was formed and started to function in a new business area of the Fuel Division: Additive Manufacturing Technologies. Key results of the integrator in the reporting year include the following:

— Arrangements were made to start batch production of RusMelt 3D printers;

— A project was launched to create an additive manufacturing centre at LLC RusAT;

— Projects were initiated to design key elements of additive manufacturing equipment based on technologies such as selective laser melting and direct laser cladding;

— A national standardization programme in the field of Additive Manufacturing Technologies for 2019 was updated and expanded.
4.3. MECHANICAL ENGINEERING DIVISION

The Mechanical Engineering Division of ROSATOM (its holding company is JSC Atomenergomash) is the leading mechanical engineering enterprise in Russia (33.9% of the market) offering effective integrated solutions for the nuclear and thermal power industry, the gas and petrochemical industry, shipbuilding and the special steel market.

The Division comprises leading research, engineering and manufacturing organizations in Russia and abroad.

Equipment produced at the enterprises of the Division has been installed at 14% of NPPs in the world and at 40% of thermal power plants in Russia, the CIS and the Baltic countries.

4.3.1. RESULTS IN 2018

KEY OPERATING RESULTS

Mechanical engineering products were delivered on time to seven NPPs in Russia and abroad. In the reporting year, the Division began to manufacture reactor and turbine hall equipment for Rosoppor NPP (Bangladesh), Akkuyu NPP (Turkey) and Kursk NPP2.

In 2018, the RITM-200 reactor unit was manufactured and shipped for the second follow-on multipurpose nuclear icebreaker. Thus, the Division completed the manufacture of equipment for three new-generation icebreakers (Arktika, Sibir and Ural) in full and on schedule.

NEW PRODUCTS

Gas and petrochemical industry

A number of major import substitution projects were implemented. In particular, batch production of check valves for main oil and gas pipeline was set up, the delivery of a wastewater treatment unit was completed; canned electric pumps for pumping hydrocarbons, explosive, flammable and toxic liquids were developed and are manufactured.

The manufacture of key static equipment for a gas liquefaction line was set up; six-coil heat exchangers are to be supplied for the Yamal LNG project in 2019. In addition, the manufacture of pumps was launched for the Yamal LNG project: for the first time, Russian-made LNG pumps are to be used at an operating facility.

Key results in 2018:

— Mechanical engineering products were delivered on time to 7 NPPs in Russia and abroad.
— The manufacture of RITM-200 innovative reactor units for three new-generation icebreakers was completed.
— A number of major import substitution projects were implemented in the gas and petrochemical industry.
— Equipment produced at the enterprises of the Division has been installed at 14% of NPPs in the world and at 40% of thermal power plants in Russia, the CIS and the Baltic countries.

SOCIAL PROJECTS TO IMPROVE THE QUALITY OF PEOPLE’S LIVES

The enterprises of the Division make improvements to their premises and participate in urban improvement projects in the municipalities where they are located.

In 2018, employees of the Atomenergomash branch of JSC AEM-Technology in Volgodonsk conducted an environmental clean-up on the premises of the enterprise and participated in the Day of Tree Planting, a municipal tree-planting campaign.

4.4. ENGINEERING DIVISION

JSC AEM-Technology optimized manufacturing equipment monitoring systems. As a result, the equipment setup time was reduced from 50% to 30% of the machine run time.

The main areas of business of the Engineering Division include the following:

— Design of large NPPs;
— Construction of large NPPs under EPC and EPC(M) contracts; and
— Digital technologies for managing complex engineering facilities.

The Division actively engages local and international suppliers in the implementation of its projects. The Division comprises major design institutes in Moscow, Saint Petersburg and Nizhny Novgorod. Its holding company is JSC ASE EC.

In 2018, a Transformation Programme was launched in the Division to make it more competitive on the global market and improve its performance.
In addition, the Division is implementing an industry-wide programme titled ‘Digitalization of NPP Construction Processes’. The programme consists of the following five main work streams:

1. Installation of the core catcher was started at power unit No. 1;
2. Reinforcement of the foundation slab of the reactor building was started at power unit No. 2.

For details on NPP construction abroad, see the section ‘International Business’.

**SOCIAL PROJECTS TO IMPROVE THE QUALITY OF PEOPLE’S LIVES**

The Engineering Division holds an annual contest of charity projects in the regions of its operation. The aim of the contest is to support the initiatives of various organizations aimed at addressing topical social and cultural issues and fostering sustainable development in the Division’s regions of operation. In 2018, financial support for projects totalled RUB 509.9 million.

In addition, in 2018, the Youth Council of the Division initiated and conducted a number of volunteer campaigns:

- The Wonderful Christmas Tree annual charity campaign (to support children from boarding school No. 1);
- Participation of the Division’s corporate team in the ‘Run, Hero!’ charity race, which has become one of the sporting highlights of the year in Nizhny Novgorod;
- The Corporate Volunteering project (volunteer campaigns at the boarding school for blind and visually impaired children in Nizhny Novgorod and at boarding school No. 1 for orphans and abandoned disabled children).

**4.5. POWER ENGINEERING DIVISION**

The Power Engineering Division generates electricity and heat at nuclear power plants and acts as the operator of all Russian NPPs’ JSC Rosenergoatom Concern, the Division’s holding company, is Russia’s largest power generation company and ranks second in the world in terms of installed capacity among NPP operators. Along with NPPs, the Division includes the Pilot and Demonstration Engineering Centre for Decommissioning, the Technology Branch Office, the Directorate for Construction and Operation of Floating Thermal Power Plants, the Capital Projects Implementation Branch Office, as well as subsidiaries specializing in NPP pre-commissioning, operational improvement and management: Atomenergoexport, Atomenergoremnost, the All-Russian Research Institute for NPP Operating, operational improvement and management; Atomenergoexport, Atomenergoremnost, the All-Russian Research Institute for NPP Operation (VNIIAES), Atomenergoexport, Consyst — Telecommunications Operator, the All-Russian Production Association Zarubezhatomenergoexport, Atomtekhexport, etc.

Key results in 2018:

- Power generation by Russian nuclear power plants reached a new all-time high and totalled 224.8 billion kWh (which is comparable to electricity consumption in Moscow and the Moscow Region over two years).
- Power unit No. 4 of Bussole NPP and power unit No. 1 of Leasing NPP-2 were put into operation.
- The first criticality stage was completed at the reactor units of the Akademik Lomonosov floating nuclear power plant, followed by a ramp-up to 10% of their capacity.
- The capacity of 10 Russian NPPs (37 operating power units, including those newly commissioned in 2018) totalled 30.1 GW.
- The NPP capacity factor totalled 79.4%.
4.5.1. RESULTS IN 2018

OPERATING RESULTS

In 2018, electricity output at 37 power units of 10 operating NPPs totalled 204.3 billion kWh, reaching a new all-time high in the history of Russian nuclear power generation (in 2017, electricity output totalled 202.9 billion kWh). The balance target set by the Federal Antimonopoly Service of Russia was exceeded by 1.5%. Nuclear power generation accounted for 18.7% of the total electricity output in Russia (18.9% in 2017).

The NPPs’ capacity factor amounted to 79.6% (83.3% in 2017). The change in the capacity factor is due to a year-on-year increase in the number of power units undergoing long-term modernization, repair schedules for the existing units and the implementation of measures to improve the integrity of graphite stacks in RBMK reactors.

New power generation capacities were commissioned in Russia. Power unit No. 4 of Rostov NPP and power unit No. 1 of Leningrad NPP-2 were put into operation. Power unit No. 1 of Leningrad NPP-2 has become the second unit equipped with a generation 3+ reactor in Russia.

NEW PRODUCTS

In 2018, JSC AtomEnergoSbyt (an organization forming part of the Division) continued to operate as the power supplier of last resort in the Kursk, Tver, Smolensk and Murmansk Regions through the branches and separate divisions established in these regions. In the reporting year, the net electricity supply totalled 15.9 billion kWh.

In order to increase exports, the production of cobalt-60 continued at Leningrad NPP; the production of this isotope was also launched at Smolensk and Kursk NPPs.

In 2018, the production of cobalt-60 continued at Leningrad NPP; the production of this isotope was also launched at Smolensk and Kursk NPPs.

DIGITIZATION PROJECTS

The first stage of the Data Centre in the vicinity of Kalinin NPP was put into operation. The Centre will be the largest one in Russia (686 MW) and in other remote areas.

The first criticality stage was completed at the reactor units of the Akademik Lomnoverov Floating nuclear power plant (FNPP), followed by a ramp-up to 10% of their capacity. The FNPP is an innovative Russian solution designed to provide power supply in the Far North, on islands and in other remote areas.

The FNPP project attracts a strong interest from ROSATOM’s foreign partners. In 2018, an agreement on the development of a project to build an optimized floating nuclear power plant was signed with Sudan.

SOCIAL PROJECTS TO IMPROVE THE QUALITY OF PEOPLE’S LIVES

In 2018, the Division held the sixth open contest of important social projects among non-profit organizations in the areas where NPPs are located. 52 projects worth a total of RUB 45 million were declared winners. All the projects have been successfully implemented.

In 2018, a pilot project was launched at Kola NPP to ensure industrial safety based on computer vision. The project involves real-time monitoring of the use of personal protective equipment by employees in the course of operations. The video stream is analysed using an artificial intelligence system. If a violation is detected, a signal is sent to the persons responsible for the operation. The goal of the project is to avoid accidents in monitored facilities caused by improper use of personal protective equipment.

In 2018, a pilot project was launched at Kola NPP to ensure industrial safety based on computer vision. The project involves real-time monitoring of the use of personal protective equipment by employees in the course of operations. The video stream is analysed using an artificial intelligence system. If a violation is detected, a signal is sent to the persons responsible for the operation. The goal of the project is to avoid accidents in monitored facilities caused by improper use of personal protective equipment.

During the year, more than 40 events aimed at developing and supporting the volunteer movement were held in the areas where NPPs are located, including the We Are Together volunteer forum (Polyarnye Zori), the People of Good Will festival (Kurchatov), the Soldier’s Grave project (Volgodonsk), the Memory Watch project (Novovoronezh) and Days of Good Deeds.

The first criticality stage was completed at the reactor units of the Akademik Lomnoverov Floating nuclear power plant (FNPP), followed by a ramp-up to 10% of their capacity. The FNPP is an innovative Russian solution designed to provide power supply in the Far North, on islands and in other remote areas.

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The FNPP project attracts a strong interest from ROSATOM’s foreign partners. In 2018, an agreement on the development of a project to build an optimized floating nuclear power plant was signed with Sudan.

In 2018, the Division held the sixth open contest of important social projects among non-profit organizations in the areas where NPPs are located. 52 projects worth a total of RUB 45 million were declared winners. All the projects have been successfully implemented.

In 2018, a pilot project was launched at Kola NPP to ensure industrial safety based on computer vision. The project involves real-time monitoring of the use of personal protective equipment by employees in the course of operations. The video stream is analysed using an artificial intelligence system. If a violation is detected, a signal is sent to the persons responsible for the operation. The goal of the project is to avoid accidents in monitored facilities caused by improper use of personal protective equipment.
INNOVATIONS AND NEW PRODUCTS TO IMPROVE THE QUALITY OF PEOPLE’S LIFE

ROSATOM creates breakthrough technologies and innovation infrastructure to meet the energy needs of mankind.
5.1. RESEARCH AND INNOVATIONS

Key results in 2018:
— High-priority areas of scientific and technological development of the industry were approved, and a plan of R&D topics was developed;
— The first ever competition of conceptual designs was held;
— Internal research and development costs amounted to 3.0% of revenue;
— The number of international applications filed and patents obtained in the reporting year totalled 417.

ROSATOM creates breakthrough technologies and innovation infrastructure to facilitate long-term development and meet the energy needs of mankind.

5.1.1. IMPLEMENTATION OF THE INNOVATIVE DEVELOPMENT AND TECHNOLOGICAL MODERNIZATION PROGRAMME OF ROSATOM

In 2018, innovative activities in the Russian nuclear industry were aimed at developing industry research and creating ‘technological corridors’ to ensure the competitiveness of products on the global market.

Implementation of the Innovative Development and Technological Modernization Programme of ROSATOM until 2030 was focused on the following areas:
— Upgrading existing technologies;
— Creating new technologies for energy markets;
— Developing an innovation management system and innovation infrastructure, cooperating with third-party organizations.

In 2018, high-priority areas of scientific and technological development of the industry were approved taking into account the latest trends in scientific research and ROSATOM’s unique research and engineering capabilities. A portfolio of research projects was created. This makes it possible to finance early stages of R&D, which are the basis for the design and development of ROSATOM’s products.

An industry-wide plan of R&D topics was developed. It includes not only applied research, but also exploratory research that can open up new development paths for the industry. As part of the plan, ROSATOM intends to achieve a significant improvement in the characteristics of VVER reactors and to ensure their reasonable compatibility with fast neutron reactors.

In 2018, the first ever competition of conceptual designs was organised. More than 650 applications were submitted for the competition, and 190 applications were selected in various areas. Following the implementation of conceptual designs, robust statements of work for R&D were prepared.

5.1.2. KEY RESEARCH AND INNOVATION INDICATORS OF ROSATOM

<table>
<thead>
<tr>
<th>Year</th>
<th>Key Indicator</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Share of innovative products and services in total sales of products and services in the industry, %</td>
<td>13.6</td>
<td>13.5</td>
<td>17.5</td>
</tr>
<tr>
<td></td>
<td>Number of items of intellectual property: foreign patents obtained by ROSATOM, applications for foreign patents submitted and registered under the established procedure, registered trade secrets (know-how) reflecting the commercialization and expansion of the sphere of application of research results in the nuclear industry (cumulative total), pcs.</td>
<td>479</td>
<td>922</td>
<td>1,339</td>
</tr>
<tr>
<td></td>
<td>Internal research and development costs, % of revenue</td>
<td>—</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>Share of projects implemented by universities, small and medium-sized enterprises and other organizations outside the industry, %</td>
<td>12.7</td>
<td>12.8</td>
<td>15.6</td>
</tr>
</tbody>
</table>

5.1.3. KEY INNOVATIVE PROJECTS FORMING PART OF THE INNOVATIVE DEVELOPMENT AND TECHNOLOGICAL MODERNIZATION PROGRAMME

In 2018, the first ever competition of conceptual designs was organized to provide a rationale for radically new developments. More than 650 applications were submitted for the competition, and 190 applications were selected in various areas. Following the implementation of conceptual designs, robust statements of work for R&D were prepared.
5.1.2. Co-operation on Scientific Research with Research Institutions and Universities

More than 25 organizations of the Russian Academy of Sciences, 40 third-party research institutions and the National Research Center Kurchatov Institute were engaged in R&D conducted in the industry. ROSATOM engaged more than 30 specialized universities to carry out orders for R&D in the industry. The volume of orders performed by these universities totalled RUB 1.16 billion. The bulk of the work was performed by the National Research Nuclear University MEPhI, Nizhny Novgorod State Technical University, Bauman Moscow Technical University, Moscow State National Research University of Civil Engineers, Far Eastern Federal University, Moscow State University, Ural Federal University named after the First President of Russia Boris Yeltsin and National University of Science and Technology MISIS. The Proryv (Breakthrough) Project is the key innovative project in the National Research Nuclear University MEPhI, Dimitrovgrad (Ulyanovsk Region). The MBIR (Main Breakthrough Integrated Reactor) Project will contribute to meeting the energy needs of mankind.

5.1.3. PRORV (BREAKTHROUGH) PROJECT AIMED AT CLOSING THE NUCLEAR FUEL CYCLE

The Proryv (Breakthrough) Project is the key innovative project in the nuclear industry. It is aimed at developing fast neutron reactors and closing the nuclear fuel cycle. The project will result in the development of technologies that will help to solve the problem of radioactive waste accumulation and make nuclear power plants more cost-effective.

In 2018, the construction of the Fabrication and Refabrication Module, one of the key parts of the pilot and demonstration energy facility which is designed to produce mixed nitride uranium-plutonium (MNUP) fuel for fast neutron reactors, continued at JSC SCC. Main process equipment was assembled. In addition, a positive opinion was obtained for the design concept and draft the relevant intergovernmental agreement for the implementation of this project will be to develop an engineering facility: an experimental tokamak facility with a strong magnetic field and adiabatic plasma compression (the TSP facility). The IGNITOR Project is aimed at creating a tokamak with high magnetic field and adiabatic plasma compression (the TSP facility). The possibility of using this facility for the construction of the IGNITOR tokamak at the site of JSC TRINITI was confirmed. The next step in the implementation of this project will be to develop an engineering design concept and draft the relevant intergovernmental agreement between Russia and Italy.

5.1.4. PARTICIPATION IN INTERNATIONAL MEGA RESEARCH PROJECTS

<table>
<thead>
<tr>
<th>ITER Project</th>
<th>ITER is the world’s first experimental fusion reactor that is being built by the international community near the Cadarache nuclear centre in France. The aim of the project is to demonstrate the scientific and technical possibility of using nuclear fusion on an industrial scale and to master the relevant technological processes. The success of the ITER project will contribute to meeting the energy needs of mankind.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FaCTOR FOR ANTI-PROTON AND ION RESEARCH IN EUROPE (FAIR)</td>
<td>The FAIR project is aimed at creating a large international laboratory for researchers from all over the world to study fundamental properties and structures of matter and the evolution of the universe after the Big Bang. Researchers from all over the world are invited to the project.</td>
</tr>
<tr>
<td>IGNITOR Project</td>
<td>The IGNITOR Project is aimed at creating a tokamak with high magnetic fields and high toroidal current. Successful IGNITOR experiments will enable a significant simplification of technology and reduction of the cost of a nuclear fusion reactor.</td>
</tr>
</tbody>
</table>

In 2018, scheduled work was performed to develop and manufacture all 25 systems included in the list of Russia’s obligations.
5.1.5. INTELLECTUAL PROPERTY MANAGEMENT AND PROTECTION

In 2018, protection of the industry’s key products and technologies abroad remained the main priority of the intellectual property management system. The Industry-Wide Competence Centre for Intellectual Property Management helped to maintain a high rate of expansion of the scope of international patenting. In 2018, the number of applications filed and foreign patents obtained by ROSATOM totalled 471.

INDICATOR | 2016 | 2017 | 2018 |
--- | --- | --- | --- |
PATENT ACTIVITY | | | |
Number of patents obtained for inventions, utility models and industrial designs, certificates for computer software and databases, number of registered items of know-how, pcs. | 1,090 | 1,286 | 500 |
Number of applications for state registration of protectable intellectual property (IP), pcs. | 1,038 | 1,073 | 296 |
Number of international applications and foreign patents, pcs. | 321 | 443 | 417 |

TRENDS IN FOREIGN PATENTING (BY YEAR AND AS A CUMULATIVE TOTAL)

In 2018, over 11,000 items of intellectual property owned by nuclear organizations were entered into the IT system for IP rights management.

In the reporting year, a methodology was developed for assessing the portfolios of intellectual property rights of ROSATOM and its organizations.

In 2019, ROSATOM plans to:

— Expand the industry-wide network of patent experts to ensure optimal allocation of resources for prioritized tasks, and improve the overall level of competence of patent offices in the industry;

— Arrange an advanced training course in patent research in the current environment for enterprises in the industry, given the large scope of R&D conducted under the industry-wide plan of R&D topics and conceptual designs;

— Ensure that the number of patent applications submitted and foreign patents obtained by ROSATOM totals at least 361 items.

5.1.6. KNOWLEDGE MANAGEMENT SYSTEM (KMS)

In 2018:

— The most in-demand areas of research and technical content and requirements for the development of KMS tools, including the Research and Technical Information Portal corporate digital library, were identified;

— 270 specialists from more than 50 enterprises in the industry completed an up-to-date online training course on the methodology and issues of the knowledge management system;

— The classification of 7,166 documents was completed;

— The first stage of an industry-wide programme to digitize archives containing research and technical information was completed.

CONTENTS OF THE RESEARCH AND TECHNICAL INFORMATION PORTAL, NUMBER OF DOCUMENTS

In 2019, ROSATOM plans to:

— Establish a framework for a single centre for subscribing to databases of global regulatory, research, technical and patent information in ROSATOM’s organizations;

— Continue to implement the industry-wide programme to digitize archives containing research and technical information until 2022;

— Take measures to preserve critical knowledge and implement knowledge transfer programmes;

— Develop the knowledge management methodology and continue to develop a knowledge management culture among employees.

IN 2018

In 2016 2017 2018 2016 2017 2018

350,000 500,000 655,000 12,136 81,500 100,000 78

5.2. BUSINESS DIVERSIFICATION

New businesses (those that cater primarily to markets outside the scope of the industry) are developed first and foremost in those segments where ROSATOM has capabilities and technological know-how. This approach helps to mitigate market and technological risks.

Key new business areas include nuclear medicine, wind power, composite materials, additive manufacturing, energy storage systems, lasers, supercomputers, automated process control systems and electrical engineering equipment for the oil and gas industry, wastewater treatment technologies, digital products, etc. These areas have been formed taking into account the maximum number of overlaps with existing technical, technological and research competences, including the research and production capabilities of ROSATOM’s enterprises. Industry-wide strategic programmes and product strategies developed and launched at ROSATOM cover more than 60 areas in total.

IN 2018

158 479 922 1,339 102 321 443 617

For details, see the section ‘Digital Transformation’.
5.2.1. RESULTS IN 2018

In the reporting year, revenue from new products outside the scope of the Corporation totalled RUB 196.7 billion, almost meeting the target (RUB 197.9 billion) and exceeding the 2017 level by 15.1%. The 10-year order portfolio outside the scope of the Corporation reached RUB 1,082.6 billion, which is 23% above the target (RUB 880.0 billion) and 33% more than in 2017.

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue from new products (outside the scope of the Corporation), RUB billion</td>
<td>147.4</td>
<td>170.9</td>
<td>196.7</td>
</tr>
<tr>
<td>10-year order portfolio of orders for new products</td>
<td>610.8</td>
<td>814.1</td>
<td>1,082.6</td>
</tr>
</tbody>
</table>

### Breakdown of Revenue from New Products (Outside the Scope of the Corporation) in 2018 by Division, Complex and Organization

- Power Engineering Division: 36.6%
- Nuclear Weapons Division: 19.2%
- Mechanical Engineering Division: 18.3%
- Sales and trading: 5.2%
- JSC Science and Innovations: 5.1%
- Advanced materials and technologies: 3.2%
- FSUE Atomflot: 4.0%
- Fuel Division: 3.6%
- JSC Rosatom Healthcare: 4.2%
- Other: 4.3%

### Breakdown of the 10-Year Portfolio of Orders for New Products (Outside the Scope of the Corporation) in 2018 by Division, Complex and Organization

- Power Engineering Division: 23.5%
- Nuclear Weapons Division: 16.4%
- Mechanical Engineering Division: 15.6%
- JSC Science and Innovations: 10.3%
- Advanced materials and technologies: 9.5%
- JSC Rosatom Healthcare: 7.2%
- Other: 6.2%
- Automotive solutions: 2.7%
- Nuclear medicine and isotopes: 2.1%
- Research and industrial reactors: 1.8%
- New Reactor Projects: 1.1%
- Fuel Division: 1.0%
- Other: 0.8%
- Life Cycle Back-End Division: 0.6%
A cooperation agreement between JSC Rusatom Healthcare and —
— of development of cooperation in various areas:
In addition, in 2018, the following documents were signed as part of the construction of facilities for the production of radiopharmaceuticals; taking into account the best international practices, including the construction, equipment and operation of nuclear medicine facilities and technical capabilities of both companies in the design, facilities and technical capabilities of both companies in the design, construction, equipment and operation of nuclear medicine facilities taking into account the best international practices, including the construction of facilities for the production of radiopharmaceuticals;
— A memorandum of cooperation between JSC Rusatom Healthcare and LLC MedInvestGroup, which forms part of Pharmstandard Group.
— A cooperation agreement between JSC Rusatom Healthcare and LLC MedInvestGroup, which forms part of Pharmstandard Group.
— A memorandum of cooperation on the construction of a network of processing centres using radiation technologies in the Philippines.
— A memorandum of cooperation between JSC Rusatom Healthcare and the Federal State Budgetary Institution National Medical Research Radiological Centre of the Ministry of Health of Russia.
— A memorandum of cooperation between JSC Rusatom Healthcare and LLC MedInvestGroup, which forms part of Pharmstandard Group.

ROSATOM offers nuclear medicine technologies and services that enable timely diagnosis and effective treatment of certain types of cancer. The Corporation is developing new high-technology equipment and radiopharmaceuticals based on isotopes produced in-house. It supplies solutions for nuclear medicine centres comprising diagnostic and radiotherapy modules worldwide.

ROSATOM is actively developing the Russian wind power market. JSC Novawind, the holding company managing wind power projects, consolidates all of ROSATOM’s wind power assets and capabilities in the leading wind power segments and technological platforms.

In 2018, letters of intent on the implementation of investment projects for the construction of advanced wind power plants were signed with the Administration of the Krasnodar Territory and the Government of the Stavropol Territory and the Government of the Rostov Region.

ROSATOM has launched the production of a wide range of carbon fibres and materials based on them. The materials match the best global analogues in terms of quality and price. JSC RPC Khimpromengineering (a brand of UIMATEX Group) is the holding company managing enterprises that produce high-strength high-modulus carbon fibre and fabrics.

This business area is strategically important to the Corporation. Its key tasks is to create a complete production chain in Russia to ensure import substitution at all processing stages and for all types of materials. The Corporation has consolidated three of the four processing stages: the manufacture of carbon fibre, fabrics (including multifilax fabrics) and pre-precipitation. A project to start in-house production of PAN precursor (the fourth processing stage) is at the active stage. A PAN precursor plant is under construction in Stavropol. It is scheduled to be launched in 2020.

In 2018, the production of fabrics and pre-precipitation was launched. Two industrial enterprises were acquired. Starting from 2019, the Corporation is ready to meet up to 90% of domestic demand for carbon composites.

In 2018, 60 sets of composite casings for wind turbines were delivered; ROSATOM is ready to meet up to 90% of domestic demand for carbon composites.

In 2018, the Corporation has consolidated three of the four processing stages: the manufacture of carbon fibre, fabrics (including multifilax fabrics) and pre-precipitation.

In 2019, these materials will be used in the renovation of the Moscow Kremlin museum complex.

Composites are considerably lighter in weight, while their strength, elasticity, chemical and corrosion resistance are several times higher than those of conventional materials. Composite materials are used in the aerospace, nuclear and automotive industries, construction, shipbuilding, bridge construction and manufacture of consumer goods.

ROSATOM produces polymer composite materials based on carbon fibre with carbon content ranging from 92% to 99.9%.

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As of December 31, 2018, rated capacity of JSC Novawind’s wind farms totaled 1 GW. This is sufficient to provide permanent power supply for 167,000 apartments. Over 20 years of operations, a wind farm of this size will help to save 92 million barrels of oil.

To promote wind power capabilities, JSC Novawind and the Dutch company Lagerwey established a joint venture, Red Wind, which will be responsible for marketing and sales in Russia, lumber supply of wind turbines and aftersales service.

After obtaining permissions for the construction of wind farms in Russia, ROSATOM plans to expand into the international market.

In 2018, construction of a 150 MW pilot wind power plant in Adygea and a wind turbine and component factory in Volgodonsk was underway.

In 2019, technologies for the repair and reinforcement of concrete, reinforced concrete, stone, metal and wooden structures. Compared to traditional structural reinforcement methods, the use of carbon tapes can significantly reduce the cost and duration of work. It does not require special expensive equipment. In addition, when buildings and structures are reinforced with carbon tapes, their life increases to 50 years. In 2019, these materials will be used in the restoration of the Moscow Kremlin museum complex.

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5.2.2. PLANS FOR 2019

In 2019, the Corporation plans to continue to take active steps to increase the revenue and expand the portfolio of orders across its new businesses.
The Uniform Digital Strategy of ROSATOM gives priority to developing digital products, rolling them out in the industry and putting them on the market.
We began to build an architecture and infrastructure that takes into account the needs of all customers from all levels of management. At the same time, I believe that the key achievement in 2018 is that we began to look at the task of digitization from a different angle, in a more systematic, business- and customer-oriented way. We were working simultaneously in strategic, tactical and operational areas. After all, digitization is not something new that has emerged from scratch. In fact, digitization is a new phase of the IT transformation programme launched earlier.

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As part of the Digital Products programme, our goal is to become a major player on the digital product market both in Russia and abroad. To achieve this goal, we plan to introduce replicable digital products based on our most promising developments in the industry and put them on the market over the next five years.

The medium-term horizon of the digital strategy extends until 2024. The key result here is ROSATOM’s contribution to the achievement of digitization goals as part of Russian national projects. The short-term horizon extends until 2021. For this period, road maps have been developed for 11 interrelated programmes, each with specific targets.

For example, by the end of 2021, under the programme titled ‘Digitization of NPP Construction Processes,’ we need to ensure end-to-end interdivisional integration of data and information systems and introduce an integrated system of reference data covering the entire life cycle of NPP construction. In terms of design digitization, we are introducing a domestically-developed network scheduling and resource planning solution. As for foreign construction projects, we plan to complete the digitization of administration and maintenance activities and the resource planning and management process; in addition, a module for managing the cost of ownership of nuclear power plants will be rolled out.

The comprehensive nature of the programme is both a challenge and a response to it. Without a systematic approach, we cannot build anything that is fundamentally new. We will have to simultaneously complete the tasks of full-scale digitization at the basic level, build state-of-the-art systems based on artificial intelligence and big data analysis and develop quantum computing.

Another challenge is the broad scope of the project, i.e. the fact that it includes a wide range of tasks. Unlike many similar examples, ROSATOM not only carries out its internal digital transformation, but also acts as a manufacturer of modern digital products and is a key participant in the digitization of the Russian economy.

And finally, there is a challenge related to high speed and flexibility. Digitization means a new pace, a new speed of decision-making and action, a new level of flexibility, including new mechanisms enabling flexible communication and cooperation between various divisions.

How do we meet these challenges? First of all, we need to engage both managers at all levels and employees in the implementation of the digital strategy. And I am absolutely certain that we will rise to these challenges. Throughout its history, the nuclear industry has succeeded in solving even more complicated problems.

— What are the key challenges in implementing the Uniform Digital Strategy?

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The scale of the industry and its special features, in terms of both a high degree of business diversification and complexity of interconnections, also pose a challenge.

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In 2018, ROSATOM was the first among state-owned corporations and partially state-owned companies to develop and approve a Uniform Digital Strategy.

The strategy is based on the analysis of the current challenges facing the Corporation and its readiness for digitization. It takes into account key technological trends, best practices in the sphere of digital transformation and analysis of the causes of success and failure in the transformation of industrial companies in Russia and abroad.

More than 300 people took part in the development of the Strategy at all levels, from the central office of the Corporation to its Divisions and enterprises.

6.2. INTERNAL DIGITIZATION

In 2018, ROSATOM was dealing with cross-cutting functional tasks in the areas that are strategically important for the Corporation:

— An end-to-end cost management system,
— Quality management systems in NPP construction processes,
— HR and resource management systems.

The first projects aimed at the digitization of corporate processes based on ROSATOM’s own digital products were implemented. These included a project to introduce an HR management system developed by FSE RFCN VNIIEF at a number of enterprises in the industry.

The enterprises of ROSATOM implemented a number of projects using advanced end-to-end technologies aimed at improving manufacturability, efficiency and industrial safety (for more details, see sections of the report on the operations of the Divisions).

6.3. DIGITAL PRODUCTS

The Uniform Digital Strategy gives priority to developing ROSATOM’s digital products, rolling them out in the industry and putting them on the market.

In 2018, a ‘product-based approach’ to development started to be introduced in the industry. It includes, among other things, market intelligence, product positioning, technical descriptions, a testing system (including usability testing), scalable technical support and a training system. The concept of a standard organizational structure for the development and implementation of digital products and their launch on the market was developed. A Digital Product Competence Centre was formed. It is responsible for the development and implementation of methodologies forming part of the ‘product-based approach’.
6.5. DEVELOPMENT OF DIGITAL COMPETENCES AND A DIGITAL CORPORATE CULTURE

In 2018:
— The Industry 4.0 training programme was launched at ROSATOM’s Corporate Academy; it is focused on digital transformation and digital technologies;
— The Corporation carried out an audit of its talent pool, prepared roadmaps for the development of a professional development system, cooperation with universities and renewal of project teams by attracting additional external resources;
— A joint digitization programme was developed in cooperation with NRNU MEPhI;
— The Digital Change Support Team started to work.

ROSATOM is a key participant in the implementation of a government programme titled ‘Digital Economy of the Russian Federation’. In 2018, the Corporation was involved in the implementation of the government programme in the following areas:
— As a competence centre in the area ‘Development of Research Competences and Technological Know-How’;
— In supporting the holding of competitive procedures for the selection of the best projects in the field of ‘end-to-end’ technologies.

In addition, in 2018, partnership agreements were signed with the Russian Highways State Company (Avtodor), the State Space Corporation Roscosmos and the Nizhny Novgorod Region.

6.4. PARTICIPATION IN THE DEVELOPMENT OF RUSSIA’S DIGITAL ECONOMY

ROSATOM is a key participant in the implementation of a government programme titled ‘Digital Economy of the Russian Federation’. In 2018, the Corporation was involved in the implementation of the government programme in the following areas:
— As a competence centre in the area ‘Development of Research Competences and Technological Know-How’;
— In supporting the holding of competitive procedures for the selection of the best projects in the field of ‘end-to-end’ technologies.

In addition, in 2018, partnership agreements were signed with the Russian Highways State Company (Avtodor), the State Space Corporation Roscosmos and the Nizhny Novgorod Region.
ROSATOM is the infrastructure operator of the Northern Sea Route and is responsible for the development of seaport infrastructure, enabling navigation and escorting vessels throughout the year.
7.1. ROSATOM’S POWERS RELATED TO THE DEVELOPMENT AND OPERATION OF THE NORTHERN SEA ROUTE (NSR)

In 2018, Federal Law No. 525-FZ on Amendments to Certain Laws of the Russian Federation was adopted. It assigns the functions of the infrastructure operator of the Northern Sea Route to ROSATOM.

In accordance with the Federal Law, the Corporation has the powers of the chief manager of budget funds, the recipient of budget funds, the chief administrator of budget revenues and the government customer under government programmes in the following areas: the development and sustainable operation of the NSR, infrastructure of seaports along the NSR (including their power supply), supporting navigation and escorting vessels along the NSR throughout the year.

The Corporation has been granted the right to formulate proposals for the government policy on the development and sustainable operation of the NSR. In addition, ROSATOM will cooperate with competent authorities to enable accurate and safe navigation of vessels along the NSR.

7.2. PERFORMANCE OF THE NUCLEAR-POWERED ICEBREAKER FLEET AND DEVELOPMENT OF THE NORTHERN SEA ROUTE

7.2.1. NORTHERN SEA ROUTE

The Northern Sea Route is a strategic shipping route that makes it possible to reduce the duration of a voyage from Europe to Asia by more than a third compared to the Southern Sea Route via the Suez Canal. In the coming years, cargo traffic along the Northern Sea Route is set to increase to 80 million tonnes per year.

7.2.2. NUCLEAR-POWERED ICEBREAKER FLEET OF ROSATOM

Russia owns the world’s only nuclear-powered icebreaker fleet and has a long track record in the construction and operation of nuclear icebreakers. Icebreakers equipped with nuclear power units help vessels navigate along the Northern Sea Route. Thus, the nuclear-powered icebreaker fleet owned by ROSATOM participates in projects in the Arctic that are strategically important for Russia’s economic development.
The nuclear-powered icebreaker fleet includes:

— Two nuclear icebreakers with 75,000 h.p. two-reactor nuclear power unit: Yamal and 50 Let Pobedy.

— Two nuclear icebreakers with a 50,000 h.p. one-reactor nuclear power unit: Taymyr and Vaygach.

— Severnaya, a nuclear-powered LASH carrier with a 40,000 h.p. one-reactor nuclear power unit.

7.2.3. ESCORTING VESSELS ALONG THE NSR

In 2018, icebreakers of FSUE Atomflot, an enterprise of ROSATOM, escorted 231 vessels with a total gross tonnage of 12.7 million tonnes along the Northern Sea Route (493 vessels with a total gross tonnage of 7.2 million tonnes in 2017). Thus, the gross tonnage of escorted vessels increased by 7.6%. While the gross tonnage increased, the number of escorted vessels decreased as large-capacity Yamal LNG carriers with a gross tonnage of 128,800 tonnes were escorted. They exported liquefied natural gas from the port of Sabetta.

In 2018, FSUE Atomflot continued the creation of a situation centre to manage the movement of vessels along the NSR in order to use icebreakers more efficiently, improve the safety and security of logistical operations, and guarantee the fulfilment of contractual obligations taking into account the hydrometeorological and ice conditions.

7.2.4. EXTENSION OF THE SERVICE LIFE OF OPERATING ICEBREAKERS AND DEVELOPMENT OF ONSHORE INFRASTRUCTURE OF FSUE ATOMFLOT

In 2018, a decision was made to develop a digital strategy for FSUE Atomflot. FSUE Atomflot is implementing a programme to extend the service life of reactor units of operating icebreakers. This helps to completely prevent the risk of unavailability of icebreakers and to start the operation of project 22220 multipurpose nuclear icebreakers once their construction is completed.

In 2018, the reactor unit of the Yamal nuclear icebreaker (whose service life was extended to 200,000 hours in 2017) and two reactor units of the Yamal nuclear icebreaker were relaid. These measures will make it possible to operate these icebreakers during the next few years with minimal time spent on routine maintenance and scheduled repairs.

In the reporting year, the service life of nuclear-powered engineering support vessels was extended for the first time. The operational life of the nuclear units of the Imandra and Lotta floating maintenance bases and special systems of the Severnaya nuclear motor vessel was extended until the end of 2025.

As part of the development of onshore infrastructure, a dock repair shop was constructed and put into operation. The shop is equipped with modern numerical control machines with digital display devices.

— Imandra and Lotta floating maintenance bases;

— Severnaya, a motor vessel intended for liquid RAW management and SNF transportation; Rossita, a motor vessel used for SNF and RAW transportation, and Route 1, a monitoring vessel operating on the Russian shelf.

The icebreakers and onshore infrastructure are operated by ROSATOM’s enterprise FSUE Atomflot, which has the status of a federal nuclear organization.

Given that cargo traffic is set to grow, ROSATOM is upgrading and modernizing its icebreaker fleet on a large scale. The construction of three new project 22220 multipurpose nuclear icebreakers is under way (Arktika, the flagship icebreaker, was launched in 2016, and Sibir, the first follow-on icebreaker, was launched in 2017). The slipway stage of construction of the third multipurpose nuclear icebreaker continues. By 2022, Russia will have a unique fleet comprising a total of eight nuclear-powered vessels that will provide icebreaker assistance to all important Arctic projects in the country.

7.2.5. NEW PRODUCTS AND SERVICES

An icebreaking tugboat, Nadym, was put into operation as part of the project to create a port of vessels for the needs of OJSC Yamal LNG. The construction of a port icebreaker, Ob, continued. The port vessels enable the year-round safe mooring of large-capacity vessels at the berths of the port of Sabetta. The service contract with OJSC Yamal LNG is valid until 2040.

In 2018, the Arctic Maritime Competence Centre was opened at the Admiral Makarov State University of Maritime and Shipping (Saint Petersburg) on the initiative of FSUE Atomflot.

The Centre has become the only educational organization in Russia for the training, professional development, management of professional competences and periodic retraining of personnel for a new generation nuclear-powered icebreaker fleet. The core of the Centre is a unique simulator complex for training in the management of the RITM-200 reactor unit.

In the reporting year, FSUE Atomflot and the Sirius Educational Centre signed a cooperation agreement. The first group of the Centre’s students visited the enterprise. In 2019, cooperation will continue: several working meetings are planned between students and representatives of the fleet and onshore divisions.

7.2.6. HUMAN RESOURCE DEVELOPMENT AT FSUE ATOMFLOT AND SOCIAL PROJECTS

In 2018, the Youth Council of FSUE Atomflot organized volunteer campaigns: Let’s Make the Planet Cleaner (collecting used batteries) and Kind Heart (collecting food for animals living in a shelter).

In 2018, the Business Council of FSUE Atomflot organized a series of meetings among students and representatives of the fleet.

In 2018, the Youth Council of FSUE Atomflot organized volunteer campaigns: Let’s Make the Planet Cleaner (collecting used batteries) and Kind Heart (collecting food for animals living in a shelter).

In 2018, the Business Council of FSUE Atomflot organized a series of meetings among students and representatives of the fleet.

7.2.7. PLANS FOR 2019 AND FOR THE MEDIUM TERM

— To participate in the implementation of the Comprehensive Plan for Upgrading and Expanding Core Infrastructure until 2024 (prepared in accordance with Presidential Executive Order No. 204 on National Goals and Strategic Objectives of the Russian Federation through to 2024 dated May 2, 2018) by developing the Northern Sea Route.

— To prepare by laws necessary for the implementation of Federal Law No. 525-FZ on Amendments to Certain Laws of the Russian Federation, whereby the functions of the infrastructure operator of the Northern Sea Route are assigned to ROSATOM.

— To prepare for the transfer of FSUE Hydrographic Enterprise to the Corporation (in coordination with the Ministry of Transport of Russia).

— To provide icebreaker assistance for new mineral development projects.

— To build port vessels.

— To prepare the infrastructure of the Murmansk seaport to accommodate a new port icebreaker (to build a floating dock, pier and a nuclear engineering support vessel).

— To continue the construction of project 22220 multipurpose nuclear icebreaker, to launch the second follow-on icebreaker, Ural, and to conduct sea trials of the flagship icebreaker in 2019.

— To start the construction of Lider, the new most powerful icebreaker which will enable year-round operation in the High Arctic, mainly in its eastern sector.

— To improve performance (to increase labour productivity and adjusted free cash flow, to reduce unit costs as a percentage of the revenue of FSUE Atomflot).

— To increase revenue from and expand the portfolio of orders for new products and services.

— To continue the work on current projects and expand the range of products and services.
ROSATOM comprises over 300 organizations and enterprises. It is tasked with implementing a uniform government policy on nuclear power and fulfilling Russia’s international commitments related to the peaceful use of nuclear energy.
In accordance with Article 23 of Federal Law No. 317-FZ on State Atomic Energy Corporation Rosatom dated December 1, 2007, the Supervisory Board is ROSATOM’s supreme governing body. Powers of the Supervisory Board are stipulated by Federal Law No. 317-FZ dated December 1, 2007.

The Supervisory Board comprises nine members, including eight representatives of the President of the Russian Federation and the Government of the Russian Federation, as well as ROSATOM’s Director General, who is a member of the Supervisory Board by virtue of his position.

The Supervisory Board members and chairman are appointed by the President of the Russian Federation. The Supervisory Board members, except for ROSATOM’s Director General, are not executives of ROSATOM.

The Supervisory Board members receive no remuneration for their participation in the work of the Supervisory Board.

Composition of ROSATOM’s Supervisory Board as of December 31, 2018

Sergey Kirienko
First Deputy Chief of the Presidential Executive Office, Chairman of the Supervisory Board

Igor Borovkov
Chief of Staff of the Military Industrial Commission under the Government of the Russian Federation, Deputy Chief of Staff of the Russian Government

Larissa Brychyna
Assistant to the President of the Russian Federation, Head of the Legal Department of the Presidential Administration

Andrey Klepach
Deputy Chairman (Chief Economist), member of the Management Board of State Development Corporation VEB.RF

Sergey Korolev
Head of the Economic Security Service of the Federal Security Service of Russia

Alexey Likhachev
Director General of State Atomic Energy Corporation Rosatom

Alexander Novak
Minister of Energy of the Russian Federation

Yury Trutnev
Deputy Chairman of the Government of the Russian Federation, Plenipotentiary Representative of the President of the Russian Federation in the Far Eastern Federal District

Yury Ushakov
Assistant to the President of the Russian Federation

In 2018, there were no changes in the composition of ROSATOM's Supervisory Board.

In the reporting year, the Supervisory Board held 12 meetings, including two face-to-face meetings, and considered 41 issues.

The Supervisory Board approved the following:

- The report on the achievement of key performance targets by ROSATOM in 2017;
- Key performance targets of federal nuclear organizations for 2018;

**ROSATOM’S DIRECTOR GENERAL**

The functions and powers of the Director General are stipulated in the Federal Law on State Atomic Energy Corporation Rosatom. ROSATOM’s Director General is the Corporation’s sole executive body and manages its day-to-day operations.

Alexey Likhachev is ROSATOM’s Director General (appointed by Decree No. 527 of the President of Russia dated October 5, 2016). Information on the background of the Director General is available on ROSATOM’s official website.

**ROSATOM’S MANAGEMENT BOARD**

The Management Board is ROSATOM’s collective executive body. The Management Board includes ROSATOM’s Director General, who is a member of the Board by virtue of his position, and other members of the Board. The Director General manages the work of ROSATOM’s Management Board.

The powers of the Management Board are stipulated in the Federal Law on State Atomic Energy Corporation ROSATOM. Information on the background of the Board members is available on ROSATOM’s website.

Members of ROSATOM’s Management Board are appointed and dismissed under the resolution of ROSATOM’s Supervisory Board on the recommendation of the Director General. The Board members work full-time for ROSATOM or are employees of ROSATOM’s organizations, joint-stock companies and their subsidiaries, as well as enterprises controlled by ROSATOM.

Information about income, expenses, property and liabilities of the Management Board members and their relatives is available on ROSATOM’s official website.

Changes in the composition of the Management Board in 2018:

- Ilya Rebrov and Vyacheslav Ruksha were appointed to the Management Board;
- Nikolay Solomon resigned from the Management Board.

In 2018, the Management Board held 33 meetings (all by absentee voting). The Board considered 292 issues, including the following key issues:

- The achievement of key performance targets by ROSATOM in 2017;
- ROSATOM’s key performance targets for 2018.

**AUDITING COMMISSION**

ROSATOM’s Auditing Commission monitors ROSATOM’s financial and business operations.

Composition of the Auditing Commission as of December 31, 2018:

- Roman Artyukhin: Head of the Federal Treasury, Chairman of the Auditing Commission
- Alexey Lipaev: Deputy Department Director, Head of the Office for Budgetary Policy in the Sphere of the State Defence Order and Material Reserves of the Department for Budgetary Policy in the Sphere of State Military and Law Enforcement Services and the State Defence Order of the Ministry of Finance of the Russian Federation
- Vladimir Katerenko: Auditor of the Accounts Chamber of the Russian Federation
- Andrey Rozhnov: Deputy Head of the 12th Main Department of the Ministry of Defence of the Russian Federation

**COMPOSITION OF THE MANAGEMENT BOARD AS OF DECEMBER 31, 2018**

- Alexey Likhachev, Director General, Chairman of the Management Board
- Ivan Kamenskikh, First Deputy Director General for Nuclear Weapons
- Kirill Komarov, First Deputy Director General for Corporate Development and International Business
- Alexander Lokshin, First Deputy Director General for Operations Management
- Konstantin Denisov, Deputy Director General for Security
- Oleg Krizhanov, Director for Public Policy on Radioactive Waste, Spent Nuclear Fuel and Nuclear Decommissioning
- Andrey Nikkelov, Chief Executive Officer of JSC Atomenergometr
- Sergey Novikov, State Secretary, Deputy Director General for Execution of State Powers and Budgeting
- Sergey Obozov, Director for ROSATOM Production System
- Yury Olshen, Deputy Director General for Innovation Management
- Andrey Petrov, Director General of JSC Rosenergometr
- Ilya Rebrov, Financial Director
- Vyacheslav Ruksha, Deputy Director General, Director for the Northern Sea Route Directorate
- Nikolay Spasskiy, Deputy Director General for International Relations
- Yury Yakovlev, Deputy Director General for the State Safety Policy in the Defence Uses of Atomic Energy
In 2018, ROSATOM had about 30 permanent committees, boards and commissions under the governing bodies.

<table>
<thead>
<tr>
<th>COMMITTEE/BOARD/COMMISSION</th>
<th>CHAIRMAN</th>
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<tbody>
<tr>
<td>Strategic Council</td>
<td>Alexey Likhachev, Director General</td>
</tr>
<tr>
<td>Operations Committee</td>
<td>Ivan Kamenskikh, First Deputy Director General for Nuclear Weapons</td>
</tr>
<tr>
<td>Staff and Incentives Committee</td>
<td>Alexander Lokshin, First Deputy Director General for Operations Management</td>
</tr>
<tr>
<td>Investment Committee</td>
<td>Yury Olenin, Deputy Director General for Innovation Management</td>
</tr>
<tr>
<td>Ethics Board</td>
<td>Evgeny Adamov, Scientific Leader of the Proxy Project</td>
</tr>
<tr>
<td>Committee on the Restructuring of Non-Core Assets, Real Property and Equity</td>
<td>Roman Zimmer, Director for Procurement, Logistics and Quality Management</td>
</tr>
<tr>
<td>Committee on Strategic Partnerships, Mergers and Acquisitions</td>
<td>Sergey Novikov, State Secretary, Deputy Director General for Execution of State Powers and Budgeting</td>
</tr>
<tr>
<td>Committee on Venture Capital Financing</td>
<td>Sergey Novikov, State Secretary, Deputy Director General for Execution of State Powers and Budgeting</td>
</tr>
<tr>
<td>Risk Committee</td>
<td>Yury Stepanov, Deputy Director General for Innovation Management</td>
</tr>
<tr>
<td>Science Committee</td>
<td>Herman Gonso, Chairman of the Central Arbitration Committee</td>
</tr>
<tr>
<td>Technical Committee of the Proxy Project</td>
<td>Gennady Sakharov, Director for Capital Investments, State Construction Supervision and Government Expert Review</td>
</tr>
<tr>
<td>Central Procurement Commission</td>
<td>Roman Zimmer, Director for Procurement, Logistics and Quality Management</td>
</tr>
</tbody>
</table>

8.1.2. IMPROVEMENT OF THE CORPORATE GOVERNANCE SYSTEM

In 2018, ROSATOM and joint-stock companies in the nuclear industry adhere to the key corporate governance principles stipulated by Russian legislation and the Corporate Governance Code (including respect for shareholder rights, determination of the procedure, format and scope of information disclosed), with some exceptions stemming from special characteristics of ROSATOM’s business and its legal status as the authorized body responsible for nuclear power management (restricted circulation of shares of joint-stock companies on the lists approved by the Russian President and comprising Russian legal entities that may own nuclear materials or nuclear facilities).

In 2018, the Corporation continued to adopt new regulations governing the cooperation between ROSATOM and the holding companies of its divisions, business incubators and industry complexes. This included the following measures:

— The procedure for cooperation between ROSATOM and LLC Rusaatom Infrastructure Solutions (the industry integrator for the Centralization and Development of Resource Distribution Systems (Concession) business area) was adopted;

— The procedure for cooperation between ROSATOM and JSC TENEX was updated;

— The procedure for cooperation between ROSATOM and JSC Federal Centre for Nuclear and Radiation Safety, which had been responsible for managing enterprises in the life cycle back end, was rescinded. Organizations that had previously been managed by JSC Federal Centre for Nuclear and Radiation Safety were transferred to ROSATOM to be managed directly by the Corporation.

In the reporting year, ROSATOM completed the development of a three-tier system for the protection of intellectual property in the course of international cooperation and international business operations with assistance from the Federal Service for Intellectual Property and the Russian Ministry of Foreign Affairs:

— Standardization of regulations on intellectual property protection for intergovernmental agreements;

— A matrix-based approach to the terms and conditions of international business contracts;

— Integrated methodological support and control through specialized processes and legal instruments in the Corporation and the industry as a whole.

8.1.3. KEY CHANGES IN THE CORPORATE STRUCTURE IN 2018

In order to consolidate the results of R&D conducted as part of the Proryv project as intangible assets and commercialize them, JSC Atomenergoprom established a wholly-owned subsidiary JSC Proryv.

In order to set up a business specializing in industrial and consumer waste management, JSC Atomenergoprom established a wholly-owned subsidiary LLC Rusatom Greenway.
JSC Atomenergomprom established a wholly owned subsidiary LLC Rusatom Infrastructure Solutions and its subsidiaries LLC RIR-Sarno and LLC RIR Lesnoy in order to create a corporate structure for the following new business areas: Centralization and Development of Resource Distribution Systems (Concession), Clean Water and the Smart City.

In order to enable joint implementation of a project to build 660 MW wind power plants in Russia, additional shares of JSC VetroOGK were issued; as a result, a special-purpose entity acquired a stake in the authorized share capital of JSC VetroOGK (with organizations of ROSATOM remaining the holders of the controlling interest).

In order to launch the production of fabrics and pre-pregs, JSC RPC Khimiproermash completed the acquisition of a 100% shareholding previously held by JSC RUSNANO and JSC Composite Holding Company in JSC Prepreg-ACM, which produces fabrics and pre-pregs from carbon fibre.

LLC RIR-Lesnoy, the administration of the Lesnoy municipality and the Swordrock Region concluded a concession agreement with regard to centralized water supply and sewerage systems owned by the Lesnoy municipality.

Shares of new joint-stock companies under federal ownership were transferred to ROSATOM pursuant to Order No. 1319 of the Russian Government dated June 30, 2018, and shares of one joint-stock company were transferred to ROSATOM pursuant to Decree No. 734 of the Russian Government dated August 1, 2016 as an asset contribution of the Russian Federation.

8.1.4. NON-ARM’S LENGTH TRANSACTIONS

In accordance with Federal Law No. 317-FZ dated December 1, 2007, the Supervisory Board approves non-arm’s length transactions. In 2018, six non-arm’s length transactions were approved with the following organizations:

— The Foundation for Advanced Research Projects;

— The National Research Centre Kurchatov Institute;

— The National Research Nuclear University MEPhI.

8.1.5. PLANS FOR 2019 AND FOR THE MEDIUM TERM

— To transfer the property of the Federal State Unitary Enterprise Situation and Crisis Centre of the Federal Atomic Energy Agency to the Corporation as an asset contribution of the Russian Federation;

— To continue to adopt regulations governing the cooperation between ROSATOM and the holding companies of its business divisions; business incubators and industry complexes;

— To establish LLC Rusatom Digital Solutions (a wholly owned subsidiary of JSC Atomenergomprom, which will become a centre for the sales, promotion and implementation of a portfolio of digital products;

— To establish LLC RIR – North-West (a subsidiary of LLC Rusatom Infrastructure Solutions) and other legal entities to be managed by ROSATOM as part of the development of new businesses;

— To issue additional shares of JSC Atomenergomprom;

— To implement measures for the corporatization of six federal state unitary enterprises of ROSATOM;

— To establish the Litigation industry-wide claims administration centre, which will provide a shared industry-wide information space for claims administration and will help to centralize the relevant processes in the industry, reporting and a system for the monitoring of enforcement of cases and compliance with deadlines.

— A quantitative risk assessment was carried out for ROSATOM’s NPP construction projects (in accordance with the recommendations of the Total Cost Management Framework developed by the Association for the Advancement of Cost Engineering (AACE))[

— The list of key risks of ROSATOM and its organizations was updated, and a matrix of responsibility for the management of key risks was developed;

— Databases were prepared on all NPP construction projects completed in Russia and abroad and on systemic risks for the industry;

— Statistical analysis of the impacts on the cost and duration of ongoing and completed global and Russian NPP construction projects was performed.

8.2. RISK MANAGEMENT

8.2.1. RISK MANAGEMENT SYSTEM

The industry-wide risk management system (RMS) is based on a continuous cyclical process of identifying, assessing and managing the risks that can affect the Corporation’s short- and long-term performance and the implementation of its strategy.

In 2018:

— A long-term Risk Management Development Programme was approved for the period from 2019 through 2024; it includes alignment with business processes and the development of a risk management culture;

— Regulations were adopted establishing the procedures for investment project risk management; risk assessment of projects forming part of the state programme ‘Development of the Nuclear Power and Industry Complex’ and quantitative risk assessment of ROSATOM’s NPP construction projects;

— A quantitative risk assessment was carried out for ROSATOM’s NPP construction projects (in accordance with the recommendations of the Total Cost Management Framework developed by the Association for the Advancement of Cost Engineering (AACE)[28];

— The list of key risks of ROSATOM and its organizations was updated, and a matrix of responsibility for the management of key risks was developed;

— Databases were prepared on all NPP construction projects completed in Russia and abroad and on systemic risks for the industry;

— Statistical analysis of the impacts on the cost and duration of ongoing and completed global and Russian NPP construction projects was performed.
8.2. KEY BUSINESS RISKS OF ROSATOM

As part of the functioning of the RMS, a list of critical risks and risk owners was compiled; risks were assessed, and risk management measures were developed and implemented.

The connection between critical risks and the Corporation’s strategic goals is shown in section 8.2.3.

**RISK RADAR**

- **1. Currency risk**
  - Risk owners: Heads of ROSATOM’s Divisions
  - Adverse changes in exchange rates
  - Management approaches:
    - Maintaining a balance of claims and liabilities denominated in foreign currencies (natural hedging);
    - Use of financial hedging instruments.
  - Results:
    - An optimal ratio of assets and liabilities denominated in the same currency was maintained.

- **2. Interest rate risk**
  - Risk owners: ROSATOM’s Treasury Department
  - Adverse changes in interest rates, different timing of interest income and interest expenses
  - Management approaches:
    - Maintaining a balance of interest income and interest expenses in terms of timing and amounts;
    - Reasonable selection of interest rates (fixed or floating) for the expected maturity period. All things being equal, the Corporation prefers long-term fixed-rate loans with the option of penalty-free early repayment. It has not raised any loans with interest rates linked to the refinancing rate/key rate of the Bank of Russia;
    - Floating-rate loans on which interest rates may be increased are refinanced using the intragroup liquidity pool.
  - Results:
    - The Corporation maintains a stable long-term credit portfolio.
    - The average interest rate on the total debt portfolio of ROSATOM and its organizations was reduced to below 5.9%, partly due to the refinancing of both the rouble-denominated and foreign-currency-denominated portions of the credit portfolio, as well as partial repayment of the rouble-denominated portion of the credit portfolio in 2018.

Changes: The reduction in the risk level was the result of effective use of the risk management approaches described above and a decrease in volatility of the Russian credit market. For details, see the section ‘Financial Management’.

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**ORGANIZATIONAL MODEL OF THE RISK MANAGEMENT SYSTEM AT ROSATOM**

**STRATEGIC LEVEL**
- Aligning risk management with the Corporation’s business strategy

**TACTICAL LEVEL**
- Organization of effective RMS functioning in accordance with the Corporation’s strategy and established risk appetite

**OPERATIONAL LEVEL**
- Risk identification and assessment; development and implementation of risk management measures
- Organizational and methodological support of RMS processes at the Corporation and Division levels
2. Credit risk (ROSATOM’s Treasury Department for banks, Heads of the Corporation’s organizations for other counterparties)

- Failure by counterparties to fulfil their obligations in full and on time

Management approaches:
- Setting and monitoring of limits for counterpartry banks;
- Use of suretyship, guarantees, restrictions on advance payments in favour of external counterparties;
- Improvement of the legal framework for the wholesale electricity and capacity market (including an increase in fines and improvement of the system of financial guarantees);
- Monitoring of accounts receivable and the financial position of counterparties;
- Internal counterparty solvency rating system.

Results:
- There were no significant losses through the fault of counterparties.

3. Credit risk (JSC Atomenergoprom/Corporation and Department for the fulfillment of obligations by the Corporation and its organizations for other heads of Divisions)

- Lack of funds for the fulfillment of obligations by the Corporation and its organizations

Management approaches:
- Centralized cash management (cash pooling);
- Rolling liquidity forecasts and cash flow budget;
- Maintaining required amounts of open lines of credit with banks;
- Reducing the period of keeping spare cash on banks deposits when this is advisable from an economic perspective;
- Discussion of matters related to state support with Russian federal executive authorities;
- Wider use of project financing instruments as part of implementation of projects and programmes by the Corporation and its organizations;
- Maintaining credit ratings assigned to JSC Atomenergoprom by the ‘Big Three’ international rating agencies (S&P, Moody’s and Fitch) and by JSC Expert RA at the level of Russia’s sovereign credit rating.

Results:
- The Corporation maintained sufficient liquidity to repay liabilities on time, preventing unacceptable losses and reputational risk.
- For details, see the section ‘Financial Management’.

4. Liquidity risk

- Use of suretyship, guarantees, restrictions on advance payments in favour of external counterparties;
- Setting and monitoring of limits for counterparty banks;
- Monitoring of accounts receivable and the financial position of counterparties;
- Internal counterparty solvency rating system.

Results:
- There were no significant losses through the fault of counterparties.

5. Nuclear fuel cycle (NFC) product and service market risk (Heads of the relevant Divisions of ROSATOM)

- Adverse change in the pricing environment and demand on markets for natural uranium and uranium conversion and enrichment services

Management approaches:
- Maintaining an optimal balance between market-focused and escalation pricing mechanisms (benchmark price inflation) in contracts;
- Aligning pricing mechanisms used for procurement and those used in contracts with a high level of commodity risk;
- Discussing the volume of future orders with customers in advance;
- Embedding quantitative flexibility and options in contracts with suppliers to align purchase and sales volumes;
- Providing supply guarantee mechanisms;
- Improving the technical and economic characteristics of nuclear fuel, developing new types of fuel;
- Promoting products in new market segments.

Results:
- The risk level remains unchanged, as the fact that natural uranium prices and separation work up until prices are currently low limits their further reduction and at the same time creates growth opportunities if the market environment is favorable.
- For details, see the section ‘International Business’ and the annual reports of JSC TENEX and JSC TVEL for 2019.

6. Electricity and capacity market risks (Director General of JSC Rosenergoatom Concern)

- Adverse changes in electricity and capacity prices

Results:
- In 2018 (like in previous periods), key drivers 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 2018 compared to 2017.
- For details, see the annual report of JSC Rosenergoatom Concern for 2018.

7. Risk of a decrease in power generation (Director General of JSC Rosenergoatom Concern)

- Decrease in power generation due to equipment shutdowns and unavailability

Results:
- All incidents and equipment failures have been properly investigated. Corrective and preventive measures have been developed in order to address the root causes of the incidents and prevent their recurrence.

Changes:
- The level has decreased. Implementation of a set of risk management measures and the use of tools forming part of ROSATOM’s Production System made it possible to offset the impact of negative factors in 2018.
- For details, see the annual report of JSC Rosenergoatom Concern for 2018.

8. Industrial and environmental safety risk (Heads of ROSATOM’s Divisions)

- Major accidents/incidents in nuclear enterprise

Results:
- Safe operation of nuclear facilities and hazardous industrial facilities.
- For details, see the section ‘Nuclear and Radiation Safety; Occupational Safety and Health’
9. Political risk (International Cooperation Department of ROSATOM)

Management approaches:
—— Coordination with the Russian Ministry of Foreign Affairs and other authorities;
—— Political support for global operations of nuclear organizations;
—— Using the platform of specialized international organizations;
—— Awareness-raising activities conducted worldwide.

Results:
As of December 31, 2018, the 10-year portfolio of overseas orders totalled USD 133.2 billion, while overseas revenue increased to USD 6.5 billion. The growth was driven primarily by the overseas NPP construction project portfolio. The Corporation concluded 8 intergovernmental agreements and 20 major interdepartmental agreements, which is a positive trend.

Changes:
The risk tends to increase, as persisting political and economic pressure on Russian individuals and legal entities generally increases uncertainty over the possibility of implementation of specific economic projects.

For details, see the sections ‘International Cooperation’ and ‘International Business’.

10. Risk of loss of assets (Asset Protection Department of ROSATOM)

Corruption and other offences leading to the damage to/loss of assets

Management approaches:
Steps have been taken to develop the legal and organizational framework for the prevention of corruption and other offences.

Results:
Changes in the macro-economic indicators of countries participating in the projects; contractors’ failure to fulfill their commitments with regard to the schedule and quality of work to be performed.

Management approaches:
—— Measures are taken to shape a positive public opinion on the development of ROSATOM’s technologies (both nuclear and non-nuclear) through improved information transparency and open stakeholder engagement (including the functioning of an industry-wide public reporting system);
—— The Corporation works continuously to consolidate the recognition and appeal of its HR brand (both in the industry and among prospective employees and within the expert community);
—— ROSATOM continuously monitors public opinion on NPP construction and information on the decisions of government and regulatory bodies on curtailment of the nuclear industry in the countries where the Corporation is implementing projects. It continuously monitors and analyses news reports in the national and international media and information obtained during business meetings, industry conferences and workshops. Measures have been taken to ensure that industry executives are immediately informed about key developments in the media space in Russia and abroad;
—— If it is reasonable to make changes to the schedule of NPP construction projects in Russia and abroad, the relevant decisions are agreed with all parties involved in the projects and are reflected transparently in communications with partners and other stakeholders (including the general public and local communities).

Results:
Projects implemented abroad are supported by government bodies. The main Russian nuclear industry exhibition, ATOMEXPO 2018, titled ‘Global Partnership’ — Joint Success was attended by over 4,000 specialists and experts from 68 countries worldwide. The Corporation received a number of prizes and awards in the sphere of personnel management. In March 2019, ROSATOM topped the Ranking of the Best Russian Employers compiled by HeadHunter.

A high level of transparency and social responsibility at ROSATOM is confirmed by the fact that it was included in the top groups in sustainable development, corporate responsibility and reporting indices compiled by the Russian Union of Industrialists and Entrepreneurs (RSPP) for 2018 and ranked second in the Best Annual Accountability Report (Financial Sector) category of the Annual Report Contest for 2018 held by Expert RA.

Changes:
An increase in the risk level was due to its strong correlation with political risk.

For details, see the sections ‘Stakeholder Engagement’, ‘Implementation of the HR Policy’ and ‘Public Reporting of ROSATOM and its Organizations’.

11. Reputational risk (Communications Department of ROSATOM and Heads of Divisions)

Changes in stakeholder perception of the trustworthiness and appeal of the Corporation and its organizations

Management approaches:
—— Improvement of project management practices;
—— Development of action plans for the interaction with foreign customers;
—— Conclusion of long-term contracts with fixed electricity prices;
—— Development of standardized design solutions;
—— Implementation of a programme to reduce the cost and duration of NPP construction;
—— Implementation of a set of measures forming part of the industry-wide approach to managing risks associated with NPP construction projects;
—— Realization of available credit resources between projects, when possible.

Results:
The Corporation continuously improves the system for managing all stages of NPP construction, from front-end engineering design to the commissioning of power units. The Corporation carries out quantitative risk assessment for NPP construction projects (using the Monte Carlo method).

For details, see the reports of JSC ASE EC and JSC Rosenergoatom Concern for 2018.

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For details, see the reports of JSC ASE EC and JSC Rosenergoatom Concern for 2018.
8.2.4. RISK INSURANCE

Risk insurance is one of the main risk management approaches used by ROSATOM. To improve the reliability of insurance coverage, in 2018, the Corporation continued to cooperate with the insurance community on the reinsurance of Russian NPPs for potential nuclear damage. This proves that the international nuclear insurance community acknowledges the safety and reliability of Russian NPPs to be adequate. In-house insurance audits were conducted with assistance from experts of the Russian Nuclear Insurance Pool. Key enterprises in the industry will continue to be audited for insurance purposes in 2019.

8.2.5. OBJECTIVES FOR 2019 AND FOR THE MEDIUM TERM

Plans for the development of the industry-wide RMS in 2019 have been aligned with the key areas of the Risk Management Development Programme approved for the period from 2019 through 2024 and take into account both external factors related to the requirements of foreign customers (NPP construction on time and on budget) and Russian government bodies and internal factors (the need to build an efficient risk management system at ROSATOM that is aligned with global best practices).

8.3. PERFORMANCE OF GOVERNMENT FUNCTIONS

Key results in 2018:
- The state defence order was 100% fulfilled.
- ROSATOM participated in the consideration of more than 400 bills.
- In 2018, overall performance against the targets set in the state programme of the Russian Federation 'Development of the Nuclear Power and Industry Complex' was assessed at 100.67%.

8.3.1. PERFORMANCE OF THE NUCLEAR WEAPONS DIVISION (NWD)

FULFILMENT OF THE STATE DEFENCE ORDER AND COOPERATION WITH THE MINISTRY OF DEFENCE OF THE RUSSIAN FEDERATION

ROSATOM's enterprises conducted research and development, supplied samples of new products and equipment and carried out their maintenance, repairs and disposal.

8.3.2. LAW DRAFTING

In 2018, the Corporation reviewed over 400 federal bills, including:
- About 30 bills reviewed as part of the interdepartmental approval process;
- More than 200 bills reviewed as part of participation in public discussions;
- About 250 bills reviewed at the meetings of the Legislative Commission of the Russian Government.

As in previous years, the Corporation took an active part in the drafting and legal support of federal bills affecting its operations and the operations of its organizations in the following areas:
- Transforming competition legislation and legislation providing the basis for the government regulation of prices (rate regulation);
- Improving legislation on the contract system in procurement for government and municipal needs;
- Creating favourable conditions for the functioning of priority social and economic development areas in CATFs;
- Amending land legislation and improving urban planning legislation.

DEVELOPMENT OF NEW PRODUCTS

Production diversification efforts in the NWD are aligned with the industry development strategy and are focused on the following prioritized areas:
- Information technology;
- Automated process control systems;
- Security systems;
- Supercomputer technologies and mathematical modelling;
- Laser and additive manufacturing technologies;
- The machine tool industry;
- Electrical engineering;
- Distributed power generation;
- Nuclear medicine (including isotope products).

Products of these businesses are designed to be used in various high-technology sectors of the economy and critical facilities taking into account the needs of large customers in the oil and gas industry, power generation and transportation sectors.

In 2018, consolidated revenue from other products of the NWD totalled RUB 88.3 billion, up by 5% year on year.

IMPROVING THE PERFORMANCE OF THE NUCLEAR WEAPONS DIVISION

In 2018, measures were taken to monitor financial discipline during settlements, which helped to reduce the leverage of NWD enterprises and significantly improve their overall financial and economic performance. A project was implemented to reduce the lead time for setting up mass production, manufacturing a batch of new (modernized) products and transferring them to the Russian Ministry of Defence. The aim of the project is to improve the development and manufacture of core products.
8.3.3. IMPLEMENTATION OF THE STATE PROGRAMME OF THE RUSSIAN FEDERATION ‘DEVELOPMENT OF THE NUCLEAR POWER AND INDUSTRY COMPLEX’

In the reporting year, ROSATOM continued to implement the state programme of the Russian Federation titled ‘Development of the Nuclear Power and Industry Complex’ (target metrics and indicators for 2018 have been set by Decree No. 344–11 of the Russian Government dated March 17, 2018)10.

Overall performance against the targets set in the state programme for 2018, which also takes into account the amount of budgetary and extra-budgetary financing used for implementing measures stipulated in the state programme, was assessed at 100.67%.

In the reporting year, the Corporation drafted a new version of the state programme, with the planning horizon for the relevant measures extended until 2027.

8.3.4. IMPLEMENTATION OF FEDERAL TARGET PROGRAMMES

In 2018, ROSATOM’s enterprises and organizations implemented measures forming part of four federal target programmes (FTP).

To implement the FTPs (included in the part of the federal budget on which information is publicly available), ROSATOM raised financing totalling RUB 48,107.9 million, including RUB 17,959.1 million from the federal budget and RUB 22,525.9 million from extra-budgetary sources.

In 2018, ROSATOM’s enterprises and organizations implemented measures forming part of four federal target programmes (FTP).

8.3.5. CONTRIBUTION TO THE IMPLEMENTATION OF THE ‘MAY DECREES’ OF THE PRESIDENT OF RUSSIA

As part of the implementation of the decrees of the President of Russia dated May 7, 2012, in the reporting year, ROSATOM and its organizations achieved the following results:

— Under Decree No. 597 on Measures for Implementing the State Social Policy: in 2018, the actual nominal salary increased by 7.3% compared to 2017 (see the section ‘Implementation of the HR Policy’);

— In terms of increasing investments to at least 27% of GDP: by the end of 2018, the amount totalled 23.6% of the Corporation’s revenue (see the section ‘Investment Management’);

— In terms of increasing the share of products of high-technology and knowledge-intensive sectors of the economy in GDP by a factor of 1.3 against 2011: by 2018, the share of innovative products in the Corporation’s total sales at year-end 2018 totalled 17.5% (1.9 times higher than in 2011) (see the section ‘Research and Innovations’).

8.3.6. PROVISION OF PUBLIC SERVICES

In 2018, ROSATOM received 1,760 requests for the provision of public services. Given the established deadlines (including rolling deadlines), the fulfilment of requests for service provision by the Corporation totalled 100%.

8.3.7. STATE PROPERTY MANAGEMENT AND RESTRUCTURING OF NON-CORE ASSETS

In 2018, the Russian Federation registered its title to 152 items of real property (buildings and structures).

In the reporting year, 38 non-core items of real property owned by joint-stock companies in which ROSATOM had a direct stake exceeding 25% were restructured, of which:

— 32 items of real property were sold and excluded from the scope of the nuclear industry (proceeds from the sale totalled RUB 260 million);

— 6 items of real property were transferred free of charge to local governments.

348 non-core assets owned by joint-stock companies in which ROSATOM had a direct stake totalling less than 25% and by companies whose shares were held by ROSATOM on behalf of the Russian Federation were restructured. More specifically:

— 243 assets were sold (proceeds from the sale totalled RUB 647 million);

— 76 assets were transferred free of charge to the government and municipalities;

— 29 assets were liquidated.

8.4. FINANCIAL AND INVESTMENT MANAGEMENT

8.4.1. FINANCIAL MANAGEMENT

IMPLEMENTATION OF ROSATOM’S FINANCIAL STRATEGY

Given the scale of ROSATOM’s business in Russia and abroad, the Corporation’s management attaches great importance to the financial sustainability of nuclear organizations in a changing environment. The financial strategy is an integral part of ROSATOM’s overall business strategy. The main goal of the financial strategy is to ensure the financial sustainability of ROSATOM and its organizations in a changing environment and to maximize the efficiency of financing and financial risk management.

Key financial transactions of ROSATOM have been centralized. Cash flow management is centralized through:

— An established single industry-wide legal framework regulating financial management (including the Uniform Industry-Wide Financial Policy);

— Vertical integration of treasury departments in subsidiaries and affiliates, which are functionally accountable to the Treasury Department of ROSATOM.

The established treasury structure enables 100% control of funds in the industry;

— Concentration of principal treasury functions of nuclear organizations in the Treasury Department of ROSATOM, which communicates with nuclear organizations and is essentially a liquidity management centre;

— An industry-wide automated system for recording treasury transactions (the Corporate Settlement Centre Information System), which enables the recording of all treasury transactions across the scope of consolidation of ROSATOM on a daily basis.

8.4.2. INVESTMENT MANAGEMENT

In 2018, ROSATOM received 1,760 requests for the provision of public services. Given the established deadlines (including rolling deadlines), the fulfilment of requests for service provision by the Corporation totalled 100%.

Services related to the accreditation of certification agencies and registration of hazardous industrial facilities controlled by ROSATOM started to be provided electronically on the Integrated Public Services Portal.

In terms of increasing the share of products of high-technology and knowledge-intensive sectors of the economy in GDP by a factor of 1.3 against 2011: by 2018, the share of innovative products in the Corporation’s total sales at year-end 2018 totalled 17.5% (1.9 times higher than in 2011) (see the section ‘Research and Innovations’).

A total of about RUB 32.4 billion was saved through intra-group financing between 2010 and 2018.

Return on the investment portfolio stood at 10.5%.

The investment programme was 90% completed.

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— Concentration of principal treasury functions of nuclear organizations in the Treasury Department of ROSATOM, which communicates with nuclear organizations and is essentially a liquidity management centre;

— An industry-wide automated system for recording treasury transactions (the Corporate Settlement Centre Information System), which enables the recording of all treasury transactions across the scope of consolidation of ROSATOM on a daily basis.
Targets for 2018 in the sphere of cooperation with banks, development of the cash pool and debt management set out in the financial strategy have been achieved. In order to improve the performance of the treas- ury functions, in 2018, the Corporation continued to work towards:

- Accumulating spare cash in the accounts of pool leaders;
- Improving the accuracy of payment scheduling (a rolling liquidity forecast);
- Ensuring competitiveness of the cost of servicing of the consolidated debt portfolio;
- Centralizing treasury transactions (complying with the financial policy).

DEBT PORTFOLIO MANAGEMENT

In the course of its day-to-day operations, the Corporation succeeds in maintaining the average interest rate on the total debt portfolio denom- inated in Russian rubles below 8.5%. Throughout the reporting year, the Corporation maintained sufficient liquidity or sources of liquidity (credit facilities, etc.) to repay liabilities on time, preventing unacceptable losses and reputational risk.

The Corporation continued to use suretyship as security for obligations of organizations in the industry to their counterparties. This meas- ure helps to reduce both the cost of bank guarantees and the cost of financing (including interest expenses).

JSC AtomCapital (a wholly-owned subsidiary of ROSATOM acting as a  pool leader in intra-group financing of FSUEs) enabled an optimal debt burden distribution between JSC Atomenergoprogram and organizations and enterprises outside its scope.

RAISING FINANCING FOR PROJECTS

Pursuant to Decree No. 304 of the President of Russia dated May 7, 2018, a number of initiatives was included in the list of national (federal) projects, including the construction of a new icebreaker fleet and the development of infrastructure for the safe handling of hazard class 1 and 2 waste.

A ‘mixed’ financing arrangement (using budget funds and extra-budg- etary resources) was examined for the construction of the new Arctic icebreaker fleet. An initiative to allocate additional budget investments within the industry between 2010 and 2018.

RECEIVING AND MAINTAINING CREDIT RATINGS

As of December 31, 2018, Russian and international rating agencies rated JSC Atomenergoprogram at the level of Russia’s sovereign credit rating:

- BBB-A-3 with a stable outlook by S&P;
- BBB- with a positive outlook by Fitch Ratings;
- Ba1 with a positive outlook by Moody's Investors Service;
- ВВВ+ with a positive outlook by Moody's; and
- ВВB-/A-3 with a stable outlook by S&P.

As of December 31, 2018, Russian and international rating agencies rated JSC Atomenergoprogram at the level of Russia’s sovereign credit rating:

- BBB-A-3 with a stable outlook by S&P;
- BBB- with a positive outlook by Fitch Ratings;
- Ba1 with a positive outlook by Moody’s Investors Service;
- ВВВ+ with a positive outlook by Moody's; and
- ВВB-/A-3 with a stable outlook by S&P.

In 2018, ROSATOM continued to take steps towards making the Rus- sian nuclear industry more attractive to investors, engaging strategic investors in NPP construction projects in Russia and abroad, maintain- ing relationships with existing investors and lenders, and establishing relationships with and setting limits on credit facilities in new banks.

- A round-table discussion titled ‘Green’ Investments: Creating Opportu- nities, Expanding Horizons’ was held as part of the ATOMEXPO 2018 International Forum;
- In 2018, ROSATOM organized visits of representatives of Russian and foreign banks to the operating Leningrad NPP Leningrad NPP-2, which is currently under construction, and FSUE MIP.
- A round-table session titled “Financial Technologies of the Future: Tomorrow Starts Today” was held on the sidelines of the NIBF 2018 International Forum;
- In 2018, ROSATOM continued to take steps towards making the Rus- sian nuclear industry more attractive to investors, engaging strategic investors in NPP construction projects in Russia and abroad, maintain- ing relationships with existing investors and lenders, and establishing relationships with and setting limits on credit facilities in new banks.

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To roll out the Payment Factory project;
- To ensure a consistent payment discipline for intra-group financing;
- To improve the accuracy of medium-term cash flow planning;
- To prevent internal competition for credit resources between organizations;
- To continue to centralize cash management;
- To focus on maintaining relations with supporting banks as the most reliable partners providing accessible funds in terms of both vol- umes and cost;
- To roll out project financing arrangements to reduce recourse on ROSATOM and minimize the use of the Corporation’s consolidated investment resources (including through the use of project financing instruments);
- To expand the range of financing instruments used by the Corpora- tion (provided it is economically feasible to do so) in order to reduce the cost of debt service and ensure timely and full financing of the investment programme of organizations in the industry on accept- able terms;
- To discuss project areas of cooperation in the sphere of digitiza- tion with banks.

The agenda in the sphere of nuclear medicine includes the discussion of participation in the project to build and operate the radiology depart- ment building of the East Siberian Cancer Centre in Khabarovsk with partner banks (with the relevant concession agreement signed in June 2018), as well as projects in other Russian cities.
**INVESTMENT MANAGEMENT**

**EKATERINA LYAKHOVA,**
Director for Economics and Investments

— How would you rate the performance of the industry as a whole and individual divisions against the targets of the investment programme in 2018?

— Performance against the targets of the investment programme improved compared to previous periods. The Power Engineering Division became a leader, as its performance against the targets for NPP construction in Russia exceeded 100%. Savings from project cost optimization totaled RUB 4.4 billion. Another major achievement of the past year was the approval of strategic programmes for six areas of development of new businesses in the industry.

— How will ROSATOM adjust its investment strategy, given its focus on the implementation of national projects stipulated in the ‘May decree’ of the Russian President?

— Many of ROSATOM’s projects contribute to achieving the objectives set by the President of Russia in the ‘May decree’. We have already launched a wide range of strategic programmes and projects that directly contribute to the achievement of national goals, improving the quality of life and providing good living conditions for Russian people. For instance, a programme titled ‘Management of Industrial and Consumer Waste of All Hazard Classes’ forms part of the Ecology federal project. Smart City projects are aimed at introducing ‘smart’ infrastructure (water supply and sewerage systems, power grids, roads, etc.) to enable the development of a comfortable modern urban environment. Establishment of nuclear medicine centres and multipurpose irradiation centres and provision of healthcare services based on nuclear technology is a major area contributing to the achievement of goals in the sphere of healthcare.

— Many of ROSATOM’s projects contribute to achieving the objectives set by the President of Russia in the ‘May decree’. We have already launched a wide range of strategic programmes and projects that directly contribute to the achievement of national goals, improving the quality of life and providing good living conditions for Russian people. For instance, the Proryv project, which is aimed at closing the nuclear fuel cycle, will help to secure fuel supply and reduce the amount of high-level radioactive waste for years to come. We continue to do research on thermonuclear fusion, which had been started in the USSR, as we are aware of the advantages that this technology can offer. The Shalf and Ritm projects are designed to ensure power supply in remote and hard-to-reach areas. They involve building small NPPs based on modular technology, whose capacity may vary depending on the needs of a specific region.

Participation in national and federal projects is a top priority for ROSATOM, and it requires a certain ‘fine-tuning’ of our investment decision-making system. ROSATOM’s management needs to focus on strategically important new business areas and on managing the implementation of federal projects that form part of Russia’s national projects. At the same time, it is important for us to remain competitive and maintain our share on the market for our existing technologies and businesses.

— What instruments does ROSATOM use to support the launch and development of new businesses?

— In 2018, we decided that ROSATOM needed to switch to the corporate entrepreneurship model. To date, six strategic programmes have been approved and launched across ROSATOM’s new businesses, and we plan to launch another four or five programmes in 2019.

In addition to providing internal corporate support for the development of new businesses, for the past two years we have also been developing an investment platform. It includes several functions: the search for ideas and promising projects in the industry; acceleration of promising ideas to help them reach a stage where the potential return on investment can be predicted more or less reliably, as well as investment in new businesses and their integration into the industry.

For instance, in 2018, ROSATOM held the Vector Start-Up Contest, an open contest aimed at searching for ideas for ROSATOM’s new businesses. 1,103 projects were submitted for the contest, with 122 projects reaching the semi-final and 5 projects progressing to the final ROSATOM awarded money prizes for these projects, and they were declared eligible for grants from the Skolkovo Foundation. This contest has become the largest one in Russia in terms of the number of applications.

**INVESTMENT MANAGEMENT TOOLS**

— A distributed system for investment decision-making by the governing bodies of ROSATOM and its organizations aligned with the distribution of competence centres across various areas of business in the industry;

— Decisions on key milestones of projects vital for ROSATOM are delegated to organizations;

— Investment infrastructure is based on an ‘open innovation’ model, which involves searching for ideas and projects outside the industry and governing bodies of ROSATOM and its organizations aligned with the distribution of competence centres across various areas of business in the industry;

— Experts are engaged to perform an in-depth probabilistic risk analysis for significant projects, the findings of analysis are incorporated in the decision-making system;

In 2018, ROSATOM’s portfolio is built as a set of projects of organizations in the industry for a year and for the medium term based on available investment resources and the required rate of return.

— A phase-venture approach is used in the course of project implementation;

— A comprehensive audit is conducted, which helps formulate recommendations on how to improve planning and implementation of investment projects;

— ROSATOM is developing approaches to raising financing as an alternative to using its own funds.

At the same time, the investment programme for NPP construction in Russia (the investment programme of JSC Rosenergoatom Concern) was implemented in full for the first time.
BREAKDOWN OF INVESTMENTS IN 2018

- 58% Power Engineering Division
- 15% Other
- 9% Engineering Division
- 9% Organizational management projects
- 9% Mechanical Engineering Division
- 8% JSC Rusatom-Energy International
- 6% Innovation Management Unit
- 3% Fuel Division
- 3% Other

BREAKDOWN OF INVESTMENTS IN SIGNIFICANT PROJECTS IN 2018

- 53.8% Akkuyu NPP
- 28.3% Hanhikivi NPP
- 18.9% Power Engineering Division
- 15.9% New gas centrifuge plant
- 15.7% Pavlodar deposit
- 15.1% Development of the chloride technology
- 14.8% Mine No. 4
- 14.0% JSC Khngig
- 4.5% Construction of port vessels to be operated in the port of Sabetta
- 2.6% JSC Khiagda
- 2.3% Shvaytakh deposit

OPERATIONS OF THE INDUSTRY VENTURE CAPITAL FUND

In 2018, JSC Atomenergoprom and LLC Orbita Capital Partners founded an industry venture capital fund, Digital Evolution Ventures.

The fund will focus on developing new businesses in promising sectors of the Russian and global economy. Key investment areas will include artificial intelligence and other digital solutions for the industry and service applications, renewable and smart energy, 3D printing and new materials, and systems for the development of smart and energy-efficient cities.

The fund will invest primarily in companies at the early and seed stages, as well as companies that have entered the scaling stage. Key criteria for the selection of companies to invest in will include fast growth prospects, a potential for global technological expansion and synergy with the main areas of development of ROSATOM.

The fund was created under an investment partnership agreement and is open for co-investors. The format of the fund (an investment partnership) makes it possible to attract market investors and double or triple the amount of investments compared to the initial level.

By the end of 2018, the fund reviewed about 100 projects submitted by small innovative companies, eight of which were provisionally approved by the Investment Committee of the fund.

MEASURES TO IMPROVE INVESTMENT EFFICIENCY

In the reporting year, the Corporation developed a Comprehensive Programme of Measures to Improve the Maturity of Project Management in ROSATOM and its Organizations. A pilot assessment of project maturity was carried out in nuclear organizations in accordance with the methodology developed earlier.

A system for evaluation and development of project personnel was built as part of the Project Management School in order to improve the competences of employees and, consequently, the efficiency of projects and investments.

Jointly with the Skolkovo Foundation and with assistance from the SKOLKOVO Moscow School of Management, the Corporation launched a programme for organizations in the industry that are responsible for developing new business areas. The programme is aimed at identifying gaps in the technological capabilities of an organization in the medium term and engaging experts and practitioners in a new business area, including identifying the growth strategies followed by competitors.

CHALLENGES OF THE REPORTING PERIOD AND MITIGATION MEASURES

- Excessive centralization of investment management in new businesses
- A window of opportunity for a more efficient implementation of national projects under the ‘May decree’ of the President of the Russian Federation

MITIGATION MEASURES

- Development of a partnership-based model of work of various functions and the business.
- Development of a project methodology to enable efficient participation in the implementation of national projects.
- Adoption of an investment strategy at ROSATOM with a focus on contributing to the implementation of national projects while simultaneously achieving an optimal return on the Corporation’s investment portfolio.
To implement the Comprehensive Long-Term Programme of Measures to Improve the Maturity of Project Management in ROSATOM and Its Organizations;

To enable nuclear organizations to form business partnerships in industry and the country as a whole.

— Formalization of approaches allowing deviations from investment targets for individual projects, provided that returns on the portfolio as a whole remain unchanged (‘house of cards’), in corporate documents;

— Reduction in the number of approvals and decision-making bodies in order to speed up the launch of a new business;

— Development of long-term incentives for the management.

Lack of maturity and capabilities in organizations involved in projects implemented in the industry

— Development of industrial partnerships, including in priority social and economic development areas;

— Search for projects in key business areas through the venture capital fund;

— Organization of the Vector Start-Up Contest in order to search for and select ideas.

Lack of maturity and capabilities in organizations involved in projects implemented in the industry

— Scaling-up of the activities of the Project Management School at ROSATOM’s Corporate Academy;

— Development of methodological guidelines for the assessment of maturity of project management in nuclear organizations.

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— To continue systematic development of a project methodology, including for the expansion of participation in national projects;

— To implement the Comprehensive Long-Term Programme of Measures to Improve the Maturity of Project Management in ROSATOM and Its Organizations;

— To enable nuclear organizations to form business partnerships in industry and the country as a whole.

— To increase the level of digitization of projects and investments.

8.5. R O S A T O M ’ S P R O D U C T I O N S Y S T E M

ROSATOM’s Production System (RPS) is a lean manufacturing culture and a system for continuous process improvement to provide ROSA- TOM with competitive advantages globally. The RPS principles are instrumental in achieving one of the Corporation’s strategic goals: to reduce the production cost and the lead time by identifying and eliminating all types of losses in manufacturing enterprises and in offices and by improving the performance of each employee.

Key results in 2018:

— The status of an RPS Leader was given to 22 enterprises in the industry.

— Over 4,500 projects to improve the performance of outpatient clinics across Russia were underway.

— The Lean Government (Productivity 360) project was launched in nine regions of Russia.

Since 2015, RPS has been rolled out systematically across enterprises in the industry: goals are decomposed to the level of area supervisors; the manufacture of an enterprise’s core products (production flows) is optimized; RPS projects are implemented; training is provided for employees, and incentive systems are being developed.

In 2018, the status of an RPS Leader was given to 22 enterprises in the industry. In order to obtain or confirm the status of an RPS Leader in 2018, in addition to traditional areas, enterprises participating in the systematic development of RPS needed to create an RPS benchmark, implement a supplier development project and introduce RPS engineering.

In 2019, 34 enterprises will be included in the scope of RPS roll-out.

RPS benchmarks

An RPS benchmark is a processing stage or a process in the process flow for a key product of ROSATOM’s organization that has achieved the level of global best practices in production engineering. The Corporation tasks its enterprises with creating RPS benchmarks that could be used as a basis for training in ROSATOM’s Production System for both employees in the industry and the country as a whole.

In 2018, programmes were developed and on-site training was arranged in 23 ROSATOM’s enterprises where RPS benchmarks were being developed. For instance, over 60 employees of ROSATOM and over 350 employees of enterprises taking part in the Federal Programme to Improve Labour Productivity and Support Employment received training at PJSC Kovrov Mechanical Plant. Plans for 2019 include the provision of training organized into different streams and using created benchmarks and the establishment of a national training centre at PJSC Kovrov Mechanical Plant.

ROSATOM voluntarily shares its best management techniques and workflow organization methods on the national level. Introduction of the principles and tools forming part of ROSATOM’s Production System enables a significant improvement in the efficiency of healthcare, education and utility systems and other sectors in Russia.

INTRODUCTION OF LEAN TECHNIQUES IN RUSSIA’S SOCIAL SECTOR AND INDUSTRY

ROSATOM is implementing a supplier development programme as part of participation in the National Project to Improve Labour Productivity and Support Employment. Projects to create benchmark process flows have been launched in 20 enterprises that are ROSATOM’s suppliers in the Bryansk Region, Rostov, Moscow and Belgorod Regions and in Saint Petersburg. As a result, the lead time has been reduced up to 50–70%, while labour productivity has increased by 20% on average. Plans for 2019 include the implementation of projects at 40 new supplier enterprises.

Medicine and healthcare

In 2018, more than 4,000 projects were underway in more than 2,000 outpatient clinics (including over 460 children’s clinics) in 52 federal subjects of Russia.

Nine lean manufacturing training centres were created at medical univer- sities, and more than 3,000 people underwent training.

CHANGES IN THE NUMBER OF RPS ENTERPRISES IN THE INDUSTRY

According to the RPS development concept, all enterprises participating in the systematic roll-out of the system are divided into three levels: RPS Leaders, RPS Candidates and RPS Reserve. RPS Leaders are provided with a package of privileges; a business coach makes on-site visits; employees are offered an opportunity to take business trips to leading foreign and Russian enterprises to share their experience; holiday packages are offered to employees’ families; employees receive vouchers for training at ROSATOM’s Corporate Academy; participate in the Workspace Design project, etc.

In 2019, 34 enterprises will be included in the scope of RPS roll-out. The Lean Government (Productivity 360) project was launched in nine regions of Russia.
The time needed for arranging an appointment was reduced 5-fold.

— The annual throughput of the health screening department increased by a factor of 8.5.

— Health screening covered all patients assigned to outpatient clinics;

— The time spent on health screening was reduced up to 12-fold;

— The time spent by doctor on the actual examination of patients doubled;

— The number of patients examined per shift increased by 30%.

— The time needed for arranging an appointment was reduced 5-fold.

See also the section 'Developing the Regions of Operation'.

8.6. PROCUREMENT MANAGEMENT

Key results in 2018:

— Overall savings from competitive procurement procedures (using ROSATOM’s own funds and federal budget funds) totalled RUB 28.2 billion.

— The share of electronic procurement (excluding procurement for foreign projects) totalled 99%.

— 42,358 contracts worth a total of RUB 118.7 billion were concluded with small and medium-sized enterprises, with the value of contracts concluded based on the results of procurement procedures held exclusively among small and medium-sized enterprises totalling RUB 54.1 billion.

— Pursuant to the order of the Prime Minister of Russia to disclose information on counterparties, ROSATOM disclosed information on 18,000 counterparties.

The Uniform Industrial Procurement Standard (UIPS) (the Regulations of the Russian Ministry of Industry and Trade) was approved by the Federal Law No. 44-FZ. The annual procurement programme is available at http://zakupki.rosatom.ru.

8.6.1. IMPLEMENTATION OF THE ANNUAL PROCUREMENT PROGRAMME

In 2018, the demand of nuclear organizations for products with the required price and quality was met in full. ROSATOM and its organizations placed orders and made 35,741 competitive purchases totalling RUB 663.16 billion using their own funds. The Corporation achieved savings totalling RUB 28.5 billion (6.4% of the amount of completed purchases).

A four-fold reduction of time required for the preparation for laboratory tests;

A two-fold reduction of time needed for awarding increased government scholarships;

— A twofold increase in the throughput of a school canteen;

— A four-fold reduction of time required for the preparation for laboratory classes.

Examples of successful project implementation in 2018 included:

— A five-fold reduction of time needed for developing a student education plan;

— A reduction of time needed for awarding increased government scholarships;

— A twofold increase in the throughput of the health screening department;

— A four-fold reduction of time required for the preparation for laboratory classes.

As a result of efforts in the field of medicine and healthcare:

— Queues were reduced up to 8-fold;

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ROSATOM ranks high in professional procurement rankings every year in the fields of industrial procurement, competitive purchases, and electronic procurement.

In 2018, Savings from competitive purchases totalling RUB 20.32 billion were made by ROSATOM using federal budget funds. Savings on procurement activities totalled RUB 0.36 billion (1.9% of the amount of completed purchases). As a result of the implementation of the annual procurement programme, contracts were concluded with 17,330 counterparties. The share of electronic procurement (excluding procurement for foreign projects) amounted to 99%.

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See also the section 'Developing the Regions of Operation'.
In 2018, the operation of the Integrated Industry-Wide Procurement Management System for International Business was optimized; this included arrangements enabling centralized procurement in electronic form. Lists of additional requirements for individual types of products to be supplied and for organizations to be engaged were compiled for foreign NPP construction projects (Akkuyu NPP, Paks NPP and Hanhikivi NPP) and were published on the Corporation’s procurement website. These materials will provide potential suppliers with additional information and will give them time to prepare for participation in procurement procedures used by nuclear organizations. Nuclear infrastructure of Zambia was assessed in terms of procure- ment activities. Recommendations were prepared for the optimization of the national procurement system.

**DIGITALIZATION OF PROCUREMENT PROCESSES**

In 2018, the first stage of development and introduction of ROSATOM’s Unified Industry-Wide Quality Management System, UIS-Quality, was completed. The system enabled the automation of the integrity management process and compliance assessment of equipment or services purchased within the industry. The practice being introduced at ROSATOM will enable the Corporation to reduce the procurement lead time and to improve the quality of products that it purchases and manufactures. By the end of 2018, over 1,000 users from 200 nuclear organizations and third-party organizations (suppliers, contractors and service providers) had been connected to the system.

**8.6.4. PROFESSIONAL DEVELOPMENT OF SUPPLIERS AND COMMUNICATION WITH STAKEHOLDERS**

ROSATOM attaches great importance to the development of a training and communication system for its customers and suppliers. In 2018, a programme for the development of external suppliers based on the principles of ROSATOM’s Production System (RPS) was launched for the first time in the nuclear industry.

In 2018, 267 suppliers, manufacturers and contractors were audited to assess whether they have the required competences and expertise with regard to the subject matter of the procurement process. As part of the development of a training and communication system for customers and suppliers, in 2018, ROSATOM’s Corporate Academy held training events on various topics in the field of procurement, logistics and quality management. A total of 2,081 people, including 115 representatives of organizations interested in providing supplies to nuclear enterprises, underwent face-to-face training, and 1,148 people completed online training courses.

In December 2018, the 10th ATOMEX International Forum of Nuclear Industry Suppliers was held in Moscow. The Forum was attended by 1,578 delegates and exhibitors. They represented 790 suppliers, including more than 60 SMEs. A distinctive feature of ATOMEX 2018 was an increase in the number of foreign participants. The largest delegations represented South Korea (31 companies) and Turkey (13 companies).
8.6.5. PLANS FOR 2019 AND FOR THE MEDIUM TERM
— To establish a methodological framework for the development of a contract strategy for NPP construction, creation of a comprehensive integrated schedule and comprehensive management of irregularities using the IDE model;
— To develop ROSATOM’s Qualified Buyer service;
— To put the E-Store into commercial operation;
— To develop the UIS-Quality Unified Industry-Wide Quality Management System and put it into commercial operation in organizations involved in the life-cycles of nuclear facilities;
— To develop procurement quality assurance tools (approval of procurement documents by quality assurance and control functions, data reliability audits, key milestones in contracts, measures to address the root causes of irregularities) based on the results of their application in ROSATOM’s organizations;
— To provide employees in the nuclear industry with training in the field of quality, including data reliability audits, management of irregularities, quality management systems and internal audits;
— To develop the Procurement, Logistics and Quality School (to develop training programmes, build and launch a training system including mandatory knowledge assessment and individual training covering only those areas that require development, as well as mandatory knowledge monitoring).

8.7. INTERNAL CONTROL SYSTEM
Key results in 2018:
— Inspections conducted to the Corporation and its organizations by Russian government bodies did not reveal any major violations that had not been detected by the Internal Control and Audit Function (ICAF).
— ROSATOM’s internal control system was rated highly by external organizations: the Accounts Chamber of the Russian Federation, the Federal Treasury (at 97%, with the average score totalling 85%); the Russian Ministry of Finance (98%) and the auditing commissions.
— The top quality of ROSATOM’s internal control practices was acknowledged by the expert community: the Corporation received an award in the Efficiency of the Internal Control and Audit System category (Institute of Certified Financial Controllers and Internal Auditors, the Best Controller category (National Association of Internal Auditors and Controllers, Russia). Managers, UK) and won in the Internal Audit Function of the Year category (Institute of Internal Auditors, Russia) and in the auditing commission.
— ROSATOM’s Uniform Industrial Procurement Standard and directives of ROSATOM or its organizations.
— In the reporting year, a vision for the development of the ICAF until 2020 was formulated.
— To improve the performance of control systems, experts of the ICAF actively participated in the development of the Uniform Digital Strategy of ROSATOM, the transformation programme of the Engineering Division and the work of Change Support Teams.
— A shared industry-wide information space was created for internal controllers and internal auditors based on the IT system supporting the work of the ICAF.
— An overwhelming majority (91%) of internal audits at ROSATOM is aimed at monitoring the achievement of strategic goals and priorities in the industry.

Standardized procedures were developed for internal audit of efficiency of business process and project management control.
In the reporting year, specialized internal control bodies (SICBs) conducted 726 inspections at ROSATOM and in its organizations.
15 inspections were conducted by external regulators supervising compliance with the budget legislation, including 7 inspections by the Accounts Chamber of the Russian Federation. No instances of misuse or illegal use of budgetary funds or assets were detected within ROSATOM, the transformation programme of the Engineering Division and the work of Change Support Teams.
Following the inspections conducted in 2018, 484 corrective measures were developed and scheduled for implementation. Implementation of corrective measures remains effective, which helps to reduce the risk of recurrence of violations.
Based on the findings of inspections conducted in the reporting year, disciplinary sanctions were imposed on 811 employees of ROSATOM and its organizations, including the dismissal of four senior managers.

Stakeholder control
In 2018, the Central Arbitration Committee of ROSATOM and the arbitration committees of the Power Engineering, Fuel and Engineering Divisions received 914 reports (complaints) from stakeholders regarding violations of procurement rules established by Russian legislation, ROSATOM’s Uniform Industrial Procurement Standard and directives of ROSATOM and its organizations.
588 complaints were investigated; 154 complaints (26% of the total number of investigated complaints) were deemed to be valid. Other complaints were withdrawn by complainants before being investigated by an arbitration committee or were dismissed on the following grounds:
— Because the deadline for filing the complaint had expired;
— Because a similar complaint had been accepted for investigation or investigated by the Federal Antimonopoly Service;
— Because the complainant was not entitled to file a complaint (after the deadline for submitting bids has expired, complaints may only be filed by bidders that have submitted a bid).
Systematic work of arbitration committees enabled a considerable reduction in the number of violations in the procurement process: the number of valid complaints as a percentage of the total number of purchases decreased by 28% (from 0.21% in 2017 to 0.12% in 2018).
In addition, in order to streamline the work of arbitration committees, in the reporting year:
— The duration of processing of complaints by arbitration committees was reduced from 20 to 16 business days;
— Processes for the sending of notices of receipt of complaints, their acceptance for investigation, the outcomes of the investigation and the publication of the relevant resolutions on the official procurement website of the nuclear industry were automated.
See also the section ‘Procurement Management’.

8.7.1. RESULTS IN 2018
2018 marked the 10th anniversary of establishment of ROSATOM’s Internal Control and Audit Function; its employees received departmental awards.
In the reporting year, a vision for the development of the ICAF until 2020 was formulated.
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An overwhelming majority (91%) of internal audits at ROSATOM is aimed at monitoring the achievement of strategic goals and priorities in the industry.
8.7.2. PLANS FOR 2019

To implement an action plan for achieving the SICB 2020 target state;
To monitor the transformation of the Engineering Division in the field of design;
To support professional development of auditors (with a specialization in the following areas: business process audit, project activities, performance evaluation of the internal control function, the risk management system and IT audits);
To continue to roll out the IT system for supporting the ICAF across the industry and continue to improve it, including by providing a platform for sharing experience (a library and a forum).

8.8.1. KEY RESULTS IN 2018

PREVENTION AND RECOVERY OF DAMAGE

PREVENTIVE MEASURES

PERSONNEL TRAINING IN ANTI-CORRUPTION PRACTICES

In 2018, the industry media published over 170 articles, stories, messages and press releases on preventing corruption and other violations, and on improving procurement terms, procedures and mechanisms.

8.8.2. OBJECTIVES FOR 2019

To improve the system of measures for the timely detection and resolution of conflicts of interest;
To improve the efficiency of awareness raising, educational and other initiatives aimed at encouraging employees in the nuclear industry to combat corruption;
To protect entrepreneurs and businesses against wrongdoings on the part of officials of ROSATOM and its organizations;
To systematize and update the anti-corruption regulatory framework.

In 2018, every manager was assigned responsibility for compliance of their subordinates with applicable legislation and timely implementation of effective measures in order to prevent and resolve conflicts of interest. Senior executives of new businesses established in the nuclear industry were instructed to implement the following anti-corruption measures as a top priority:

— To appoint officials or divisions responsible for preventing corruption and other offences;
— To approve industry-wide anti-corruption standards in organizations and provide anti-corruption training for employees.
ROSATOM does business as a socially responsible company which seeks to promote the well-being of the regions and territories where its enterprises are located.
9.1. IMPLEMENTATION OF THE HR POLICY

Key results in 2018:
— First in the Ranking of the Best Russian Employers compiled by HeadHunter, Russia’s biggest recruitment agency.
— First place in the Industrial Engineering and Manufacturing category in the international youth ranking compiled by Indeed.

The only state-owned company among the eight best Russian employers according to an international consultancy AON Hewitt.

The top seven in a competition of the sphere of adoption of professional standards organized by the Ministry of Labour and Social Protection in cooperation with the National Agency for Qualifications Development and the National Research Institute.

— ROSATOM’s Corporate Academy received the Global Council of Corporate Universities international award in the Best Corporate University category.
— Fourth victory in the WorldSkills Hi-Tech National Competition.
— The average monthly salary totaled RUB 76,000 per month (+7.3% against 2017).
— 72% of members of the executive succession pool were appointed to a new managerial position.
— Over 400 employees of ROSATOM and its organizations received government awards, certificates of appreciation and acknowledgements from the President and the Government of the Russian Federation. 8,380 people received industry awards.

We have built an integrated career and succession management system in the industry covering 80,000 positions. Employees have an opportunity studying under our programmes.

Projects require a completely different set of competences. We need not just engineers, but technical specialists that have knowledge of foreign languages. The average monthly salary totalled RUB 79,000 per month (+7.3% against 2017). The employee engagement rate stood at 80%.

In 2018, ROSATOM participated in the WorldSkills Hi-Tech national competition for workers and engineers for the fifth time. The principal aim of ROSATOM’s partnership with the WorldSkills movement is to support professional development of workers and engineers in the Russian nuclear industry in order to match global benchmarks. In 2018, our people continued to set new records. ROSATOM not only topped the individual and team standings in the WorldSkills Hi-Tech National Competition for the fourth time, but also became an undisputed leader in the WorldSkills Hi-Tech International Competition 2019, international competition in Kazan, with ROSATOM as its national strategic partner. It is important for us to take the competition to a whole new level and transform it into a major platform enabling politicians, company executives and educational institutions to discuss the future of the global system of education and professional development.

— In 2018, Change Support Teams started active work in the industry. This practice is quite unique among Russian companies. Could you provide more detail on this project? What are its goals and objectives, and what progress has already been made?
— ROSATOM has a good tradition of supporting bottom-up initiatives and thus enabling talented employees to fullfil themselves. Change Support Teams (CSTs) are an example of such ideas actively supported by industry executives and personally by the Director General. The CSTs comprise corporate employees who implement projects in order to drive changes. Participation in the CSTs enables them to turn their ideas into practice, but also serves as an informal channel for prompt and direct communication with the management, which opens up career opportunities for employees. Each CST provides an efficient tool for training future leaders on the ground. Members of the teams not only help to achieve strategic objectives in the field of safety, digitization and development of scientific research and new businesses, but also address more practical matters on the local level, such as infrastructure development in nuclear towns and cities, volunteer initiatives and onboarding of new employees. The CSTs are a good example of efficient horizontal cooperation and communication. Every day, we are witnessing not only an increase in the number of teams, new ideas and projects, but also a further strengthening of cross-functional links. There are currently about 100 teams of this kind in the industry; they comprise about 900 employees of various enterprises.

— 2018 was the Year of Volunteers in Russia, and ROSATOM gave special focus to this aspect as well by establishing a corporate volunteer framework in the industry. How do you plan to develop volunteering in ROSATOM’s organizations?

A culture of mutual assistance forms part of the DNA of the nuclear industry. Special features of our operations require us to provide the fullest possible support for their development and career progression and offer them opportunities for implementing exciting and ambitious projects not only within the Corporation, but also on the national level and even globally.

In Russia, we continuously update training programmes in our specialized universities and hold competition schools for corporate employees. We do this deliberately: the nuclear industry is unique, and in most cases we cannot just hire a person on the labour market. This is the case with most of our employees, except for corporate functions (financial, legal and HR specialists). Most specialized professions require special training in nuclear technology. Therefore, the majority of employees in nuclear professions are hired from universities. We are assisted in this area by our core university, NRNU MEPhI. In 2018, we held more than 18 national and international school competitions jointly with NRNU MEPhI, with 30,000 students taking part in these events.

A growing number of international projects have opened up opportunities for working in multicultural project teams and proving oneself, as these projects require a completely different set of competences. We need not just engineers, but technical specialists that have knowledge of foreign languages and distinguishing features of the relevant countries and are able to negotiate and establish cross-cultural cooperation. Many of our international projects also involve exporting our education to partner countries. Currently, over 1,600 foreign students from 45 countries are studying under our programmes.

We have built an integrated career and succession management system in the industry covering 80,000 positions. Employees have an opportunity to follow different career paths: as managers, experts or members of project teams. This is one of the factors that has enabled ROSATOM to reach an employee engagement rate on a par with the best employers. The share of succession pool members appointed to key managerial positions has reached 72%. In 2018, executives aged under 35 were appointed to new positions.

In 2018, ROSATOM and its organizations employed 285,400 people (including 1,800 people in foreign organizations), with men and women accounting for 66% and 34% of the total headcount respectively.

Number of employees by employee category:
— Executives: 31,720 people;
— Specialists: 102,690 people;
— White-collar workers: 103,780 people;
— Blue-collar workers: 110,590 people.

The age of employees averaged 43.4 years (46.5 years for executives). 31.4% of employees were aged under 35.

In 2018, the personnel turnover rate stood at 12.7%.

In 2018, 137,100 employees (53.7% of the total headcount) have a university degree. 3,353 employees (1.3% of the total headcount) are Candidates and Doctors of Sciences.

The age of employees averaged 43.4 years (46.5 years for executives). 31.4% of employees were aged under 35.

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### AVERAGE HEADCOUNT BY BUSINESS AREA, '000 PEOPLE

<table>
<thead>
<tr>
<th>Division/Complex/Organization</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
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</thead>
<tbody>
<tr>
<td>Nuclear Weapons Division</td>
<td>95.23</td>
<td>93.79</td>
<td>93.41</td>
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<tr>
<td>Emergency preparedness units</td>
<td>—</td>
<td>2.04</td>
<td>2.51</td>
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<tr>
<td>Mining Division</td>
<td>7.28</td>
<td>6.66</td>
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<tr>
<td>Fuel Division</td>
<td>22.13</td>
<td>21.79</td>
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<tr>
<td>Sales and Trading Division</td>
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<td>Uranium One Holding</td>
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<td>1.51</td>
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<td>Power Engineering Division</td>
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<tr>
<td>Mechanical Engineering Division</td>
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<td>0.79</td>
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<tr>
<td>Overseas Division</td>
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<td>New businesses</td>
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<td>Innovation Management Unit</td>
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<td>JSC ITPC</td>
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<td>Security units</td>
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<td>JSC Rosatom Healthcare</td>
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<td>ROSATOM, total</td>
<td>249.94</td>
<td>247.30</td>
<td>255.36</td>
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</table>

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### 9.1.1. STAFF COSTS AND REMUNERATION SYSTEM

In 2018, staff costs totalled RUB 324.0 billion, up by 11.2% year on year. The costs per employee per year increased from RUB 1,174,100 in 2017 to RUB 1,263,900 in 2018 (up by 7.7% year on year).

<table>
<thead>
<tr>
<th>STRUCTURE OF STAFF COSTS, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Payroll fund</td>
</tr>
<tr>
<td>Insurance contributions</td>
</tr>
<tr>
<td>Social and other expenses</td>
</tr>
</tbody>
</table>

#### REMUNERATION SYSTEM

The current remuneration system at ROSATOM:

- Provides competitive remuneration matching the compensation in the best Russian companies;
- Is result-based: the size of employees’ salaries is linked to their efficiency, professionalism and achievement of key performance indicators (KPIs).

ROSATOM has in place a flexible remuneration system which includes a variety of tools ensuring that employees achieve business targets and are closely focused on results.

#### EXECUTIVE SUCCESSION POOL

A centralized programme to build and develop an executive succession pool (ESP) is implemented to ensure succession and train executives to be appointed to managerial positions at ROSATOM.

ESP members are included in the executive succession pool through the career and succession planning process. The ESP is divided into four levels in order to select development programmes that are best suited to the target positions of ESP members. The level that they occupy in the ESP is determined by the target position of a candidate within the ESP:

- ROSATOM’s Capital (middle-level executives);
- ROSATOM’s Assets (top executives);
- ROSATOM’s Talents (promising specialists and junior executives).

Since the establishment of the executive succession pool, the number of its members has exceeded 3,600 people. 72% of ESP members were appointed to a new position by the end of 2018.

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In 2018, the procedure for the calculation of the indicators was revised to provide more accurate results. The number of ESP members was assessed based on the number of ESP members with mandatory ESP modules for ROSATOM’s Capital and ROSATOM’s Talents, which was 1,888 in 2018. The assessment is carried out annually, taking into account the share of promoted ESP members who were included in the assessment for 2017 and 2018 respectively.
**APPOINTMENT OF ESP MEMBERS TO NEW POSITIONS, %**

<table>
<thead>
<tr>
<th>Year</th>
<th>Share of ESP members appointed to vacant top and senior executive positions (top 30 and top 1000 executives of the industry)</th>
<th>Share of ESP members among senior, middle-level and junior executives that were appointed to a new (managerial) position</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>48.95</td>
<td>54</td>
</tr>
<tr>
<td>2017</td>
<td>57.67</td>
<td>45</td>
</tr>
<tr>
<td>2018</td>
<td>63.64</td>
<td>72</td>
</tr>
</tbody>
</table>

**ESP LEVEL DEVELOPMENT PROGRAMME**

<table>
<thead>
<tr>
<th>Training Area</th>
<th>Number of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROSATOM’s Assets, Senior executives, Basic Level, Strategy, market-oriented thinking, strategic leadership, innovation management, marketing for high-technology companies</td>
<td>198 295 304</td>
</tr>
<tr>
<td>ROSATOM’s Assets, Middle-level executives, ROSATOM’s Capital, Leadership and project management, advanced managerial skills, data management</td>
<td>846 1,102 1,490</td>
</tr>
<tr>
<td>ROSATOM’s Talents, Junior executives</td>
<td>964 1,177 1,675</td>
</tr>
<tr>
<td>Total</td>
<td>2,008 2,688 3,649</td>
</tr>
</tbody>
</table>

**TRAINING AS PART OF ESP DEVELOPMENT PROGRAMMES**

**9.1.3. PERSONNEL TRAINING**

ROSATOM’s HR policy prioritizes the development of competences and employee training.

ROSATOM’s Corporate Academy is the central training platform for specialists and executives in the industry. The Academy implements projects aimed at developing the corporate culture and unlocking the leadership potential of ROSATOM’s employees. It also trains a new generation of workers and engineers in accordance with WorldSkills Standards.

In 2018, over 113,000 employees (44% of the average headcount) underwent training and retraining and completed professional development programmes. The number of training hours per employee averaged 23.7 hours.

In order to support the implementation of ROSATOM’s Uniform Digital Strategy, in 2018, a road map was developed for the Digital Competences and Culture programme for the period from 2018 through 2021. The programme will cover four areas:

- Developing digital competences of ROSATOM’s employees and managers;
- Executing an appropriate selection of IT and digital specialists for digital project teams;
- Performance management: implementing a single onboarding programme using digital technologies and improved incentive systems for digital teams;
- Values and corporate culture.

**EMPLOYER CATEGORY**

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Employees who Completed at Least One Training Programme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top executives</td>
<td>22 43 30</td>
</tr>
<tr>
<td>Senior executives</td>
<td>1,196 1,356 1,404</td>
</tr>
<tr>
<td>Middle-level executives</td>
<td>6,667 7,317 7,324</td>
</tr>
<tr>
<td>Junior executives</td>
<td>12,413 12,893 12,193</td>
</tr>
<tr>
<td>Specialists and white-collar workers</td>
<td>36,742 38,432 42,043</td>
</tr>
<tr>
<td>Blue-collar workers</td>
<td>50,630 56,105 50,104</td>
</tr>
<tr>
<td>Total</td>
<td>107,670 116,056 113,068</td>
</tr>
</tbody>
</table>

**NUMBER OF EMPLOYEES WHO UNDERWENT TRAINING**

In 2018, ROSATOM initiated an assessment of negotiating skills of industry executives who are key members of international negotiating teams. As a result, a pool of executives was formed for active participation in future negotiations with foreign partners on behalf of ROSATOM (it comprises 55 people).

**INTERNATIONAL NEGOTIATIONS IN THE NUCLEAR INDUSTRY TRAINING PROGRAMME**

In 2018, ROSATOM initiated an assessment of negotiating skills of industry executives who are key members of international negotiating teams. As a result, a pool of executives was formed for active participation in future negotiations with foreign partners on behalf of ROSATOM (it comprises 55 people).

**9.1.4. EMPLOYEES’ PARTICIPATION IN EXTERNAL AND INDUSTRY-WIDE PROFESSIONAL COMPETITIONS**

**LEADERS OF RUSSIA**

Employees of ROSATOM and its organizations actively participate in the Leaders of Russia national management competition. 850 employees of industry organizations took part in the first competition held in 2017 and 2018. 20 people reached the semi-finals, with 9 people progressing to the final. Winners included a senior executive of one of ROSATOM’s organizations. 1,894 employees took part in the second competition held in 2018 and 2019, with 78 people reaching the semi-finals and 4 people progressing to the final.
In 2018, over 900 participants and experts from 74 nuclear organizations, 11 branches of NRNU MEPhI and 6 partner colleges participated in the AtomSkills Industry-Wide Championship. In 2018, the AtomSkills Juniors movement was created for school students. This initiative includes running engineering and technical creativity comprising employees of nuclear enterprises and ROSATOM’s partner universities.

ROSATOM’S PERSON OF THE YEAR

ROSATOM’s Person of the Year is an industry contest aimed at recognizing the achievements of the best employees in the industry. The contest includes over 50 individual and team nominations. The primary selection criteria include significant work achievements, ability to think out of the box, adherence to corporate values, and professional competencies of the candidates.

In 2018, 2,031 applications were submitted, and 300 people won prizes.

WORLD SKILLS

WorldSkills International[1] is a not-for-profit association operating in 76 member countries worldwide. The aim of WorldSkills is to provide skilful training to meet market needs and to develop talent by organizing professional skill competitions. Participants of the movement include college and university students, young specialists, teachers, the government and industries.

The industry-wide team won the WorldSkills Hi-Tech National Competition of cross-industry skilled professions for workers in high-technology industries for the fourth time. The team won 34 medals (including 28 golds). ROSATOM’s team was represented in 20 competencies by 76 participants and 10 experts, as well as 5 junior teams. In addition, industry-wide teams won medals in DigitalSkills, WorldSkills 50+ and 5 junior teams. In addition, 76 participants and 90 experts, as well as 5 junior teams. Additionally, 5 junior teams. The team won 34 medals (including 28 golds). ROSATOM’s team was represented in 20 competencies by 76 participants and 10 experts, as well as 5 junior teams. In addition, industry-wide teams won medals in DigitalSkills, WorldSkills 50+ and 5 junior teams.

The target for the next three to five years is to maintain the employee engagement rate on a par with global leaders in high-technology industries (at least 75%) and to achieve this rate in most industry organizations that participate in the survey.

9.1.5. EMPLOYEE ENGAGEMENT SURVEYS

In 2018, the survey covered 44,672 employees in 67 of ROSATOM’s organizations. According to the findings of the annual survey, the employee engagement rate in the industry stood at 80%.

Corporate volunteering

Given a large number of volunteering initiatives in the industry and the fact that 2018 had been declared the Year of Volunteers in Russia, it was decided to develop a single corporate project in this field. Key objectives of corporate volunteering include:

— Forming a pool of social leaders comprising employees of organizations in the industry;
— Developing horizontal cooperation;
— Enhancing the image of ROSATOM as a socially responsible company.

In addition, the following areas of corporate volunteering were prioritized in the reporting year:

— Environmental protection (including waste management);
— Promoting a healthy lifestyle;
— Career guidance and mentorship;
— Intellectual volunteering;
— Supporting socially disadvantaged groups and veterans.

In 2018, 44,672 employees in 67 of ROSATOM’s organizations participated in the survey. Engagement surveys in the industry and in ROSATOM’s head office. These are informal groups comprising the most active employees.

The Code of Ethics is available on the official website of the Corporation.

Corporate policy

ROSATOM’s social policy is designed to:

— Make ROSATOM more attractive as an employer;
— Engage and integrate young professionals and highly skilled specialists;
— Improve employee loyalty;
— Improve the efficiency of social expenses.

Employment benefits provided to employees and retirees comply with the Uniform Industry-Wide Social Policy, which is based on standardization of corporate social programs. The structure of corporate social programs and the relevant expenses are determined based on the Corporation’s priorities in personnel management:

— Importance of maintaining health and a long working life;
— Protecting the health of people working in conditions that deviate from the standard conditions (which is why the bulk of funding is allocated for additional personal insurance and health resort treatment of employees);
— Traditions established at ROSATOM (companies in the Russian nuclear industry always pay great attention to retired employees who had worked in the industry for a long time, veterans receive social assistance and are involved in various events, including working with young people).
Given a large number of employees nearing retirement (those in the so-called ‘third age’ category) in the industry (in the reporting year, they made up 13% of the average headcount), in 2018, the Industry-Wide Social Protection and Social Support System, the Uniform Industry-Wide Social Policy and the Occupational Safety Management System.

The Agreement gives priority to the protection of employees’ lives and health (see the sections ‘Occupational Safety’ and ‘Social Policy’). Jointly with the trade union, employers maintain records of and analyse morbidity among employees, including based on records of periodic medical examinations and sick leave, and build an integrated health care programme titled Health. The Agreement incorporates the opportunities provided by legislation on the special inspection of working conditions (SIWC) and stipulates an additional mechanism for cooperating with the trade union in conducting an SIWC and analysing inspection findings. See also the section ‘Occupational Safety’.

Collective agreements in all of the Corporation’s organizations provide for a minimum notice period of two months for significant operational changes and of three months for situations that may lead to dismissals.

Collective agreements cover 85% of employees working in ROSATOM’s enterprises.

At the 19th International Futsal Tournament among teams representing the nuclear industry, ROSATOM’s team won the 1st place trophy.

SUPPORT TO INDUSTRY VETERANS

The Interregional Social Movement of Veterans of Nuclear Power and Industry (ISMV NPI) comprises 130 veteran organizations in Russia with a total of 312,200 members.

In 2018, ISMV NPI started to actively cooperate with the Union of Veterans of Ignalina NPP and the Armenian Union of Nuclear Energy Veterans.

In reporting year, at the request of ISMV NPI:
— 93 veterans were awarded the Veteran of Nuclear Power and Industry badge, a departmental award for outstanding work; and
— 117 veterans were awarded ROSATOM’s badges;
— 42 veterans were awarded certificates of appreciation and letters of acknowledgment from ROSATOM.

As part of a special industry-wide wellness programme for veterans, in 2018, over 16,000 veterans of the nuclear industry were provided with subsidized vouchers for treatment at health resorts of the Russian Federal Biomedical Agency (FMBA) and the industrial trade union.

9.1.7. SOCIAL PARTNERSHIP IN THE NUCLEAR INDUSTRY

ROSATOM adheres to the Industry-Wide Agreement on Nuclear Power, Industry and Science for 2018–2020. The Agreement is based on the established practice of social partnership in the nuclear industry and is aimed at implementing the Integrated Standardized Remuneration System, the Uniform Industry-Wide Social Policy and the Occupational Safety Management System.

The Agreement has been developed and is implemented jointly with the Russian Trade Union of Nuclear Power and Industry Workers 63.

The Agreement gives priority to the protection of employees’ lives and health (see the sections ‘Occupational Safety’ and ‘Social Policy’). Jointly with the trade union, employers maintain records of and analyse morbidity among employees, including based on records of periodic medical examinations and sick leave, and build an integrated health care programme titled Health. The Agreement incorporates the opportunities provided by legislation on the special inspection of working conditions (SIWC) and stipulates an additional mechanism for cooperating with the trade union in conducting an SIWC and analysing inspection findings. See also the section ‘Occupational Safety’.

Collective agreements cover 85% of employees working in ROSATOM’s enterprises.


9.1.8. COOPERATION WITH UNIVERSITIES AND RECRUITMENT OF YOUNG PROFESSIONALS

Due in every three young employees hired in the Russian nuclear industry in 2018 had graduated from university with honours.

Specialized educational institutions that train specialists for the nuclear industry form part of the Consortium of Core Universities of ROSATOM. The Consortium comprises 18 universities specializing in disciplines relevant to the nuclear industry. The National Research Nuclear University MEPhI (NRNU MEPhI) is the central university for the industry.

In 2018, a total of 2,093 students attended universities under arrangements with nuclear enterprises. 5,973 university students undertook internships in nuclear organizations. Over 500 people were subsequently hired by the organizations. Overall, about 1,200 university graduates were hired, with almost half of them graduating from core universities. The grade point average of university graduates hired by organizations in the industry totalled 4.5 points.

ROSATOM has prepared a forecast until 2027 for the industry’s demand for specialists who have received university education or secondary vocational education. The industry organizations are expected to hire around 800 graduates of NRNU MEPhI and its branches.

TEMP TOURNAMENT

The TeMP Tournament for Young Professionals is a landmark project for recruiting, selecting and hiring promising graduates. In 2018, the Tournament comprised two streams: Solving Business Cases and Development of Start-Ups in ROSATOM’s key business areas. Over 3,000 students and graduates from core universities per year on average, including around 800 graduates of NRNU MEPhI and its branches.

TEMP Tournament for Young Professionals in 2018 had graduated from university with honours.

ROSATOM successfully exports Russian nuclear education to potentially attractive markets. Foreign students study at NRNU MEPhI, as well as at ROSATOM’s core universities and partner universities.

As of December 31, 2018, over 1,612 people were studying in Russian universities with a specialization in nuclear and related disciplines, including students from Vietnam, Bolivia, Turkey, Bangladesh, Jordan, Egypt, Zambia, Algeria, Nigeria, South Africa, Cuba and other countries (a total of over 40 countries). In 2018, 180 foreign students graduated from these universities. Another 315 foreign students from 48 countries are due to enrol in 2019.

In the reporting year, ROSATOM’s partner universities in Russia (NRNU MEPhI and Tomsk Polytechnic University) launched seven joint educational programmes in cooperation with universities in ROSATOM’s partner countries (Armenia, Bolivia, Turkey, Egypt and Bangladesh). A management school was set up in cooperation with the UAEA for senior managers of atomic energy commissions, the relevant ministries and nuclear infrastructure organizations in foreign countries.
9.1.11. PLANS FOR 2019 AND FOR THE MEDIUM TERM

— To develop a system for training engineers and blue-collar workers in accordance with the WorldSkills international standards;
— To enable rapid development of key business competences;
— To create a digital environment and promote employees’ digital literacy;
— To support talent development and to top employer rankings.

Together with the Divisions and enterprises, we are implementing a wide range of projects in nuclear cities and towns. To prevent their duplication and to ensure that they all have common goals and objectives and contribute to making our efforts more effective, we have launched a competition titled #Rosatomvmeste.

In 2018, this event was held for the first time, and it has a brand new format. #Rosatomvmeste included four contests: ROSATOM’s Month, a contest of creative achievements of nuclear cities and towns. The Days of Cities and Towns were held in ROSATOM’s headquarters in Moscow. And, as has been pointed out by ROSATOM’s Director General Alexey Likhachev, improving the quality of life in our cities and towns is one of the top priorities in our strategic agenda.

— Maintaining a high standard of living in its cities and towns has traditionally been one of ROSATOM’s priorities since the time when it was managed by the Ministry of Medium Machine-Building. And, as has been pointed out by ROSATOM’s Director General Alexey Likhachev, improving the quality of life in our cities and towns is one of the top priorities in our strategic agenda.

— We seek to implement the ‘May decree’ of the Russian President in nuclear cities and towns. We are going to compile a list of projects that facilitate healthy development of the nuclear industry in our cities and towns, on the one hand, and are important for the development of the cities and towns themselves, on the other hand. This list will include initiatives in the sphere of culture, education, the urban environment, smart and digital technologies. As a result, cities and towns will have their own portfolios of projects to be implemented in individual regions taking into account their special features.

— What development opportunities will nuclear cities and towns have in the context of implementation of Russian national projects, especially in terms of improvement of the quality of life?

In addition, we support the work of RPS offices aimed at redesigning the management of municipal services and infrastructure. Plans for 2019 include the conclusion of agreements with representatives of 15 municipal administrations on the introduction of LEAN SMART CITY approaches. As a result, we will formulate a target vision of modules comprising an integrated digital platform, digital services and solutions needed for the implementation of the Lean Smart City project in each city and town.

We have also revised our communication processes. In 2019, we will launch a special digital application called ‘Citizen of ROSATOM’s Country’, which will become a permanent discussion platform for active city residents.

ANDREY POLOSIN,
Head of the Department for Regional Liaison

— The Corporation launched a large-scale project titled #Rosatomvmeste (‘ROSATOM Together’), which consolidates ROSATOM’s social projects in the cities and towns where it operates. Could you give more detail about its goals, objectives, results and future prospects?

— We are going to compile a list of projects that facilitate healthy development of the nuclear industry in our cities and towns, on the one hand, and are important for the development of the cities and towns themselves, on the other hand. This list will include initiatives in the sphere of culture, education, the urban environment, smart and digital technologies. As a result, cities and towns will have their own portfolios of projects to be implemented in individual regions taking into account their special features.

— In 2018, the Corporation launched a large-scale project titled #Rosatomvmeste (‘ROSATOM Together’), which consolidates ROSATOM’s social projects in the cities and towns where it operates. Could you give more detail about its goals, objectives, results and future prospects?

9.2. DEVELOPING THE REGIONS OF OPERATION

Key results in 2018:
— Taxes paid to Russian budgets at all levels totalled RUB 188.2 billion.
— NPPs accounted for 18.7% of the total electricity output in Russia.

Performance of State Atomic Energy Corporation Rosatom in 2018

—— Maintaining a high standard of living in its cities and towns has traditionally been one of ROSATOM’s priorities since the time when it was managed by the Ministry of Medium Machine-Building. And, as has been pointed out by ROSATOM’s Director General Alexey Likhachev, improving the quality of life in our cities and towns is one of the top priorities in our strategic agenda.

—— We seek to implement the ‘May decree’ of the Russian President in nuclear cities and towns. We are going to compile a list of projects that facilitate healthy development of the nuclear industry in our cities and towns, on the one hand, and are important for the development of the cities and towns themselves, on the other hand. This list will include initiatives in the sphere of culture, education, the urban environment, smart and digital technologies. As a result, cities and towns will have their own portfolios of projects to be implemented in individual regions taking into account their special features.

—— What development opportunities will nuclear cities and towns have in the context of implementation of Russian national projects, especially in terms of improvement of the quality of life?

—— We are going to compile a list of projects that facilitate healthy development of the nuclear industry in our cities and towns, on the one hand, and are important for the development of the cities and towns themselves, on the other hand. This list will include initiatives in the sphere of culture, education, the urban environment, smart and digital technologies. As a result, cities and towns will have their own portfolios of projects to be implemented in individual regions taking into account their special features.

—— In 2018, the Corporation launched a large-scale project titled #Rosatomvmeste (‘ROSATOM Together’), which consolidates ROSATOM’s social projects in the cities and towns where it operates. Could you give more detail about its goals, objectives, results and future prospects?

—— We seek to implement the ‘May decree’ of the Russian President in nuclear cities and towns. We are going to compile a list of projects that facilitate healthy development of the nuclear industry in our cities and towns, on the one hand, and are important for the development of the cities and towns themselves, on the other hand. This list will include initiatives in the sphere of culture, education, the urban environment, smart and digital technologies. As a result, cities and towns will have their own portfolios of projects to be implemented in individual regions taking into account their special features.

—— What development opportunities will nuclear cities and towns have in the context of implementation of Russian national projects, especially in terms of improvement of the quality of life?
NPPs accounted for 18.7% of the total electricity output in Russia (18.9% in 2017). Nuclear power generation contributes significantly to power systems across Russia.

ROSATOM’s organizations and enterprises have a significant impact on budget revenue in ROSATOM’s regions of operation. ROSATOM is one of the largest taxpayers in Russia. In 2018, payments to budgets of all levels totalled RUB 188.2 billion.

The construction and commissioning of nuclear facilities, including NPP power units, creates new jobs: a number of employees are recruited from local communities within a 100 km radius of the construction site. In addition, every job in the construction of an NPP creates another 10 to 12 jobs in related sectors of the economy (the metals industry, mechanical engineering, etc.).

9.2.1. ENSURING THE ENERGY SECURITY OF RUSSIAN REGIONS

<table>
<thead>
<tr>
<th>NPP</th>
<th>EMPLOYEES ENGAGED IN NPP CONSTRUCTION INCLUDING CONTRACTOR ORGANIZATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NUMBER OF EMPLOYEES ENGAGED IN NPP CONSTRUCTION IN 2018</td>
</tr>
<tr>
<td>Novovoronezh NPP-2 (Russia)</td>
<td>2,999</td>
</tr>
<tr>
<td>Leningrad NPP-2 (Russia)</td>
<td>2,695</td>
</tr>
<tr>
<td>Rostov NPP (Russia)</td>
<td>3,411</td>
</tr>
<tr>
<td>Kurusk NPP-2 (Russia)</td>
<td>1,595</td>
</tr>
<tr>
<td>Rooppur NPP (Bangladesh)</td>
<td>4,136</td>
</tr>
<tr>
<td>Ostrovets NPP (Belarus)</td>
<td>3,004</td>
</tr>
<tr>
<td>Total</td>
<td>19,930</td>
</tr>
</tbody>
</table>

In 2018, ROSATOM continued to establish priority social and economic development areas (PSEDAs) in CATFs in the nuclear industry and to develop the relevant management system.

In 2018, PSEDAs were created in the CATFs of Snezhinsk and Ozersk (Chelyabinsk Region), the CATF of Zheleznogorsk (Krasnoyarsk Territory) and the CATF of Zarechny (Penza Region).

20 projects were being developed in the newly established PSEDAs; they are scheduled for implementation between 2019 and 2021. The management company JSC ATOM-TOR conducted expert reviews of business plans and selected production facilities and land plots for the implementation of the projects. A total of RUB 2.2 billion will be invested in the implementation of the projects by potential residents; they are expected to create about 800 new jobs.

TAXES PAID BY ROSATOM AND ITS ORGANIZATIONS, RUB BILLION

<table>
<thead>
<tr>
<th>YEAR</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxes, including</td>
<td>125.3</td>
<td>148.5</td>
<td>188.2</td>
</tr>
<tr>
<td>To the federal budget</td>
<td>82.4</td>
<td>95.1</td>
<td>116.8</td>
</tr>
<tr>
<td>To the budgets of federal subjects of Russia</td>
<td>42.3</td>
<td>52.7</td>
<td>70.8</td>
</tr>
<tr>
<td>To local budgets</td>
<td>0.6</td>
<td>0.7</td>
<td>0.6</td>
</tr>
</tbody>
</table>

ROSATOM’s organizations and enterprises have a significant impact on budget revenue in ROSATOM’s regions of operation. ROSATOM is one of the largest taxpayers in Russia. In 2018, payments to budgets of all levels totalled RUB 188.2 billion.

In 2018, ROSATOM continued its cooperation with the Association of CATFs in the Nuclear Industry (http://zato.tv/association) in the following areas:

— Enhancing and expanding government support for the social and economic development of CATFs, including by improving the regulatory framework;
— Supporting the implementation of ROSATOM’s international projects (in the reporting year, a delegation of CATF heads visited Egypt);
— Preparing and holding industry conferences, workshop meetings and other events aimed at improving the management of social and economic development in CATFs;
— Ensuring that the development of the nuclear power industry is acceptable to society (including through the preparation of ROSATOM’s public reports).
In 2018, ROSATOM continued to implement the Lean Polyclinic project. The project is aimed at optimizing the most problematic processes in the work of primary healthcare institutions, reducing queuing time, simplifying the procedure for arranging an appointment with a doctor, ensuring optimal availability of healthcare institutions and increasing the level of satisfaction with the availability of medical care.

In the reporting year, the project was implemented in 25 healthcare institutions in CATFs and other cities and towns where nuclear organizations are located in 20 regions of Russia. As a result:

— The time spent by patients at the reception desk was reduced two- to three-fold;
— Queuing time for patients waiting to be seen by a doctor was reduced three- to seven-fold;
— The number of visits to outpatient clinics as part of health screening or medical check-ups was reduced two- to three-fold;
— The waiting time for blood sampling was reduced by a factor of 1.5-2.

9.2.7. URBAN INFRASTRUCTURE DEVELOPMENT

In 2018, a system for public monitoring of the implementation of the Lean Polyclinic project was created on the basis of the Healthcare Commission of ROSATOM’s Public Council. Eight working groups consisting of 150 experts are active in CATFs and other cities and towns where nuclear organizations are located. In the reporting year, the experts conducted two opinion surveys on the outcomes of the Lean Polyclinic project, in the course of which respondents mentioned positive changes in the availability of medical care:

— The introduction of a digital reception desk;
— An opportunity to arrange an appointment with a doctor remotely (online);
— A reduction of queues to doctors in local outpatient clinics and to treatment and physiotherapy rooms;
— Transformation of exteriors and interiors of outpatient clinics.

See also the section ‘ROSATOM’s Production System’.

In 2018, ROSATOM continued to actively develop innovative clusters in Zheleznogorsk (Krasnoyarsk Territory) and Dimitrovgrad (Ulyanovsk Region). Projects were implemented in the clusters both by ROSATOM’s organizations and as part of consortia. In order to implement the projects, in the reporting year, cluster members raised more than RUB 130 million from development institutions.

In 2018, ROSATOM actively cooperated with the Moscottown Development Fund. As a result:

— Agreements were concluded on the co-financing of infrastructure facilities in Dimitrovgrad (Ulyanovsk Region) and Glazov (Udmurtia);
— 16 investment projects in ‘nuclear’ cities and towns worth over RUB 4 billion were included in the pool of projects provided with the Fund’s new product, Interest-Free Loan;
— A partnership agreement was concluded by the Fund and the Corporation’s subsidiary LLC Kavmash Infrastructure Solutions with a view to implementing joint investment projects aimed at the application of digital technologies in the management of municipal business processes.

9.2.6. IMPROVING THE QUALITY OF SERVICES PROVIDED TO THE POPULATION IN THE TOWNS AND CITIES OF OPERATION

In 2018, ROSATOM continued to implement the Clean Water project. The project is aimed at optimizing the most problematic processes in the work of primary healthcare institutions, reducing queuing time, simplifying the procedure for arranging an appointment with a doctor, ensuring optimal availability of healthcare institutions and increasing the level of satisfaction with the availability of medical care.

In the reporting year, the project was implemented in 25 healthcare institutions in CATFs and other cities and towns where nuclear organizations are located in 20 regions of Russia. As a result:

— The waiting time for blood sampling was reduced by a factor of 1.5-2.
— An opportunity to arrange an appointment with a doctor remotely (online);
— A reduction of queues to doctors in local outpatient clinics and to treatment and physiotherapy rooms;
— Transformation of exteriors and interiors of outpatient clinics.

See also the section ‘ROSATOM’s Production System’.

The Clean Water project involves developing solutions for water desalination and purification and wastewater treatment. ROSATOM designs, builds, upgrades and services water supply, wastewater treatment and water purification facilities for the energy, oil and gas, petrochemical, food and other industries. It has designed seawater desalination plants for far and regions.

In 2019, the Corporation will continue to develop references and prepare integrated offers for cities and towns based on utility infrastructure solutions, opportunities are being discussed for the promotion of Clean Water solutions on foreign markets. 2019 has been declared the ‘Year of Health’ in nuclear cities and towns.

The Clean Water project involves developing solutions for water desalination and purification and wastewater treatment. ROSATOM designs, builds, upgrades and services water supply, wastewater treatment and water purification facilities for the energy, oil and gas, petrochemical, food and other industries. It has designed seawater desalination plants for far and regions.
The second season of a popular musical project titled ‘Culture should be open in a closed town’. The programme produces residents of Russian nuclear cities and towns to the highlights of producing, figurative and dramatic arts. The motto of the programme is: ‘Culture should be open in a closed town’. The programme is aimed at finding and supporting creative talents in the cities and towns where ROSATOM operates, improving the performance of cultural institutions and introducing residents of Russian nuclear cities and towns to the highlights of performing, figurative and dramatic arts. The motto of the programme is: ‘Culture should be open in a closed town’. In 2018:

— The first circus art festival and contest among ‘nuclear’ cities and towns was held in Zarechny (Sverdlovsk Region) and in Snezhinsk (Chelyabinsk Region) in order to provide targeted support to children from ‘nuclear’ cities and towns who have shown outstanding musical abilities;

— ‘The PERVYE (The First Ones)’ theatre festival was held in Zarechny (Penza Region); it was aimed at promoting the nuclear industry among the population, stimulating interest in this subject among young people and preserving continuity in the industry;

— An international festival of pure music was held in Sosnovy Bor (Leningrad region); it was attended by about 350 participants from Russia and foreign countries.

In addition, in 2018, Yulia Rutberg, Dmitry Dyuzhev, Dmitry Nazarov, Konstantin Khabensky, Yury Bashmet, Alexey Guskov and Sergey Shakurov gave performances in the cities and towns of ROSATOM’s operation.

The programme of the forum included:

— Organization of research; conducting research and expert activities;

— Work in the regions, conducting public dialogue forums;

— Public awareness campaigns, educational, social and cultural activities.

In 2018, the Public Council continued to support the environmental expert community in the regions where key nuclear enterprises are located. ‘Non-nuclear’ universities became the core participants of this work. Their faculty members, graduate and postgraduate students studied and revised the ‘Green Courses of the State Atomic Power Industry of the Future’ concept. A total of 19 universities in 12 regions of Russia were engaged in this work, and 27 project teams were formed.

In 2018, a congress of ROSATOM’s cultural leaders ‘The Future Has Arrived. State of the Art Approaches to Process Management’ was held (Moscow).

Starting from 2019, as part of the Territory of Culture project, ROSATOM will provide support to professional and amateur ensembles and individual performers living in cities and towns where nuclear enterprises are situated and wishing to take part in festivals and contests in Russia.

To improve the performance of cultural institutions in nuclear cities and towns, in 2018, ROSATOM took the following measures:

— The cultural space was monitored in order to assess performance and the quality of services in 18 cities and towns where ROSATOM operates;

— A training programme consisting of 36 webinars, three workshops and one internship (Belgorod) was developed and implemented based on the findings of monitoring for 2017;

— A congress of ROSATOM’s cultural leaders ‘The Future Has Arrived. State of the Art Approaches to Process Management’ was held (Moscow).

In 2018, the Public Council continued to support the environmental expert community in the regions where key nuclear enterprises are located. ‘Non-nuclear’ universities became the core participants of this work. Their faculty members, graduate and postgraduate students studied and revised the ‘Green Courses of the State Atomic Power Industry of the Future’ concept. A total of 19 universities in 12 regions of Russia were engaged in this work, and 27 project teams were formed.
9.3. STAKEHOLDER ENGAGEMENT

Key results in 2018:
— 74.5% of the population in Russia supports the use of nuclear energy.
— Over 459,000 people visited Nuclear Energy Information Centres.
— Viewership of channels broadcasting the Strana ROSATOM TV programme in various regions of Russia totals 7.3 million people.

Fundamental principles of stakeholder engagement are as follows:
— Respect and accommodation of the interests of all participants;
— Open-efficient cooperation;
— Timely and exhaustive information on the Corporation’s activities;
— Striving to provide specific benefits to all participants;
— Fulfillment of obligations.

As part of ROSATOM’s ongoing cooperation with non-governmental and non-profit organizations in its regions of operation, the Corporation held an annual contest of socially useful initiatives implemented by non-profit organizations and associations. To be eligible to participate in the contest, an applicant organization must invest its own funds totaling at least 25% of the total project cost.

In 2018, 460 projects were entered in the contest, and 75 winning projects were implemented in six project areas (environmental protection, education and advocacy in the field of the safe use of nuclear energy, the Russian nuclear industry in the international arena, culture and creativity, the urban environment, development of physical education and sports).

Due to its scale and special characteristics of its business (simultaneous performance of state and business tasks, operation across a large number of markets), ROSATOM has a wide range of stakeholders both in Russia and worldwide. Targeted work with stakeholders is aimed at achieving strategic objectives and getting the public on board for developing nuclear energy. The Corporation fosters systematic and constructive stakeholder engagement in each area of its business and communicates with society as a whole.

Federal legislative and executive bodies of Russia (including supervisory bodies)
Government bodies of federal subjects of Russia
Local governments
Government bodies of foreign countries
Regulators (including those responsible for maintaining standards)
Employees of ROSATOM and its organizations
Business partners
Trade Union (RTUNPIW)
Research institutes
Educational institutions
Consumers
Professional and expert communities, rating agencies and market analysts
Non-governmental organizations (NGOs) and environmental NGOs
Local communities
Mass media

Implementation of federal target programmes
Tax payments
Sales of products and services to customers
Remuneration and social benefits provided to employees
Expenditure on targeted educational programmes for university students
Purchases of goods and services for operational needs
Payments to suppliers of capital and external borrowings
Expenditure on research
Expenditure on safety and environmental protection
Expenditure on social, economic and charitable programmes in operating regions
INTERESTS AND TYPES OF STAKEHOLDER ENGAGEMENT

<table>
<thead>
<tr>
<th>INTERESTS</th>
<th>TYPES OF STAKEHOLDER ENGAGEMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ensuring non-proliferation of nuclear materials and technologies</td>
<td>A. Cooperation with specialized international organizations, participation in international programmes and projects</td>
</tr>
<tr>
<td>2. Nuclear, radiation and environmental safety</td>
<td>B. Participation in law-drafting activities</td>
</tr>
<tr>
<td>3. Economic efficiency of ROSATOM’s organizations</td>
<td>C. Public consultations and public environmental impact assessments of NPP construction projects</td>
</tr>
<tr>
<td>4. Efficient use of budget funds</td>
<td>D. Employees training and development programmes</td>
</tr>
<tr>
<td>5. Compliancy with international and Russian legislation</td>
<td>E. Social programmes and projects</td>
</tr>
<tr>
<td>6. Fair competition and responsible behaviour on the market</td>
<td>F. Participation in the development of the regions of operation</td>
</tr>
<tr>
<td>7. Technological modernization in the nuclear industry</td>
<td>G. Charity work</td>
</tr>
<tr>
<td>8. Competitiveness on global markets</td>
<td>H. Opinion polls, customer satisfaction surveys</td>
</tr>
<tr>
<td>9. Improvement of product and service quality</td>
<td>I. Hotlines</td>
</tr>
<tr>
<td>10. Transparency of ROSATOM’s operations, including transparency of procurement activities</td>
<td>J. Programmes of cooperation with specialized universities</td>
</tr>
<tr>
<td>11. Dealing with the legacy of past business operations and defence efforts</td>
<td>K. Dialogues, presentations, forums, conferences</td>
</tr>
<tr>
<td>12. Reliable electricity supply</td>
<td>L. Open and competitive procurement procedures</td>
</tr>
<tr>
<td>13. Adoption of international governance norms and standards</td>
<td>M. Programmes of cooperation with other companies</td>
</tr>
<tr>
<td>14. Adequate remuneration to employees; support for professional development of employees; safe working conditions</td>
<td>N. Programmes of cooperation with government regulators (supervisory bodies) and law enforcement agencies</td>
</tr>
<tr>
<td>15. Improvement of the quality of life in the regions of operation</td>
<td>O. Information and communication</td>
</tr>
<tr>
<td>16. Development of human resources in ROSATOM and its organizations</td>
<td>P. Public reports</td>
</tr>
</tbody>
</table>

STAKEHOLDER INTERESTS

1. Development of human resources in ROSATOM and its organizations
2. Reliable electricity supply
3. Dealing with the legacy of past business operations and defence efforts
4. Transparency of ROSATOM’s operations, including transparency of procurement activities
5. Improvement of product and service quality
6. Fair competition and responsible behaviour on the market
7. Technological modernization in the nuclear industry
8. Nuclear, radiation and environmental safety
9. Economic efficiency of ROSATOM’s organizations
10. Efficient use of budget funds

Nuclear Kids (NuKid) (http://www.nukids.ru/en) is an annual international art project for the children of employees of Russian nuclear organizations and ROSATOM’s foreign partners. The main aim of the project is to promote friendship between children. 2018 saw the 10th anniversary of the launch of the project. 58 children from Russia and 26 of their age-mates from foreign countries (Bangladesh, Belarus, the UK, Hungary, Egypt, India, China, Turkey and Croatia) participated in the production of a musical titled Lomomnere’s Scroll. The musical was performed in Moscow, Cherkiz, Snezhinsk and Snezhod (Hungary).

A project is underway in the Russian nuclear industry to build a network of nuclear energy information centres (NEICs) in ROSATOM’s regions of operation. The first centre was opened in 2008. As of December 31, 2018, the NEIC network comprised 17 centres in Russia, as well as centres in Minsk (Belarus) and Astana (Kazakhstan). In 2018, over 459,000 people visited the centres.

Key projects of the NEICs

In 2018, the Kstati (‘By the Way’) Festival of Science took place in Ekaterinburg, Novoshirk and Rostov-on-Don, while Voronezh and Vladimir hosted the Scientific Encounters mini festival. The festivals were conducted in the form of a marathon of interactive lectures, popular science talk shows, intellectual games, workshops and film screenings. The projects had an audience of more than 18,000 people.

In the reporting year, the NEICs gave special focus to holding open-air pop-culture events. The Go Offline series of one-day science and entertainment events was held in Saratov, while Ulyanovsk hosted the Night of Science city festival. In addition, the NEIC in Saint Petersburg had its own venues at major Russian geek festivals: VK Fest and Geek Pilioz. A total of over 7,000 people participated in NEIC activities at open-air summer festivals.

In 2018, 364 teams from 30 Russian cities and school students from Minsk and Astana participated in the 5th Formula of Intelligence National Simultaneous Intellectual Games Championship for School Students. In addition, over 600 high school students took part in the 4th Matro Simultaneous Intellectual Games Championship for School Students.

9.3.3. ATOMEXPO INTERNATIONAL FORUM

The ATOMEXPO International Forum is a major event in the global nuclear industry. Held annually since 2009, it is the largest exhibition and business platform for discussing the current state of the nuclear industry and setting future trends.

The Forum is attended by executives from the key companies working in the global nuclear industry; government agencies, international and non-commercial organizations, and leading experts.

In 2018, the ‘10th Forum’ was held; its key topic was ‘Global Partnership — Joint Success’. The Forum was attended by more than 4,000 people from 68 countries worldwide. ROSATOM’s key partner coun-
tries were represented at a high level by 32 official foreign delegations, including 15 ministers and persons holding equivalent positions; 9 agreements and other documents on cooperation and partnership, including commercial contracts, were signed on the sidelines of ATOMEXPO 2018.

As part of the 10th ATOMEXPO International Forum, the Director General of the IAEA Yukiya Amano and the Director General of the OECD-NEA William D. Magwood visited Russia.
9.3.5. ONLINE COMMUNICATIONS

ROSATOM is actively developing online communication with stakeholders. In 2018, the Corporation’s official website at http://www.rosatom.ru/en/ was visited by more than 730,000 people, or approximately 5,000 people every weekday.

The Corporation is also expanding its presence on social media in order to inform users of various developments in the Russian nuclear industry, answer questions and conduct awareness-raising events. In 2018, ROSATOM recorded a substantial increase in the number of its followers on Instagram and VKontakte.

<table>
<thead>
<tr>
<th>SOCIAL MEDIA PRESENCE</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK</td>
<td>32,842</td>
<td>28,356</td>
</tr>
<tr>
<td>Instagram</td>
<td>20,316</td>
<td>16,992</td>
</tr>
<tr>
<td>YouTube</td>
<td>10,602</td>
<td>10,449</td>
</tr>
<tr>
<td>VKontakte</td>
<td>10,649</td>
<td>10,680</td>
</tr>
<tr>
<td>Telegram</td>
<td>6,705</td>
<td>7,007</td>
</tr>
<tr>
<td>TOTAL</td>
<td>68,876</td>
<td>62,538</td>
</tr>
</tbody>
</table>

The survey was conducted from February 7 through February 20, 2019 across a representative sample of Russian citizens consisting of 3,985 people aged 18 and above.

9.3.6. OPINION POLLS

ROSATOM analyses the public perception of the development of nuclear power in Russia on a yearly basis and adjusts its communication with stakeholders accordingly.

According to an independent opinion survey by Levada-Centre\(^{71}\), 74.5% of the Russian population supported the use of nuclear power (73.9% in 2017; over the past few years, this figure remains persistently high).

— Do you think that the nuclear power industry should be actively developed, maintained at its current level, curtailed or totally abandoned?

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Actively developed</td>
<td>48.2%</td>
</tr>
<tr>
<td>Maintained at its current level</td>
<td>26.3%</td>
</tr>
<tr>
<td>Curtailed</td>
<td>8.3%</td>
</tr>
<tr>
<td>Totally abandoned</td>
<td>9.2%</td>
</tr>
<tr>
<td>I do not know</td>
<td>8.0%</td>
</tr>
</tbody>
</table>

— Do you agree with the following statement: ‘Nuclear energy is a “green”, environmentally friendly type of power generation’?

<p>| | |</p>
<table>
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<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>I completely agree</td>
<td>18.5%</td>
</tr>
<tr>
<td>I partly agree</td>
<td>35.2%</td>
</tr>
<tr>
<td>I partly disagree</td>
<td>22.6%</td>
</tr>
<tr>
<td>I completely disagree</td>
<td>14.7%</td>
</tr>
<tr>
<td>I do not know</td>
<td>9.0%</td>
</tr>
</tbody>
</table>

1. The survey was conducted from February 7 through February 20, 2019 across a representative sample of 3,985 people aged 18 and above.
ROSATOM ensures safe and steady operation of enterprises in the nuclear industry, protects the life and health of its employees, ensures the environmental safety of its operations and seeks to preserve the environment.
10.1. NUCLEAR AND RADIATION SAFETY; OCCUPATIONAL SAFETY AND HEALTH

Key results in 2018:
- No events rated at level 2 or higher on the INES scale were detected.
- The injury frequency rate and the lost time injury frequency rate (LTIFR) stood at 0.25 and 0.12 respectively.
- Individual radiation risk was calculated for 44,645 people using the WAIR system.

Recently, ROSATOM has been paying increasing attention to safety culture in the course of its operations. Could you tell us how ROSATOM defines this concept, what it plans to do in the near future to enhance this culture, and how this is expected to affect the overall performance of organizations and enterprises in the industry?

One of ROSATOM’s goals is to create the conditions and mechanisms for ensuring safety, including an improvement of safety culture in the industry as an important tool in this field. Safety is one of ROSATOM’s corporate values.

The term ‘safety culture’ was introduced by the International Nuclear Safety Advisory Group (INSAG) in 1986. Safety culture describes the behavior of personnel of nuclear facilities at all hierarchical levels, at all stages of the life cycle and in all possible situations, both under normal conditions and in an emergency. The fundamental components of safety culture are knowledge, competence and responsibility.

Safety culture can be described by two approaches to the activities of personnel of nuclear facilities. Under the first approach, an operator’s actions are strictly limited by instructions. Instructions are considered comprehensive and apply to any normal and emergency situations. The level of the operator’s qualifications is determined by his ability to recognize the signs of a problem in accordance with instructions and implement the necessary measures according to the given algorithm. Instructions cannot foresee everything. Therefore, under another approach, the operator plays a key role: he is a trusted employee, a specialist with a university degree who has received proper training in engineering and physics and has knowledge of the processes, controls and their capabilities. A sensible decision is to trust an operator who has completed the relevant professional development programme, and at the same time to impose reasonable restrictions on his activities; other solutions include the development of symptom-oriented manuals and improvement of automatic systems.

An important role in the development of safety culture is played by managers of all levels, who should create an atmosphere of trust, openness and responsibility regarding safety matters among employees. This is necessary to ensure that employees always report on events on the international INES scale, on the identification of safety deficiencies and on errors that have occurred, including those that did not lead to a disruption (deviations) in the operation of an NPP. Managers of all levels are required to adopt an approach whereby concealing the circumstances surrounding employees’ incorrect actions is unacceptable and employees are encouraged to openly discuss the immediate and root causes of the wrong actions.

The Corporation holds annual dialogue forums titled ‘Nuclear Power and Industry Safety Day’, where the key issues related to safety culture are discussed. The Divisions periodically conduct a self-assessment of safety culture, with the findings announced during the Days of Safety Culture; they carry out monitoring, develop and implement corrective measures to improve safety culture. We also plan to establish the Safety Culture Business Club, which will develop a uniform strategy for involving employees and managers in addressing safety issues. The ‘Culture-Safety-RO’ programme will enhance the necessary measures according to the given algorithm. Instructions cannot foresee everything. Therefore, under another approach, the operator plays a key role: this is a trusted employee, a specialist with a university degree who has received proper training in engineering and physics and has knowledge of the processes, controls and their capabilities. A sensible decision is to trust an operator who has completed the relevant professional development programme, and at the same time to impose reasonable restrictions on his activities; other solutions include the development of symptom-oriented manuals and improvement of automatic systems.

An industry-wide competition in the field of safety culture is scheduled for 2019. In addition, in October 2019, the second stage of the Industry-wide Safety Day will be held as part of the annual International Nuclear Forum in Saint Petersburg, it will be chaired by the Director General of ROSATOM and will focus on various aspects of safety culture.
In 2018, the Basic Principles of State Policy of the Russian Federation on Nuclear and Radiation Safety until 2025 and beyond and an Action Plan for their implementation were approved. The documents establish a systemic problem-oriented approach to nuclear and radiation safety in the use of nuclear energy; it is aimed at addressing the main issues in this area, implementing strategic priorities and protecting people and the environment against radiation.

The following business units of ROSATOM perform the nuclear and radiation safety management functions:

— The Directorate for Public Policy on Radioactive Waste and Spent Nuclear Fuel Management and Nuclear Decommissioning plays a crucial role in the system for the management of state programmes related to dealing with ‘nuclear legacy’ issues;

— The Technical Regulation Department updates the system of technical safety requirements in the area of the use of nuclear power.

The Nuclear and Radiation Safety, Licensing and Permitting Department is responsible for ensuring that the personnel and equipment are ready to deal with emergency situations at nuclear facilities and for monitoring the implementation of preventive measures.

10.1.2. NUCLEAR AND RADIATION SAFETY AT NUCLEAR FACILITIES

The safety status of nuclear facilities is assessed based on the number and scale of recorded deviations in their operation that are benchmarked against the IAEA International Nuclear and Radiological Event Scale (INES). Events on the Scale are rated at 7 levels; the upper levels (4-7) are termed ‘accidents’, while the lower levels are ‘incidents’ (2-3) and ‘anomalies’ (1).

In 2018, ROSATOM ensured safe and steady operation of enterprises in the nuclear industry. There were no incidents involving radiation leaks. Limits on employee radiation exposure were not exceeded.

NUCLEAR POWER PLANTS

As in many recent years, in 2018, no events rated at level 2 or higher on the international INES scale were detected at Russian nuclear power plants (level 1 and 0 deviations do not pose a risk to employees operating the facilities, local residents or the environment). In 2018, 42 deviations were recorded at Russian nuclear power plants.

CHANGES IN THE NUMBER OF DEVIATIONS IN THE OPERATION OF NPPs ON THE INES SCALE

<table>
<thead>
<tr>
<th>Level</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total, including</td>
<td>46</td>
<td>33</td>
<td>42</td>
</tr>
<tr>
<td>Level 0 and out of scale</td>
<td>44</td>
<td>33</td>
<td>40</td>
</tr>
<tr>
<td>Level 1</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Based on the findings of investigations, the commissions of JSC Rosenergostar Concern established the causes of the deviations, and measures were taken to prevent future deviations.

Both level 1 deviations occurred at Kursk NPP. These deviations were caused by:

— Damage to a fuel assembly during its loading into the reactor;

— Steam escaping into the central hall due to depressurization of the cooling device of the fuel channel of the reactor.

RESEARCH REACTOR UNITS

In 2018, there was one deviation in the operation of research nuclear facilities (in 2016 and 2017, there were 3 deviations per year). The deviation occurred at JSC IRM and was rated at level 0 on the INES scale.

MARINE NUCLEAR PROPULSION UNITS

There were no violations of safe operating limits and conditions for propulsion units of nuclear-powered vessels in 2018. The radiation level remained within permitted limits.

All deviations recorded in 2018 were rated at level 0 on the INES scale or out of scale. Most deviations were due to leaks in the pipe systems of steam generators. An increase in the number of deviations compared to 2017 was mainly related to a more intensive operation and the ageing of equipment.

CHANGES IN THE NUMBER OF DEVIATIONS IN THE OPERATION OF MARINE NUCLEAR PROPULSION UNITS

<table>
<thead>
<tr>
<th>Year</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 0 and out of scale</td>
<td>17</td>
<td>11</td>
<td>16</td>
</tr>
</tbody>
</table>

In 2018, the overall increase in the number of deviations in the operation of NPPs was mainly due to failures of thermal mechanical equipment and control systems.

The failures of thermal mechanical equipment were caused by a loss of integrity of small-diameter pipelines and welded joints.

The failures of control systems were related to software failures (faxes) and deficiencies in self-diagnostic systems.

10.1.3. PHYSICAL PROTECTION OF NUCLEAR FACILITIES

The security and physical protection of ROSATOM’s facilities posing nuclear and radiation hazards and nuclear and radioactive materials used and stored by ROSATOM (including during their transportation) complies with the Russian legislation. Furthermore, Russian regulatory requirements are consistent with the IAEA recommendations on physical protection and in some respects even exceed them.

In 2018:

— 12 scheduled checks of physical protection in ROSATOM’s organizations were carried out, including an assessment of their compliance with anti-terrorist security requirements; the findings of the inspections confirmed that the physical protection was at a high level;

— ROSATOM continued to improve the information system for monitoring the status of the physical protection system of facilities posing nuclear and radiation hazards, over 150 automated workstations for security analysts and 70 automated workstations for facility inspectors were equipped in nuclear organizations;

— ROSATOM upgraded and replaced security equipment along more than 32 kilometres of the perimeters of protected areas of facilities posing nuclear and radiation hazards, including about 50 check-points for people and vehicles;

— Over 2,000 items of equipment were installed in protected areas as part of equipment systems for physical protection;
In 2018, there were no violations of access control and internal security requirements at ROSATOM’s facilities resulting in the theft of nuclear materials, terrorist acts or sabotage at nuclear facilities.

Emergency response teams of ROSATOM’s organizations took an active part in securing radiation safety during the 2018 FIFA World Cup as part of an interdepartmental group. Measures aimed at ensuring overall safety at the stadiums included the use of integrated security systems developed and manufactured by the Corporation’s organizations, held jointly with an emergency assistance group at Balakovo NPP; and drills. These included comprehensive emergency response exercises and drills. These measures enabled the safe towing of the floating power unit, including in international waters.

As of December 31, 2018, on-site ARMS stations integrated into the IARMS operated in the locations of 31 facilities of ROSATOM posing nuclear and radiological hazards, including all NPPs. The total number of fixed monitoring stations increased to 450 compared to 443 in 2017 (with 321 stations located outside industrial sites and 129 ARMS stations located at industrial sites of ROSATOM’s organizations). These include:

- 437 stations monitoring the gamma radiation dose rate;
- 3 stations monitoring hydrogen fluoride concentration in the atmosphere;
- 5 stations monitoring the volumetric activity of radioactive gases and aerosols;
- 19 stations monitoring meteorological parameters.

Real-time data from the radiation monitoring stations is available on the website at www.russianatom.ru.

The IARMS is a functional subsystem forming part of the integrated state system for emergency prevention and response (ISSEPR). It is an important element of the integrated state system for emergency prevention and response (ISSEPR), which is a functional subsystem forming part of the integrated state system for emergency prevention and response (ISSEPR), and radiation hazards are located. The IARMS is one of the tools for alarm notification and providing information for decisions on accident response.

As of December 31, 2018, 104 of ROSATOM’s organizations operated 739 hazardous industrial facilities (757 facilities in 2017), including 6 hazardous class 1 facilities, 34 hazardous class 2 facilities, 284 hazardous class 3 facilities and 415 hazardous class 4 facilities.

All equipment operated at the Corporation’s facilities undergoes timely technical inspection and industrial safety assessment. Employees operating hazardous industrial facilities are provided with special clothing and personal protective equipment of proper quality.

In 2018, there were no events classified as ‘accidents at a hazardous industrial facility’ at ROSATOM’s industrial facilities.

One of the fundamental priorities for ROSATOM is to protect the life and health of employees in the industry. Organizations in the industry have in place an Occupational Safety and Health Management System, which is an important element of mutual obligations undertaken by ROSATOM, the Russian Union of Employers in the Nuclear Industry, Power and Science and the Russian Trade Union of Nuclear Power and Industry Workers in accordance with the Industry-Wide Agreement on Nuclear Power, Industry and Science (in the reporting year, the agreement for the period from 2018 through 2020 was in force).

ROSATOM has adopted a Single Industry-Wide Policy on Occupational Safety and Health, which stipulates the goals, basic principles and obligations in the sphere of occupational safety and health in the course of the Corporation’s operations. Internal regulations adopted in the Corporation’s organizations are designed to prevent accidents and occupational diseases, facilitate systematic monitoring of working conditions and occupational safety and health performance and support occupational safety and health not only in ROSATOM, but also in contractor and subcontractor organizations engaged in the operation of nuclear facilities.

The Corporation has declared 2019 the Year of Occupational Safety, Health and Healthy Lifestyle and plans to hold a variety of events, including the third industry-wide dialogue forum titled ‘Nuclear Power and Industry Safety Day’ as part of the National Occupational Health and Safety Week.

One of the effective mechanisms for increasing the level of safety is a system to motivate ROSATOM’s employees through key performance indicators, which is being implemented at ROSATOM.

In 2018, the emergency response teams took part in more than 400 major emergency, special tactical and command post exercises and drills. These included comprehensive emergency response exercises and drills. These measures enabled the safe towing of the floating power unit, including in international waters.

In the reporting year, a set of measures was taken to ensure the safety (security) of the Akademik Lomonosov floating nuclear power unit during its transportation from Saint Petersburg to Murmansk. These measures enabled the safe towing of the floating power unit, including in international waters.

10.1.6. INDUSTRIAL SAFETY

As of December 31, 2018, ROSATOM has adopted a Single Industry-Wide Policy on Occupational Safety and Health, which stipulates the goals, basic principles and obligations in the sphere of occupational safety and health in the course of the Corporation’s operations. Internal regulations adopted in the Corporation’s organizations are designed to prevent accidents and occupational diseases, facilitate systematic monitoring of working conditions and occupational safety and health performance and support occupational safety and health not only in ROSATOM, but also in contractor and subcontractor organizations engaged in the operation of nuclear facilities.

The Corporation has declared 2019 the Year of Occupational Safety, Health and Healthy Lifestyle and plans to hold a variety of events, including the third industry-wide dialogue forum titled ‘Nuclear Power and Industry Safety Day’ as part of the National Occupational Health and Safety Week.

One of the effective mechanisms for increasing the level of safety is a system to motivate ROSATOM’s employees through key performance indicators, which is being implemented at ROSATOM.

10.1.7. OCCUPATIONAL SAFETY AND HEALTH

Emergency response teams of ROSATOM’s organizations took an active part in securing radiation safety during the 2018 FIFA World Cup as part of an interdepartmental group. Measures aimed at ensuring overall safety at the stadiums included the use of integrated security systems developed and manufactured by the Corporation’s organizations.

In order to ensure the safe operation of the nuclear industry and protect employees, local population and areas against the possible effects of accidents (emergencies), ROSATOM operates an emergency prevention and response system (EPRE), which is a functional subsystem forming part of the integrated state system for emergency prevention and response (ISSEPR).

As of December 31, 2018, 15 professional emergency response teams (ERTs) and 60 volunteer ERTs had been formed and were in a state of readiness in the nuclear industry. They comprise a total of 2,453 emergency response workers.

In 2018, the emergency response teams took part in more than 400 major emergency, special tactical and command post exercises and drills. These included comprehensive emergency response exercises and drills. These measures enabled the safe towing of the floating power unit, including in international waters.

10.1.4. EMERGENCY PREPAREDNESS

In order to ensure the safe operation of the nuclear industry and protect employees, local population and areas against the possible effects of accidents (emergencies), ROSATOM operates an emergency prevention and response system (EPRE), which is a functional subsystem forming part of the integrated state system for emergency prevention and response (ISSEPR).

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10.1.5. INDUSTRY-WIDE AUTOMATED RADIATION MONITORING SYSTEM (IARMS)

The IARMS is a functional subsystem of the Integrated State Automated Radiation Monitoring System (ISARMS). Its main function is to monitor the radiation level in the areas where facilities posing nuclear risks are located. The IARMS is one of the tools for alarm notification and providing information for decisions on accident response.

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In 2018, the emergency response teams took part in more than 400 major emergency, special tactical and command post exercises and drills. These included comprehensive emergency response exercises and drills. These measures enabled the safe towing of the floating power unit, including in international waters.
OCCUPATIONAL SAFETY AND HEALTH INDICATORS

- Number of people injured in accidents: 98, 67, 66
- Number of fatalities: 10, 10, 4
- Injury frequency rate (FR): 0.38, 0.26, 0.25
- LTIFR: 0.19, 0.13, 0.12
- Number of people newly diagnosed with an occupational disease: 55, 37, 10

INJURY FACTOR NUMBER OF INJURED PERSONS

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Serious injuries</th>
<th>Fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>98</td>
<td>19</td>
<td>4</td>
</tr>
<tr>
<td>2017</td>
<td>67</td>
<td>15</td>
<td>10</td>
</tr>
<tr>
<td>2018</td>
<td>66</td>
<td>15</td>
<td>4</td>
</tr>
</tbody>
</table>

INDUSTRIAL INJURIES AND ACCIDENTS

In 2018, the injury frequency rate across the industry was relatively low compared to major Russian companies. The injury frequency rate (FR) stood at 0.25, which is almost five times lower than the national average (FR = 1.2).

The number of employees of contractor organizations injured in 2018 totalled 7 people, including 2 people who suffered serious injuries and 2 fatalities. A decrease in the number of fatalities compared to 2016 and 2017 was related, among other things, to efforts to improve workplace safety culture.

The risk of injuries remains high for employees involved in the operation and maintenance of various types of equipment; there is also a high risk of falling when employees move around the premises of an organization.

CAUSES OF INDUSTRIAL INJURIES

- Falling from a height: 3, 4, 2
- Electric shock: 13, 15, 11
- Falling on the premises (on the surface of the same level, with a difference in heights, etc.): 98, 37, 10
- Impact of moving or scattering objects, structures or parts: 55, 37, 10
- Fall of an object on the victim: 5, 10, 12
- Burns (thermal, etc.): 3, 5, 4
- Illegal actions and other unclassified factors: 8, 1, 3

In addition to the FR injury frequency rate, ROSATOM also uses the lost time injury frequency rate (LTIFR), which enables it to benchmark the injury rate across the Corporation against that of other companies and countries. The LTIFR has been included in the KPI maps of all Division heads.

0.5 is accepted as the reference value of the LTIFR for Divisions, units and holding companies and ROSATOM as a whole, which is a good result for any company in any country of the world. The target for ROSATOM as a whole has been set at 0.4, which is better than the reference value. Individual values not exceeding the baseline values (a three-year average) have been accepted as target LTIFR values for Divisions, units and holding companies within ROSATOM.

In 2018, the LTIFR across the Corporation and its organizations stood at 0.12. The LTIFR calculation does not include employees injured in traffic accidents caused by external factors, and those whose health suddenly deteriorated due to an illness (11 people).
10.1.8. RADIATION EXPOSURE OF EMPLOYEES

In 2018, the number of people newly diagnosed with occupational diseases decreased significantly and totalled 10 people (37 people in 2017, 55 people in 2016), including:

— 9 people in the Mining Division (PJSC PIMCU);
— 1 person in the Nuclear Weapons Division (FSUE Elektrokhimpribor Integrated Plant).

The main occupational diseases of employees in the industry include diseases of the musculoskeletal system and the peripheral nervous system, as well as diseases caused by vibration (more than 80% of the total incidence). As a rule, people newly diagnosed with occupational diseases are employees aged 50 to 60 years who have been working in the industry for about 20 to 30 years on average.

A high risk of occupational diseases persists at PJSC PIMCU. To prevent them and to improve working conditions, mine equipment is being upgraded. In addition, strict disciplinary sanctions are imposed on employees who do not use respiratory protective equipment. This enabled a significant reduction in the incidence of occupational diseases in 2018.

In addition, ROSATOM has organized the provision of medical treatment and preventive care to employees, which includes not only preliminary and periodic medical examinations, but also measures aimed at treating and preventing diseases and enabling the workers’ rehabilitation, if necessary (provision of health food and milk, health resort treatment).

As of December 31, 2018, 65,238 people (group A personnel) were under individual radiation exposure monitoring in ROSATOM’s organizations. The number decreased by 1.3% compared to 2017.

In 2018, the average annual effective radiation dose of ROSATOM’s personnel totalled 1.64 mSv. In 2018, employee radiation exposure did not exceed regulatory limits. The total effective dose for any employee did not exceed 100 mSv over five consecutive years. The annual dose limit of 50 mSv was not exceeded. Over the past ten years, average effective employee radiation exposure and the number of people exposed to radiation have been varying insignificantly and remain low.

Ionizing radiation is an occupational hazard specific to ROSATOM’s enterprises. The criteria of employee radiation safety are laid down in the Radiation Safety Standards (NBR-99/2009), the Basic Sanitary Rules of Radiation Safety (ESP09/2010) and other regulations. Most enterprises in the industry provide workplace conditions that fully comply with the requirements set out in these documents.
In 2018, ROSATOM continued to monitor radiation risks for group A personnel using the IRAW occupational radiation risk assessment system. Individual risk was calculated for 64,643 people, or 98.8% of the total number of group A employees. The absolute majority of group A employees work in conditions of acceptable occupational risk. For 696 people (1.08% of the number of employees included in the IRAW system), individual risk exceeded the regulatory level of $10^{-3}$. The high-risk group comprises mainly veterans of the industry, whose average age exceeds 60 years. To ensure the safe operation of nuclear facilities, ROSATOM uses systems for technical regulation, standardization, compliance assessment and ensuring the uniformity of measurements.

The main objectives of these systems are to:
- Establish mandatory technical standards and requirements for products related to the safe use of nuclear energy;
- Regulate consumer properties of products, works and services that meet the needs of the industry;
- Organize and conduct compliance assessment of products for which mandatory requirements have been set;
- Ensure metrological safety and the uniformity of measurements in the use of nuclear energy.

In 2018, as part of the Corporation’s standardization programme, 29 standardization documents were approved, including 23 national standards (GOST R) and 6 standards of ROSATOM (STO 95).

Monitoring the radiation status of personnel showed:

- Share of employees in the high risk area: 1.22, 1.21, 1.08
- Share of employees in the industry undergoing individual radiation exposure monitoring and included in the IRAW system: 0.70, 0.99, 0.80
- Share of employees in the negligible and acceptable occupational risk areas: 98.78, 98.79, 98.92
- Total across the Corporation: 7.00·10^{-5}, 7.00·10^{-5}, 6.30·10^{-5}

The percentage of employees in the high risk area decreased by 15% compared to 2017 and by 25% compared to 2016.

In 2018, as part of the implementation of FTP NRS 2, large-scale work was started on 24 sites to decommission facilities posing nuclear and radiation hazards. This will enable a significant reduction of costs in the future and will help to prevent man-made accidents, natural disasters and acts of terrorism at the decommissioned facilities.

The most important results of the Corporation’s activities in the field of safety and radiation protection in 2018 were as follows:

- Eight facilities posing nuclear and radiation hazards were decommissioned.
- One nuclear maintenance ship was dismantled.
- The development of a metrological support system for the use of nuclear energy came into force.
- Following the completion of certification, in the 2018 reporting year, 327 certificates of compliance were issued to manufacturers of various types of industrial products both within and outside the industry.
- In 2018, ROSATOM created, registered and put into operation the ROSATOMREGIST Certification System (No. ROSS RU.18182 049AP0 of April 18, 2018), a system for the certification of management systems in organizations performing work and providing services in the use of nuclear energy. The system will enable customers to objectively evaluate suppliers of products (goods, work and services) and increase confidence in their qualifications and capabilities. At the same time, suppliers will be able to demonstrate their ability to provide a steady supply of products in accordance with contract terms and legislative requirements.

In 2018, as part of the Corporation’s standardization programme, 29 standardization documents were approved, including 23 national standards (GOST R) and 6 standards of ROSATOM (STO 95).

Changes in key indicators of the IRAW system, %

<table>
<thead>
<tr>
<th>DIVISION/COMPLEX/UNIT</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining Division</td>
<td>2.00·10^{-4}</td>
<td>2.30·10^{-4}</td>
<td>2.50·10^{-4}</td>
</tr>
<tr>
<td>Fuel Division</td>
<td>2.80·10^{-5}</td>
<td>2.70·10^{-5}</td>
<td>2.40·10^{-5}</td>
</tr>
<tr>
<td>Mechanical Engineering Division</td>
<td>5.20·10^{-5}</td>
<td>5.10·10^{-5}</td>
<td>4.50·10^{-5}</td>
</tr>
<tr>
<td>Engineering Division</td>
<td>6.00·10^{-6}</td>
<td>2.40·10^{-5}</td>
<td>2.90·10^{-5}</td>
</tr>
<tr>
<td>Power Engineering Division</td>
<td>1.20·10^{-5}</td>
<td>1.10·10^{-5}</td>
<td>9.60·10^{-6}</td>
</tr>
<tr>
<td>Life Cycle Back-End Division</td>
<td>4.30·10^{-6}</td>
<td>4.40·10^{-6}</td>
<td>3.70·10^{-6}</td>
</tr>
<tr>
<td>Nuclear Weapons Division</td>
<td>4.40·10^{-6}</td>
<td>4.50·10^{-6}</td>
<td>4.50·10^{-6}</td>
</tr>
<tr>
<td>Innovation Management Unit</td>
<td>9.20·10^{-6}</td>
<td>9.10·10^{-6}</td>
<td>7.80·10^{-6}</td>
</tr>
<tr>
<td>Total across the Corporation</td>
<td>7.00·10^{-6}</td>
<td>7.00·10^{-6}</td>
<td>6.30·10^{-6}</td>
</tr>
</tbody>
</table>

In 2018, as part of the implementation of FTP NRS 2, a large-scale work was started on 24 sites to decommission facilities posing nuclear and radiation hazards. This will enable a significant reduction of costs in the future and will help to prevent man-made accidents, natural disasters and acts of terrorism at the decommissioned facilities posing nuclear and radiation hazards.
In 2018, the disposal of class 4 RAW continued; 5,625.17 m³ of RAW were accepted for disposal.

As of December 31, 2018, the volume of SNF accumulated in the Russian Federation totalled 24,035 tonnes (including ‘16,836.01 tonnes of SNF forming part of the ‘nuclear legacy’). During the reporting year, 943.84 tonnes were accumulated.

In 2018, 750.45 tonnes of SNF from Russian NPPs were placed in long-term storage facilities, and 35 tonnes of various types of SNF were reprocessed.

As of December 31, 2018, the volume of SNF accumulated in the Russian Federation totalled 24,035 tonnes (including ‘16,836.01 tonnes of SNF forming part of the ‘nuclear legacy’). During the reporting year, 943.84 tonnes were accumulated.

In 2018, removal of spent fuel assemblies from Russian NPPs continued:

- 5,760 spent fuel assemblies from BBMK-1000 reactors were removed and placed in dry storage at FSUE Mining and Chemical Plant.
- 228 spent fuel assemblies from VVER-1000 reactors were removed and placed in temporary storage for subsequent reprocessing at FSUE Mining and Chemical Plant;
10.2.5. DEVELOPMENT OF A SYSTEM FOR DECOMMISSIONING OF FACILITIES POISING NUCLEAR AND RADIATION HAZARDS

In 2018, eight facilities posing nuclear and radiation hazards were decommissioned.

Preparation for the decommissioning of the facilities of Building A continued at JSC VNIMM.

The decommissioning of the AD industrial uranium-graphite reactor and preparation for the decommissioning of storage pools for SNF from industrial uranium-graphite reactors continued at FSUE Mining and Chemical Plant.

10.2.6. DISMANTLING OF NUCLEAR SUBMARINES

In 2018, one nuclear maintenance ship was dismantled.

Using international funding for technical assistance (a total of RUB 1.03 billion was received), in 2018:

— The construction of the Rome-Moscow tugboat was completed; it will be used to transport dock pontoons, escort sea vessels and support rehabilitation efforts at the Gremikha facility (Murmansk Region);

— The construction of a building for the RAW management system was completed in Andreev Bay (its storage capacities consist of 440 containers with a volume of 1.5 m³ each); a permit to put the facility into operation was obtained;

— Preparations for the unloading of SNF from the storage area of the Lepsy floating maintenance base were completed.

10.2.7. PLANS FOR 2019

In 2019, ROSATOM will continue to implement FTP NRS 2, including:

— Establishment of a pilot and demonstration centre (second start-up facility) for SNF reprocessing based on innovative technologies at FSUE Mining and Chemical Plant;

— Construction of facilities for permanent isolation of class 3 and 4 RAW;

— Preparation for RAW disposal, transportation and transfer of RAW for disposal;

— Removal of accumulated SNF from NPPs for reprocessing and long-term storage;

— Reprocess 2.77 tonnes of spent nuclear fuel from dismantled nuclear submarines.

10.3. ENVIRONMENTAL SAFETY

10.3.1. ENVIRONMENTAL SAFETY AND ENVIRONMENTAL PROTECTION MANAGEMENT

Since 2008, the Uniform Sectoral Environmental Policy has been the main regulatory document on environmental safety and environmental protection at ROSATOM. Given the adoption of strategic documents on environmental protection and environmental safety in Russia and changes in environmental legislation, in 2017, a new version of the environmental policy was introduced:

A list of environmentally relevant organizations of ROSATOM is compiled and updated on an annual basis (54 organizations in 2018). The Corporation’s management gives special focus to their operations. On an annual basis, environmentally relevant organizations issue public reports on environmental safety.

An important tool for the implementation of the environmental policy is a three-year Comprehensive Implementation Plan. In 2018, the Corporation completed the implementation of the Comprehensive Plan for 2016–2018, which stipulated organizational, operational and technical measures to be implemented by the Corporation and its organizations (including environmentally relevant organizations). A new Comprehensive Plan for 2019–2021 was developed and approved.

To assess progress in the implementation of the Environmental Policy, ROSATOM has developed the Uniform Industry Wide Guidelines for the Use of Environmental Performance Indicators in its environmentally relevant organizations. To improve environmental safety and the efficiency of environmental protection measures, the Corporation’s organizations that make a considerable impact on the environment introduce and use environmental management, quality management, occupational health and safety management and energy management systems.

In 2018, integrated management systems were in place in 11 environmentally relevant organizations. They comprise:

— Quality management systems compliant with the ISO 14001 standard;

— Occupational health and safety management systems compliant with the OHSAS 18001 standard;

— Energy management systems compliant with the ISO 50001 standard.

10.3.2. ENVIRONMENTAL SAFETY AND SUSTAINABILITY

ROSATOM has developed the Uniform Industry Wide Guidelines on the Use of Environmental Performance Indicators in its environmentally relevant organizations.

To improve environmental safety and the efficiency of environmental protection measures, the Corporation’s organizations that make a considerable impact on the environment introduce and use environmental management, quality management, occupational health and safety management and energy management systems.

In 2018, recertification audits were conducted in 23 organizations of ROSATOM to assess compliance with the requirements of the ISO 14001 environmental management system standard and in 24 organizations to assess compliance with the requirements of the ISO 9001 quality management system standard. The implementation of environmental management, quality management and occupational health and safety management systems continued in 16 organizations of the nuclear industry.


https://docs.fsue.ru/docs/b1.pdf.


10.3.2. INDUSTRY-WIDE SYSTEM FOR ON-SITE SUBSOIL CONDITION MONITORING

The industry-wide system for on-site subsoil condition monitoring (IS OSCM) ensures continuous radiation and chemical monitoring of the geological environment (groundwater, surface water and aquifers) in ROSATOM’s organizations. The system covers 55 organizations of the Corporation, a total of more than 3,800 observation wells are used for monitoring the condition of the subsoil.

By the end of 2018, based on monitoring findings, 25 geofiltration and geomigration models were developed, which were used in retrospective and predictive calculations of the migration of radionuclides and harmful chemicals in groundwater from operating facilities posing nuclear and radiation hazards. Based on the results of the calculations, long-term forecasts of the impact of facilities posing nuclear and radiation hazards on the subsoil were prepared for all enterprises, and rehabilitation measures were developed for ten enterprises.

To provide information support for the decommissioning of facilities posing nuclear and radiation hazards and nuclear legacy facilities, 28 industry organizations have been selected, for which geoenvironmental information packages (GEIPs) will be developed based on the data from OSCM systems. In 2018, GEIPs were developed for PJSC Machine Building Plant and JSC SSC RIRAR.

10.3.3. IMPROVED ENERGY EFFICIENCY

Energy conservation is an important prerequisite for the efficient use of the Corporation’s energy resources, making it more competitive and reducing its negative environmental impact. In 2018, ROSATOM approved an energy conservation and energy efficiency improvement programme for the period from 2018 through 2022.

ENERGY EFFICIENCY MANAGEMENT SYSTEM

In 2018, the Industry-Wide Energy Conservation Ranking of the Corporation’s organizations was compiled. It is used to analyze energy conservation performance and take steps towards its continuous improvement. In particular, the Corporation has introduced the Energy Management Systems for an integrated incentive system designed to encourage employee involvement in its energy conservation project.

In addition, in the Corporation’s organizations:
- Energy costs are assessed at the main stages of the production cycle;
- Energy excellence requirements have been set for investment and procurement activities;
- Employee remuneration in core production and supporting divisions is linked to energy conservation performance.

In 2018, the basis for the calculation of the reduction in energy consumption related to safety measures. As a result, data on energy consumption for 2018 is not provided the relevant information until 2018.

The energy management system compliant with the ISO 50001 standard has been implemented in the Power Engineering Division (JSC Rosenergoatom Concern) and the Fuel Division (JSC TVEL) of ROSATOM.

To monitor progress on measures to improve energy efficiency and evaluate their results, an Automated Energy Efficiency Management System is in place in the industry. 78 organizations are connected to the System.

When assessing the impact of measures aimed at improving energy efficiency, the Corporation uses 2015 as the base period (2015 marked the completion of the first five-year period of implementation of energy conservation programmes).

In 2018, the annual energy conservation target of 5% was exceeded (the target set in the state programme ‘Development of the Nuclear Power and Industry Complex’). The cumulative total reduction in energy consumption across the Corporation against 2015 as the base year amounted to 8.9%, or RUB 2.7 billion (in physical terms, energy savings totalled 5,949,560 GJ).

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In 2018, the Industry-Wide Energy Conservation Ranking of the Corporation’s organizations was compiled. It is used to analyze energy conservation performance and take steps towards its continuous improvement. In particular, the Corporation has introduced the Energy Management Systems for an integrated incentive system designed to encourage employee involvement in its energy conservation project.

In 2018, energy costs in the industry (under comparable conditions) totalled RUB 22.1 billion (excluding VAT), including:
- RUB 6.2 billion for heat;
- RUB 1.8 billion for water;
- RUB 12.5 billion for electricity;
- RUB 1.6 billion for other types of energy resources.

When assessing the impact of measures aimed at improving energy efficiency, the Corporation uses 2015 as the base period (2015 marked the completion of the first five-year period of implementation of energy conservation programmes).

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<table>
<thead>
<tr>
<th>DIVISION/COMPLEX/UNIT</th>
<th>CUMULATIVE TOTAL COMPARED TO 2015, RUB BILLION (EXCLUDING VAT)</th>
<th>CUMULATIVE TOTAL COMPARED TO 2015, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Engineering Division</td>
<td>116.3</td>
<td>5.7</td>
</tr>
<tr>
<td>Fuel Division</td>
<td>1,081.8</td>
<td>10.8</td>
</tr>
<tr>
<td>Mining Division</td>
<td>163.9</td>
<td>9.1</td>
</tr>
<tr>
<td>Mechanical Engineering Division</td>
<td>213.2</td>
<td>21.8</td>
</tr>
<tr>
<td>Life Cycle Back-End Division</td>
<td>409.9</td>
<td>17.2</td>
</tr>
<tr>
<td>Innovation Management Unit</td>
<td>65.4</td>
<td>7.1</td>
</tr>
<tr>
<td>Nuclear Weapons Division</td>
<td>538.8</td>
<td>8.8</td>
</tr>
<tr>
<td>Other</td>
<td>85.8</td>
<td>From 6.0 to 39.2</td>
</tr>
<tr>
<td>Total for ROSATOM</td>
<td>2,675.1</td>
<td>8.9</td>
</tr>
</tbody>
</table>

The largest reductions in energy costs were achieved in the following organizations:

- FSUE Mining and Chemical Plant — by RUB 384.5 million (17.6%);
- JSC SCC — by RUB 375.5 million (17.7%);
- JSC UEIP — by RUB 224.1 million (6.5%).

In relative terms:

- LLC Alabuga-Volokno — by 66.7% (RUB 26.4 million);
- JSC Atomenergoremont — by 39.2% (RUB 13.6 million);
- JSC RPA CNITMASH — by 33.9% (RUB 10.8 million).

**PLANS FOR 2019 AND FOR THE MEDIUM TERM**

The target for energy conservation under the state programme ‘Development of the Nuclear Power and Industry Complex’ for 2019 has been set at 6%. ROSATOM sets individual differentiated targets for annual energy savings (expressed as a percentage) for divisions/complexes, provided that the overall target set under the state programme is achieved. Between 2019 and 2022, ROSATOM plans to monitor progress on the energy re-audit of 43 organizations in the industry.

<table>
<thead>
<tr>
<th>DISTRIBUTION OF ENVIRONMENTAL PROTECTION COSTS AT ROSATOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMOUNT, RUB BILLION</td>
</tr>
<tr>
<td>2016</td>
</tr>
<tr>
<td>Expenditure on environmental measures</td>
</tr>
<tr>
<td>Fixed asset investment</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

The largest share of expenditure on environmental measures was allocated for ensuring radiation safety (50.6%). Fixed asset investment was allocated primarily for the protection of the atmosphere (47.4%) and for the protection and efficient use of water resources (21.3%).

**ENVIROMENTAL COST STRUCTURE IN 2018**

- 9.5% Industral and consumer waste management
- 8.4% Protection of the atmosphere and prevention of climate change
- 22.7% Wastewater collection and treatment
- 50.6% Ensuring radiation safety
10.3.5. ENVIRONMENTAL CHARGES AND FINES

In 2018, charges for the negative environmental impact totalled RUB 85.6 million, including charges for allowable emissions and discharges of pollutants, disposal of industrial and consumer waste totalling RUB 33.7 million (39.4%), and charges for excess emissions and discharges totalling RUB 51.9 million (60.6%).

The nuclear industry is a large user of water. In 2018, water withdrawal from natural sources by ROSATOM’s organizations made up 10.6% of the total water withdrawal in Russia. The main consumers of water among ROSATOM’s organizations and enterprises are Leningrad NPP and Kola NPP (84.4% of the total water withdrawal).

In the reporting year, water withdrawal from natural sources by ROSATOM’s organizations totalled 7,317.8 million m³, which is 93.2 million m³ less than in 2017 (mainly due to a decrease in sea water withdrawal by 81.4 million m³).

In 2018, environmental regulators detected 46 violations, for which they imposed administrative penalties on ROSATOM’s organizations in the form of fines totalling RUB 2.2 million. The violations did not pose a threat to the well-being of the population and did not necessitate restrictions on the operations of the organizations.

In 2018, there were no instances of non-financial sanctions against ROSATOM’s organizations for non-compliance with environmental legislation and regulatory requirements.
In 2018, wastewater discharge by ROSATOM’s organizations totalled 6,626.9 million m³, with clean water compliant with regulatory requirements accounting for 98.3% of the total volume, while the share of treated wastewater compliant with regulatory requirements and contaminated wastewater stood at 0.7% and 1.0% respectively.

The main wastewater discharge destinations are seas (73.7%), lakes (18.6%) and rivers (7.4%).

Wastewater discharge decreased by 89.5 million m³ compared to 2017 due to a decrease in the discharge from Leningrad NPP into the Gulf of Finland in the Baltic Sea.

In the reporting year, discharge of treated wastewater compliant with regulatory requirements totalled 44.5 million m³, of which 26.1% of wastewater was treated using the biological method, while wastewater treated using the physical and chemical method and the mechanical method accounted for 2.0% and 71.9% of the total volume respectively.

In 2018, discharges of contaminated wastewater by ROSATOM’s organizations accounted for 0.5% of the total volume of discharges in Russia.

**WATER DISCHARGE**

<table>
<thead>
<tr>
<th>WATER CATEGORY</th>
<th>VOLUME, MILLION m³</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean water compliant with regulatory requirements</td>
<td>6,902.6</td>
<td>6,608.1</td>
<td>6,517.3</td>
<td></td>
</tr>
<tr>
<td>Treated wastewater compliant with regulatory requirements</td>
<td>36.6</td>
<td>37.3</td>
<td>44.5</td>
<td></td>
</tr>
<tr>
<td>Contaminated wastewater</td>
<td>96.5</td>
<td>79.0</td>
<td>70.1</td>
<td></td>
</tr>
<tr>
<td>Total:</td>
<td>7,035.7</td>
<td>6,724.4</td>
<td>6,626.9</td>
<td></td>
</tr>
</tbody>
</table>

**10.3.7. POLLUTANT EMISSIONS INTO THE ATMOSPHERE**

Implementation of initiatives to reduce the environmental impact on the atmosphere in 2018

— Branch of JSC TFP in Krasnoyarsk: the retrofit of an ash collector will increase the efficiency of ash removal from fly gas to FPL.

— JSC KNP: after the exhaust ventilation system was equipped with gas scrubbers, chromium, hydrocyanide and dichromate emissions decreased by 99% compared to 2017.

— JSC Arktikv NPP: the commissioning of an additional air filter will increase the efficiency of emission treatment by 20%.

In 2018, pollutant emissions into the atmosphere totalled 39,900 tonnes; the pollutant capture rate reached 90.3%. In 2018, the Corporation’s organizations accounted for 0.1% of the total emissions in the Russian Federation.

Pollutant emissions into the atmosphere increased by 3,500 tonnes compared to 2017 due to fuel combustion at CHPPs. Emissions of ozone-depleting substances remained unchanged compared to 2017.
### 10.3.8. INDUSTRIAL AND CONSUMER WASTE MANAGEMENT

In 2018, organizations in the nuclear industry produced 20.9 million tonnes of industrial and consumer waste, which is 7.1 million tonnes (25.4%) less than in 2017. 99.96% of generated waste is hazard class 4 and 5 waste (low-hazard and practically non-hazardous waste). In 2018, industrial and consumer waste generated by ROSATOM’s organizations accounted for 0.3% of the total waste generation in Russia.

Most of the waste was generated by PJSC PIMCU (15.6 million tonnes). Most of this waste is hazard class 5 waste, which is the least hazardous class.

A significant reduction in waste generation was due to a decrease in the volume of overburden at the Uruskyoye Open-Pit Mine Office (PJSC PIMCU) resulting from the achievement of the targets for overburden production.

The weight of waste transferred to other organizations amounted to 176,400 tonnes. 72.6% of the total amount of waste generated in ROSATOM’s organizations and received from other organizations was recycled; 0.02% was treated.

As of December 31, 2018, the area of land disturbed by ROSATOM’s organizations totalled 6,500 ha (5,100 ha in 2017 and 5,600 ha in 2016). This included land disturbed during the following operations:

- Mining: 3,400 ha;
- Construction: 2,400 ha;
- Disposal of industrial waste (including construction waste) and solid household waste: 600 ha;
- Survey work: 5.5 ha;
- Other operations: 96.9 ha.

In 2018, ROSATOM’s organizations implemented a set of measures to restore the productivity and economic value of disturbed land and improve the environment. In the reporting year, the area of restored land totalled 9.57 ha. A decrease in the area of restored land was due to the completion of the main stage of work to restore the productivity and economic value of disturbed land at JSC Lunnoye in 2018.

### 10.3.9. REHABILITATION OF DISTURBED AREAS

As of December 31, 2018, the area of land disturbed by ROSATOM’s organizations totalled 6,500 ha (5,100 ha in 2017 and 5,600 ha in 2016). This included land disturbed during the following operations:

- Mining: 3,400 ha;
- Construction: 2,400 ha;
- Disposal of industrial waste (including construction waste) and solid household waste: 600 ha;
- Survey work: 5.5 ha;
- Other operations: 96.9 ha.

In 2018, ROSATOM’s organizations implemented a set of measures to restore the productivity and economic value of disturbed land and improve the environment. In the reporting year, the area of restored land totalled 9.57 ha. A decrease in the area of restored land was due to the completion of the main stage of work to restore the productivity and economic value of disturbed land at JSC Lunnoye in 2018.
In 2018, radiation burden on the environment was almost unchanged compared to 2017. The total activity of radionuclides emitted into the atmosphere by ROSATOM's enterprises amounted to 4.82·10¹⁴ Bq (the activity was almost completely due to emissions of beta-emitting nuclides), which totals 20.96% of the permitted amount for alpha-emitting nuclides.

The activity of alpha-emitting radionuclides discharged into the open drainage system totalled 3.99·10¹³ Bq (0.18% of the permitted amount). Natural uranium accounted for 57.3% of the activity.

The activity of beta-emitting radionuclides discharged with wastewater into surface water bodies totalled 3.99·10¹³ Bq (0.18% of the permitted amount). Tritium accounted for 99.6% of the activity.

The analysis of field data on the gamma radiation dose rate shows that the gamma radiation doses in buffer and radiation control areas of all NPPs are within the limits of natural background radiation which was formed before the start-up of the nuclear power plants. This indicates that nuclear power plants have no impact on the areas where they are located.

Additional radiation exposure of the population due to the NPP operation is assessed by the relevant regional departments of the Federal Biomedical Agency (FMBA) during radiation and hygienic certification of organizations. According to the findings of radiation and hygienic certification in the Russian Federation, additional radiation exposure of the population at the locations of nuclear enterprises associated with their day-to-day operation on average does not exceed 1.3% per person of the basic dose limits for the population set (about 14%). The contribution of enterprises using nuclear technology is estimated at a fraction of a percent. Over many years, this has been the case in all regions where large facilities posing radiation hazards are located.

Environmentally relevant organizations in the nuclear industry regularly monitor radionuclide content in local agricultural products, wild-growing foods (berries, mushrooms, etc.) and fodder in radiation control areas, as well as in fish and other aquatic organisms living in cooling ponds of NPPs. We monitor the specific activity of dose-forming radionuclides in food products. Regional offices of the Russian Federal Biomedical Agency (FMBA) carry out independent radiation monitoring of the environment and locally produced food products. Radiation monitoring of abiotic components of the environment is carried out by the Federal Service for Hydrometeorology and Environmental Monitoring. The results of many years of radiation monitoring

Changes in gas and aerosol emissions following an increase in the capacity of power units

The activity of exhaust radionuclides depends on the capacity at which a reactor is operating, on whether fuel cladding is leak-proof and on the condition of scrubber systems used for treating atmospheric emissions from an NPP power unit. During the startup of power units at an increased capacity, no leaking fuel assemblies were formed. The activity of exhaust radionuclides (by more than 6.7%) following an increase in the capacity of a power unit equipped with a VVER-1000 reactor to 1.64% is offset by effective operation of special scrubbers used for capturing gas and aerosol emissions. At the same time, the level of emissions remains significantly below the allowable limits.

The activity of alpha-emitting radionuclides discharged into the open drainage system totalled 3.99·10¹³ Bq (0.18% of the permitted amount). Tritium accounted for 99.6% of the activity.

10.3.10. EMISSIONS AND DISCHARGES OF RADIONUCLIDES

10.3.11. RADIATION IMPACT ON THE POPULATION AND THE ENVIRONMENT

The analysis of field data on the gamma radiation dose rate shows that the gamma radiation doses in buffer and radiation control areas of all NPPs are within the limits of natural background radiation which was formed before the start-up of the nuclear power plants. This indicates that nuclear power plants have no impact on the areas where they are located.

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According to the Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing (Rospotrebnadzor), the key factors behind radiation exposure of the Russian population are natural (over 85%) and medical sources of ionizing radiation (about 14%). The contribution of enterprises using nuclear technology is estimated at a fraction of a percent. Over many years, this has been the case in all regions where large facilities posing radiation hazards are located.

The activity of alpha-emitting radionuclides discharged into the open drainage system totalled 3.99·10¹³ Bq (0.18% of the permitted amount). Tritium accounted for 99.6% of the activity.

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According to the Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing (Rospotrebnadzor), the key factors behind radiation exposure of the Russian population are natural (over 85%) and medical sources of ionizing radiation (about 14%). The contribution of enterprises using nuclear technology is estimated at a fraction of a percent. Over many years, this has been the case in all regions where large facilities posing radiation hazards are located.
indicate that the content of radioactive substances in different types of crops corresponds to the background radiation level, that species composition of the local flora and fauna is almost unchanged, and that the growth rate of the amount of dead wood is within permissible limits.

In addition, the close proximity of NPPs to nature reserves also provides evidence of conservation of biodiversity at their locations. The Lapland State Nature Reserve is located within a 30-kilometre radius of Kola NPP. 16 nature monuments and 33 wildlife sanctuaries are located within a 30-kilometre radius of Kalinin NPP. The man-made impact of NPP operation is felt mostly by natural ecosystems of cooling ponds. The discharge of warm water affects the life of aquatic organisms and may cause changes in species composition. According to the findings of observations and research, the diversity of aquatic organisms living in the area where warm water is discharged from an NPP may either decrease (e.g. in the Koporye Bay in the Gulf of Finland) or increase (as in the Beloyarsk Reservoir through the relocation of fish species that prefer warmer temperatures, such as bream and zander). Such changes can be observed at existing nuclear power plants using once-through and recycled process water supply systems with a cooling pond, which require large amounts of recycled water. In order to minimize this impact and maintain a stable and sustainable condition of ecosystems in the area where they are located, NPPs spend considerable sums of money on environmental measures every year. The designs of modern nuclear power plants include modern closed-circuit cooling systems with evaporative cooling towers, which can significantly reduce the impact of nuclear power plants on water bodies in their vicinity.

10.3.12. FORECAST FOR THE ENVIRONMENTAL IMPACT OF ROSATOM AND ITS ORGANIZATIONS AND PLANS FOR CHANGING THE IMPACT AND ENSURING ENVIRONMENTAL SAFETY IN 2019 AND THE MEDIUM TERM

In 2019 and the medium term, ROSATOM’s organizations will continue to annually carry out large-scale work and implement a large number of measures to upgrade and build structures and systems for environmental protection (wastewater treatment facilities, dust collectors and gas scrubbers, waste disposal facilities, etc.).

Forecasts for the period until 2024 predict:

— A reduction in fixed asset investment related to environmental protection due to the completion of the construction of new power units at NPPs;

— Contaminated wastewater discharge remaining at the current level (its share in the total volume of wastewater discharge by the Corporation’s organizations is significantly lower than the national average);

— No major changes in emissions of harmful pollutants into the atmosphere;

— A continuing downward trend in the generation of hazard class 1 and 2 waste.
ROSATOM demonstrates strong commitment to ensuring that the development of nuclear technology is publicly acceptable and willingness to hold an open dialogue with stakeholders on various aspects of its operations.
Since 2009, ROSATOM has been developing a public reporting system whereby the Corporation and its organizations prepare integrated annual reports. These reports are designed to give stakeholders a comprehensive picture of the Corporation’s strategy, business sustainability, operating, financial and economic results of the reporting year, initiatives in the sphere of nuclear and radiation safety, environmental safety, contribution to the development of ROSATOM’s regions of operation and other socially important aspects of its business. In addition, the Corporation annually submits a report to the Russian Government. Some of ROSATOM’s organizations and enterprises prepare environmental reports.

ROSATOM prepares its public annual reports in accordance with the following international standards: the GRI Sustainability Reporting Standards, the International Integrated Reporting Framework and the AA1000 AccountAbility Principles Standard. They provide the basis for the Uniform Industry-Wide Public Reporting Policy and the Public Reporting Standard of ROSATOM and Its Organizations.

In 2018, 16 integrated annual reports were published in the industry. Their preparation included a set of stakeholder engagement measures (opinion polls, questionnaire surveys, dialogues and public assurance procedures) aimed at identifying material aspects to be disclosed in the reports and increasing their usefulness for users.

Key results in 2018:
- 16 integrated annual reports were prepared (for 2017).
- 7 reports were prepared in accordance with the Global Reporting Initiative Sustainability Reporting Standards (GRI SRS), with 2 reports prepared in accordance with the Comprehensive option.
- 8 and 21 awards were won in Russian and international report contests respectively.

ROSATOM was included in the top group in the Sustainability, Corporate Social Responsibility and Reporting Indices compiled by the Russian Union of Industrialists and Entrepreneurs (RSIPP) (based on data provided in public reports).

Since 2019, ROSATOM has been developing a public reporting system whereby the Corporation and its organizations prepare integrated annual reports. These reports are designed to give stakeholders a comprehensive picture of the Corporation’s strategy, business sustainability, operating, financial and economic results of the reporting year, initiatives in the sphere of nuclear and radiation safety, environmental safety, contribution to the development of ROSATOM’s regions of operation and other socially important aspects of its business. In addition, the Corporation annually submits a report to the Russian Government. Some of ROSATOM’s organizations and enterprises prepare environmental reports.

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of 8 awards in national annual report contests and 21 awards in international company rankings compiled by the Russian Regional Integrated Reporting Index. In 2018, the reports of the Corporation and its organizations won a total of 10 awards in national report contests and 21 awards in international category. The reports are assessed by an independent panel comprising experts in reporting and sustainable development. The annual contest of annual reports is an important mechanism for ensuring the quality of reporting in the industry. It covers ~100 organizations in the nuclear industry and sustainable development (including ecology). The reports of the Corporation and its organizations in an integrated format aligned with Russian and international standards and best practices in this area.

**11.1.1. AWARDS IN NATIONAL AND INTERNATIONAL RANKINGS AND CONTESTS**

In 2018, 10 out of 11 reports submitted by organizations in the nuclear industry were awarded 5 stars (the highest quality) or 4 stars (very high quality) in the ranking of annual reports compiled by RAEX Agency (Expert RA). ROSATOM ranked second, and JSC ASE EC ranked third in the Best Annual Report (Non-Financial Sector) category. JSC Rosenergoatom Concern ranked second in the Best Interactive Annual Report category. JSC Atomredmetzoloto ranked third in the Best Integrated Report category.

Seven nuclear organizations, including ROSATOM, were ranked in the top 20 in the annual corporate transparency ranking of the largest Russian companies compiled by the Russian Regional Integrated Reporting Network. JSC ASE EC and JSC TVEL topped the ranking. In 2018, the reports of the Corporation and its organizations won a total of 8 awards in national annual report contests and 21 awards in international contests. Since the introduction of the public reporting system in 2011, ROSATOM has been developing its public reporting system to improve the transparency and accountability at ROSATOM.

**11.2. DIALOGUES WITH STAKEHOLDERS**

In order to improve transparency and accountability at ROSATOM, representatives of key stakeholders are engaged in the preparation of the report and participation in discussions on socially important aspects of the Corporation’s business and their reflection in the report. In addition, stakeholder representatives also participate in public assurance of the report. Stakeholder engagement is one of the key requirements of international standards such as the Accountability Index, the Global Reporting Initiative Sustainability Reporting Standards (GRI SRS) and the International ISRS Framework. When preparing the previous report, ROSATOM assumed a number of obligations that were later fulfilled in the 2018 report. In 2018, 10 out of 11 reports submitted by organizations in the nuclear industry were awarded 5 stars (the highest quality) or 4 stars (very high quality) in the ranking of annual reports compiled by RAEX Agency (Expert RA). ROSATOM ranked second, and JSC ASE EC ranked third in the Best Annual Report (Non-Financial Sector) category. JSC Rosenergoatom Concern ranked second in the Best Interactive Annual Report category. JSC Atomredmetzoloto ranked third in the Best Integrated Report category.

**11.3. INCORPORATION OF STAKEHOLDERS’ PROPOSALS**

In 2018, the sixth industry-wide contest was held. The winners included — JSC Rosenergoatom Concern in the Best Public Annual Report of ROSATOM’s Division and the Best Public Annual Report According to Stakeholders categories; — JSC UEF in the Best Public Annual Report of an Organization of ROSATOM’s Division category.

**11.1. INDUSTRY-WIDE CONTEST OF PUBLIC REPORTS OF ROSATOM’S ORGANIZATIONS**

The annual contest of annual reports is an important mechanism for ensuring the quality of reporting in the industry. It covers ~100 organizations divided into several groups with different assessment criteria. The reports are assessed by an independent panel comprising experts in reporting and sustainable development. The Sustainable Development Vector Index reflects changes in corporate performance in this sphere by assessing trends in key social, economic and environmental indicators over a number of years. The indices are interrelated: the former is both an independent tool for assessing progress on corporate information disclosure and a sampling ‘filter’ for the latter index, which reflects changes in the actual performance reflected in the disclosures. Input data for analysis is obtained from public corporate reports of approximately 100 major Russian companies.

Except from an analytical overview of the results of the Expert RA contest and ranking for 2018: ‘Looking at the participants of the latest contest by industry, one cannot help noticing a large number of reports submitted by energy companies (making up almost 1/2 of the total number of commercial companies). If we added annual reports of some companies affiliated with ROSATOM (23%), this figure would be even higher. The significant share of nuclear and energy companies is hardly surprising, as companies in these sectors of the economy were early adopters of public reporting. For instance, ROSATOM has been developing its public reporting system since 2010. This involves preparing annual reports of the Corporation and its organizations in an integrated format aligned with Russian and international standards and best practices in this area.’

**RSPP INDICES**

In the reporting year, ROSATOM was included in the top group in the Sustainability, Corporate Social Responsibility and Reporting Indices compiled by the Russian Regional Integrated Reporting Index (RSPF). The Responsibility and Transparency Index, ROSATOM ranked in the top 32, while in the Sustainable Development Vector Index, it was included in the group of 24 leading Russian companies. The RSPF has been compiling the indices since 2014. The Responsibility and Transparency Index is designed to provide an overview of progress on corporate information disclosure in the sphere of sustainable development and corporate social responsibility. The Sustainable Development Vector Index reflects changes in corporate performance in this sphere by assessing trends in key social, economic and environmental indicators over a number of years. The indices are interrelated: the former is both an independent tool for assessing progress on corporate information disclosure and a sampling ‘filter’ for the latter index, which reflects changes in the actual performance reflected in the disclosures. Input data for analysis is obtained from public corporate reports of approximately 100 major Russian companies.

**FULFILMENT OF OBLIGATIONS ASSUMED BY ROSATOM DURING THE PREPARATION OF THE 2017 REPORT**

To provide statistics on third-party injuries at ROSATOM’s enterprises.

To provide a table on human resources with a breakdown by gender and age and information on gender equality (including prevention of workplace harassment) in the section on labour relations.

Not incorporated. ROSATOM considers information provided in the section ‘Nuclear and Radiation Safety; Occupational Safety and Health’ to be sufficient and complete in terms of the interests of various stakeholders.

Not incorporated. ROSATOM considers information provided in the section ‘Implementation of the HR Policy’ to be sufficient and complete in terms of the interests of various stakeholders.
To reflect ROSATOM's role in Russia's technological development and establishment of high-technology centres in universities. Partly incorporated in various sections of the report.

To add a comparison of nuclear power generation with wind and solar power generation to the report. Incorporated in the section 'Business Strategy until 2030'.

To disclose ROSATOM's strategy on scientific research. Not incorporated. ROSATOM considers information provided in the section 'Research and Innovation' to be sufficient and complete in terms of the interests of various stakeholders.

To develop indicators for information disclosure on the quality of life in order to enable an assessment of the Corporation's contribution to its improvement (through the introduction of new technologies and innovations, etc.). The development of these indicators will be considered in the future as part of comprehensive work in the sphere of sustainable development at ROSATOM.

To give more focus to the market overview, including not only the current situation and market shares of major players, but also market analysis and forecasts. Incorporated in the section 'Markets served by ROSATOM'.

To add more information on the ‘green square’ concept in the energy industry. The topic of sustainable, ‘green’ energy has been covered in the sections 'Business Strategy until 2030' and 'Sustainable Development Agenda'.

To participate in the sustainable development competition organized by the UN, with a focus on the public reporting system. Participation in the competition will be considered in the future as part of comprehensive work in the sphere of sustainable development at ROSATOM.

To reflect climate risks in financial statements. Partly incorporated in the section 'Risk Management'.

Stakeholders’ Requests and Proposals

Incorporation of Stakeholders’ Main Proposals Voiced During the Preparation of the 2018 Report

11.4. Statement of Public Assurance

Background

ROSATOM has suggested that we assess the report on the performance of State Atomic Energy Corporation Rosatom in 2018 (the Report). To do so, we and our representatives were offered an opportunity to participate in a dialogue with stakeholders on the priority topic of the Report: Contribution of Russian Nuclear Technology to Improving the Quality of People’s Lives and Preserving the Environment (Moscow, April 3, 2019), and in public consultations on the draft Report (Moscow, June 21, 2019). We also participated in the determination of material topics to be disclosed in the Report.

Our analysis and evaluation during the public assurance process focused on the materiality and completeness of information disclosed in the Report and on the Corporation’s response to stakeholders’ requests and proposals. Our conclusion is based on a comparative analysis of two versions of the Report (the draft Report for public consultations and the final version of the Report); materials provided to us following the dialogues (minutes of the dialogues and tables reflecting the incorporation of stakeholders’ proposals) and the feedback provided by ROSATOM's management and employees during public assurance of the Report.

We received no remuneration from the Corporation for our participation in the public assurance procedure.
ASSESSMENTS, COMMENTS AND RECOMMENDATIONS

We are unanimous in the opinion that the Report is of high quality in terms of both its format and the scope of information that it provides.

In our opinion, ROSATOM adheres to a consistent approach to ensuring the transparency and accountability of its business. During the preparation of the Report, the Corporation demonstrated strong commitment to ensuring that the development of nuclear technology is publicly acceptable and willingness to hold an open dialogue with stakeholders on various aspects of its operations.

In our view, the Report provides comprehensive information on all major aspects of the Corporation’s operations, including those related to sustainable development. Through a detailed examination of the Corporation’s business model, the Report clearly presents the complex value chain, the Corporation’s governance system, strategic goals and management approaches, its social, environmental and economic impacts.

Materiality of Information

To incorporate stakeholders’ requests as fully as possible, ROSATOM conducted a questionnaire survey among stakeholders to identify material topics to be disclosed in the Report (the information received was compared with the results of a questionnaire survey conducted among the Corporation’s managers). We highly appreciate this initiative and recommend that ROSATOM should continue active collaboration with stakeholder representatives on this matter in the future as they represent the target audiences for the Corporation’s public reports.

Completeness of Information

We believe that the reporting information adequately covers all material aspects and enables readers to draw conclusions on the Corporation’s performance in the reporting year.

Responding to Stakeholders’ Requests and Proposals

At the request of stakeholders’ representatives, the final version of the Report was updated and supplemented with additional information (or substantiated explanations were provided as to why the requested information could not be disclosed). Chapter 11 of the Report provides information on the incorporation of stakeholders’ main proposals voiced during the preparation of the 2018 Report, as well as ROSATOM’s obligations to consider and incorporate stakeholders’ comments during the preparation of the 2019 Report.

To summarize, we would like to point out that in recent years ROSATOM has made significant progress in public reporting and, consequently, continues to improve confidence in its business. We hope that ROSATOM will continue to consistently implement the principles of responsible business conduct in the future, work systematically on the sustainable development agenda and disclose information on its performance in this context.

PERSONS WHO TOOK PART IN THE PUBLIC ASSURANCE OF ROSATOM’S PUBLIC ANNUAL REPORT FOR 2018

ALEXANDER AGEEV
Director General of the Institute for Economic Strategies of the Social Sciences Division of the Russian Academy of Sciences

SERGEY BARANOVSKY
President of the Inter-Regional Environmental Non-Governmental Organization Green Cross, Deputy Chairman of ROSATOM’s Public Council

NATALIA DAVYDOVA
Director of the Environmental Projects Consulting Institute, member of ROSATOM’s Public Council

ALEXANDER MAKARENKO
Executive Director of the Association of CATFs in the Nuclear Industry

DENIS MOSKVIN
Deputy of the State Duma of the Russian Federation, member of the Committee on Economic Policy, Industry, Innovative Development and Entrepreneurship

VLADIMIR OGNEV
Deputy of the State Duma of the Russian Federation, member of the Committee on Energy

GENNADY SKLYAR
Chairman of the Interregional Social Movement of Veterans of Nuclear Power and Industry

ALEXANDER AGEEV
Managing Director for Corporate Responsibility, Sustainable Development and Social Entrepreneurship of the Russian Union of Industrialists and Entrepreneurs (RSPP) and ROSATOM’s Uniform Industry-Wide Public Reporting Policy and Public Reporting Standard

IGOR FOMICHEV
Chairman of the Russian Trade Union of Nuclear Power and Industry Workers

ANNUAL REPORT FOR 2018
The Annual Report of State Atomic Energy Corporation Rosatom for 2018 (the Report) has been prepared on a voluntary basis and is intended for a broad range of stakeholders. 

The Report has been prepared in an integrated format and provides a comprehensive picture of the following: 

— The implementation of ROSATOM’s strategy, including contribution to the sustainability of the Corporation’s business in the reporting year; as well as short-, medium- and long-term plans; 

— Significant financial, economic and operating results of the Corporation’s core businesses; 

— Results achieved in the sphere of nuclear radiation safety, environmental protection, contribution to the development of the regions where the Corporation operates, implementation of socio-political and other aspects of sustainable development; 

— The economic, environmental and social impact on the external and internal environment; 

— The approach of ROSATOM’s executives to managing various business aspects.

The Report focuses on the contribution of Russian nuclear technology to improving the quality of people’s lives and preserving the environment; this topic has been selected by the top management and representatives of key stakeholders. Information on the selection of material topics to be disclosed in the Report is provided below in the sections: "Process for determining the Report content" and "Ranking map of material topics to be disclosed in the Report".

ROSATOM’s internal regulations stipulate an annual reporting cycle. The previous annual report was published in August 2018. The Report covers the Corporation’s operations during the period from January 1, 2018 through December 31, 2018.

The Report was prepared in accordance with:

— The Public Reporting Policy and the Public Reporting Standard of ROSATOM and its organizations; 

— The International Integrated Reporting Framework (International "IR" Framework); 

— The Global Reporting Initiative Sustainability Reporting Standards (GRI SRS; Core option)"; 

— The AA1000 Accountability Standards (AA 1000 AP 2018, AA1000 SES 2015); 


STANDARDS AND REGULATORY REQUIREMENTS

The Report has been prepared in accordance with:

— The International Integrated Reporting Framework (International "IR" Framework); 

— The Global Reporting Initiative Sustainability Reporting Standards (GRI SRS; Core option)"; 

— The AA1000 Accountability Standards (AA 1000 AP 2018, AA1000 SES 2015); 


STAKEHOLDER ENGAGEMENT

To improve transparency and accountability and to determine the materiality of information to be disclosed, the Report was prepared in cooperation with stakeholders in accordance with the AA1000SES International standard. To identify material aspects to be disclosed in the Report, a poll was carried out and two dialogues with stakeholders were held, including public consultations on the draft Report. The Report incorporates key requests voiced by stakeholder representatives during these dialogues (see the section ‘Incorporation of Stakeholders’ Proposals’).

The implementation of ROSATOM’s strategy, including contribution to the sustainability of the Corporation’s business in the reporting year, as well as short-, medium- and long-term plans;

— Significant financial, economic and operating results of the Corporation’s core businesses;

— Results achieved in the sphere of nuclear radiation safety, environmental protection, contribution to the development of the regions where the Corporation operates, implementation of socio-political and other aspects of sustainable development;

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— The Global Reporting Initiative Sustainability Reporting Standards (GRI SRS; Core option);

— The AA1000 Accountability Standards (AA 1000 AP 2018, AA1000 SES 2015);


The Report contains information about ROSATOM’s medium- and long-term objectives and initiatives. The objectives are forward-looking, and their actual achievement depends on, among other things, a number of economic, political and legal factors beyond ROSATOM’s control (the global financial, economic and political environment; situation on the key markets; amendments to the tax, customs and environmental legislation, etc.). Therefore, actual performance in the future years may differ from the forward-looking statements contained herein.

DISCLAIMER
REPORT
of the Internal Audit Department of ROSATOM on the findings of internal audit of the business process ‘Public Reporting Procedure in ROSATOM’

Internal audit of the business process ‘Public Reporting Procedure in ROSATOM’ has been performed pursuant to the Consolidated Monitoring Plan of Specialized Internal Control Bodies of ROSATOM for the Second Half of 2019 signed off by the Director General of ROSATOM and approved by the Chairman of the Supervisory Board of ROSATOM.

The audit has involved:
- An assessment of efficiency of internal controls in the public reporting process;
- An assessment of compliance of the public reporting procedure with applicable legislation, international standards and internal regulatory requirements for public reporting;
- Producing recommendations for improving internal controls in public reporting and enhancing the efficiency of this process.

The business process ‘Public Reporting Procedure in ROSATOM’ complies with applicable legislation, international standards and internal regulatory requirements for public reporting. At the same time, the auditors would like to point to the need for more detailed disclosure of information in accordance with individual requirements of international standards and internal regulations. Deviations detected in the course of the audit have not made a significant impact on the quality or reliability of the public annual report.

Head of the audit team

A.P. Ivanova

Member of the audit team

O.M. Bludkovskaya
PERFORMANCE OF STATE ATOMIC ENERGY CORPORATION ROSATOM IN 2018

An extract for growth

Grant Thornton

Company of the Year by the Investments of the Tax Authority

A limited liability partnership in the area of financial and investment management services, the Russian Association of Private Equity, the Russian Association of Private Energy Corporation ROSATOM

PERFORMANCE OF STATE ATOMIC ENERGY CORPORATION ROSATOM IN 2018
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARMS</td>
<td>automated radiation monitoring system</td>
</tr>
<tr>
<td>CATF</td>
<td>closed administrative and territorial formation</td>
</tr>
<tr>
<td>CNFC</td>
<td>closed nuclear fuel cycle</td>
</tr>
<tr>
<td>EUP</td>
<td>enriched uranium product</td>
</tr>
<tr>
<td>FAIR</td>
<td>Facility for Antiproton and Ion Research (FAIR)</td>
</tr>
<tr>
<td>FMBA</td>
<td>Federal Biomedical Agency</td>
</tr>
<tr>
<td>FTP</td>
<td>federal target programme</td>
</tr>
<tr>
<td>HEU</td>
<td>highly enriched uranium</td>
</tr>
<tr>
<td>HLW</td>
<td>high-level waste</td>
</tr>
<tr>
<td>IAEA</td>
<td>International Atomic Energy Agency</td>
</tr>
<tr>
<td>IARMS</td>
<td>Industry-Wide Automated Radiation Monitoring System</td>
</tr>
<tr>
<td>IGA</td>
<td>intergovernmental agreement</td>
</tr>
<tr>
<td>ILW</td>
<td>intermediate level waste</td>
</tr>
<tr>
<td>INES</td>
<td>International Nuclear Event Scale (INES)</td>
</tr>
<tr>
<td>INPRO</td>
<td>International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO)</td>
</tr>
<tr>
<td>INPS RAW</td>
<td>Integrated National System for Radioactive Waste Management</td>
</tr>
<tr>
<td>IP</td>
<td>intellectual property</td>
</tr>
<tr>
<td>IRAW</td>
<td>individual risk assessment workstation</td>
</tr>
<tr>
<td>IRSF</td>
<td>Integrated Standardized Remuneration System</td>
</tr>
<tr>
<td>ITER</td>
<td>International Thermonuclear Experimental Reactor (ITER)</td>
</tr>
<tr>
<td>IUREC</td>
<td>International Uranium Enrichment Centre</td>
</tr>
<tr>
<td>KPI</td>
<td>key performance indicator</td>
</tr>
<tr>
<td>LCBE</td>
<td>life cycle back-end</td>
</tr>
<tr>
<td>LEU</td>
<td>low-enriched uranium</td>
</tr>
<tr>
<td>LLW</td>
<td>low-level waste</td>
</tr>
<tr>
<td>LTOP</td>
<td>Long-Term Operational Programme of ROSATOM</td>
</tr>
<tr>
<td>NF</td>
<td>nuclear facility</td>
</tr>
<tr>
<td>NFA</td>
<td>nuclear fuel assembly</td>
</tr>
<tr>
<td>NFE</td>
<td>nuclear fuel element</td>
</tr>
<tr>
<td>NPP</td>
<td>nuclear power plant</td>
</tr>
<tr>
<td>NRS</td>
<td>nuclear and radiation safety</td>
</tr>
<tr>
<td>NS</td>
<td>nuclear submarine</td>
</tr>
<tr>
<td>NWD</td>
<td>Nuclear Weapons Division</td>
</tr>
<tr>
<td>OECD/NEA</td>
<td>Nuclear Energy Agency of the Organization for Economic Cooperation and Development</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>research and development</td>
</tr>
<tr>
<td>RAW</td>
<td>radioactive waste</td>
</tr>
<tr>
<td>RBMK</td>
<td>high-power channel-type reactor</td>
</tr>
<tr>
<td>ROSATOM,</td>
<td>State Atomic Energy Corporation Rosatom</td>
</tr>
<tr>
<td>Corporation</td>
<td></td>
</tr>
<tr>
<td>Rostekhnadzor</td>
<td>Federal Service for Environmental, Technological and Nuclear Supervision</td>
</tr>
<tr>
<td>RSPP</td>
<td>Russian Union of Industrialists and Entrepreneurs</td>
</tr>
<tr>
<td>RTG</td>
<td>radioisotope thermoelectric generator</td>
</tr>
<tr>
<td>Russia</td>
<td>Russian Federation</td>
</tr>
<tr>
<td>SNF</td>
<td>spent nuclear fuel</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>WPP</td>
<td>wind power plant</td>
</tr>
</tbody>
</table>
Enrichment (isotopic) a) The amount of atoms of a specific isotope in a mixture of isotopes of the same element if it exceeds the share of this isotope in a naturally occurring mixture (expressed as a percentage); b) a process resulting in an increase in the content of a specific isotope in a mixture of isotopes.

Fast neutrons Neutrons whose kinetic energy exceeds a certain limit. This limit varies within a broad range and depends on the application (reactor physics, protection or radiation monitoring). In reactor physics, this limit is usually set at 0.1 MeV.

First criticality A stage in the commissioning of an NPP which involves loading nuclear fuel into the reactor, achieving first criticality and performing required physical experiments at a power level at which heat is removed from the reactor through natural heat losses.

Fuel assembly A set of fuel elements (rods, bars, plates, etc.) held together with spacer grids and other structural elements that are transported and irradiated in the reactor in one piece. Fuel assemblies are loaded into the reactor core.

Corporate social responsibility A concept whereby an organization takes into account stakeholder requests. It is a set of obligations voluntarily assumed by the organization’s executives to take into account the interests of employees, shareholders, local communities in the organization’s operating regions, government bodies and municipal governments and other stakeholders. These obligations are funded mainly from the organization’s own funds and are aimed at implementing significant internal and external social (in a broad sense) programmes whose outcomes help develop the organization, improve its reputation and image, and enable constructive stakeholder engagement.

Corporate business model A model comprising key business processes used by the organization to create and maintain its value in the short, medium and long term.

Depleted uranium Uranium with a lower content of the U-235 isotope than natural uranium (e.g. uranium in spent fuel from reactors fuelled with natural uranium).

Depletion of uranium Uranium with a lower content of the U-235 isotope than natural uranium (e.g. uranium in spent fuel).

Dialogue with stakeholders (as part of reporting processes) An event held in accordance with the international AA1000 standards to facilitate communication between the organization and representatives of key stakeholders when preparing and promoting its public reports.

Digitization A systematic approach to the use of digital resources in order to improve labour productivity, gain a competitive advantage and promote overall economic development.

Enrichment (isotopic) a) The amount of atoms of a specific isotope in a mixture of isotopes of the same element if it exceeds the share of this isotope in a naturally occurring mixture (expressed as a percentage); b) a process resulting in an increase in the content of a specific isotope in a mixture of isotopes.

EPC (Engineering – Procurement – Construction) contract A contract imposing obligations related to the turnkey construction of a facility, i.e. obligations related to the engineering, procurement and construction of a facility. Unlike a BOO contract, it does not provide for ownership of a facility to be built.

EPCM (Engineering – Procurement – Construction – Management) contract A contract imposing obligations related to the turnkey construction (engineering, procurement and construction) and management of a facility. Unlike a BOO contract, it does not provide for ownership of a facility to be built.

First criticality A stage in the commissioning of an NPP which involves loading nuclear fuel into the reactor, achieving first criticality and performing required physical experiments at a power level at which heat is removed from the reactor through natural heat losses.

Fuel assembly A set of fuel elements (rods, bars, plates, etc.) held together with spacer grids and other structural elements that are transported and irradiated in the reactor in one piece. Fuel assemblies are loaded into the reactor core.
Key performance indicators

Performance indicators consistent with the goals of the Corporation and reflecting the efficiency and performance of organizations, divisions and the individual performance of employees.

Natural background radiation

Ionizing radiation including cosmic radiation and ionizing radiation from naturally distributed natural radionuclides (on the surface of the Earth, in the air, food, water, the human body, etc.).

Non-financial reporting

Reports provided by an organization on its performance beyond its core operational and financial activities (and the management of this performance). Examples of non-financial reports include sustainability reports, corporate social responsibility reports, environmental reports, reports on philanthropy, etc.

NPP safety

An NPP characteristic that ensures radiation safety for personnel, the general public and the environment within required limits during normal operation and in the event of an accident.

Nuclear fuel

Material containing fissionable nuclides which, after being placed in a nuclear reactor, enables a nuclear chain reaction.

Nuclear fuel cycle (NFC)

A sequence of manufacturing processes aimed at ensuring the operation of nuclear reactors, ranging from uranium production to radioactive waste disposal.

Nuclear power

A branch of power engineering that uses nuclear energy for electricity and heat generation.

Nuclear safety

The ability of nuclear facilities to prevent nuclear accidents and radioactive leaks.

Operator

An organization that has obtained a permit from a regulator for the operation of an NPP or another nuclear facility.

Pilot operation

A stage in the commissioning of a nuclear power plant from the power start-up to acceptance of the power plant for commercial operation.

Power start-up

A stage in the commissioning of an NPP at which the NPP starts to generate energy, and the operation of the NPP is tested at various power levels, up to the level specified for commercial operation.

Radiation burden

A sum of individual doses of radiation received or planned in the course of operation, maintenance, repairs, replacement or dismantling of equipment at a nuclear facility.

Radiation monitoring

Measures for obtaining information on radiation levels in the organization and in the environment and on human exposure to radiation (including dosimetry and radiometric monitoring).

Radiation safety

Protection of the current and future generations and the environment against the harmful impact of ionizing radiation.

Radioactive discharge

Controlled release of radionuclides into industrial reservoirs as a result of the operation of a nuclear facility.

Radioactive release

Controlled atmospheric emission of radionuclides by a nuclear facility.

Radioactive waste

Materials and substances unsuitable for further use, as well as equipment and products with a radionuclide content above prescribed levels.

Radioactive waste disposal

Safe disposition of radioactive waste in repositories or any places that rules out waste withdrawal or a possibility of radioactive releases into the environment.

Radioactive waste processing and conditioning

Process operations aimed at ensuring that the physical form and condition of radioactive waste are appropriate for its disposal.

Recommendations of the Russian Union of Industrialists and Entrepreneurs (RSPP) for Use in Governance Practices and Corporate Non-Financial Reporting (basic performance indicators)

A system of economic, social and environmental performance indicators for non-financial reports developed by the RSPP in order to facilitate the adoption of responsible business principles. It is based on a number of framework documents developed by UN organizations (including the UN Global Compact) and the Global Reporting Initiative, as well as methodological and procedural guidelines of the Federal State Statistics Service of the Russian Federation and guidelines developed by the RSPP (the Social Charter of Russian Business, Recommendations on the Preparation of Non-Financial Reports ‘Five Steps Towards Social Sustainability of Companies’, etc.).

Research reactor

A nuclear reactor designed for use as an object of research to obtain data on reactor physics and technology required in order to design and develop similar reactors or components thereof.

Separative work unit (SWU)

A measure of efforts expended on the separation of a given amount of material with a specific isotopic composition into two fractions with different isotopic compositions. Separative work is measured in kilograms, and enrichment and energy costs are calculated per kilogram of separative work performed.

Spent nuclear fuel reprocessing

A set of chemical engineering processes for removing fission products from spent nuclear fuel and for regeneration of fissionable material for reuse.

Stakeholder assurance of the report

A procedure organized in accordance with the AA1000SES international standard whereby representatives of principal stakeholders provide assurance for the report by confirming the materiality and completeness of information disclosed in the report, and whereby the organization responds to requests and proposals from stakeholders. The outcome of stakeholder assurance is a Statement of Public Assurance signed by representatives of principal stakeholders and included in the report.

Stakeholders

Individuals and/or legal entities and groups of individuals or entities that make an impact on the organization’s operations through their actions and/or are affected by the organization. An organization may have different stakeholders (national and international regulatory (supervisory) authorities, shareholders, consumers of goods and services, business partners, suppliers and contractors, civil society organizations, local communities, trade unions, etc.) with differing and conflicting interests.

Sustainable development

A process of economic and social change whereby the exploitation of natural resources, allocation of investments, the focus of scientific and technical development, personal development and institutional changes are aligned with each other and strengthen the present and future potential for meeting human needs and aspirations.

Sustainable Development Goals

17 interdependent goals set in the 2030 Agenda for Sustainable Development adopted by 193 countries at the session of the UN General Assembly in 2015. The goals include eradicating poverty in all its forms, reducing inequality and addressing climate change.
<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treaty on the Non-Proliferation of Nuclear Weapons</td>
<td>An international treaty aimed at limiting the arms race; its objective is to prevent the emergence of new states possessing nuclear weapons. The treaty imposes an obligation on states possessing nuclear weapons, requiring them not to transfer nuclear weapons or control over such weapons to any party, while non-nuclear weapon states are obliged not to manufacture or acquire nuclear weapons or other nuclear explosive devices.</td>
</tr>
<tr>
<td>Uranium conversion</td>
<td>A chemical engineering process involving the transformation of uranium-containing materials into uranium hexafluoride.</td>
</tr>
<tr>
<td>Uranium hexafluoride</td>
<td>A chemical compound of uranium and fluorine (UF₆), which is the only highly volatile uranium compound (when heated to 53°C, uranium hexafluoride changes directly from the solid state into the gaseous state); it is used as feedstock for the separation of uranium-235 and uranium-238 isotopes using gaseous diffusion or the gas centrifuge method and for production of enriched uranium.</td>
</tr>
<tr>
<td>Uranium ore enrichment</td>
<td>A combination of processes for primary treatment of uranium-containing mineral resources in order to separate uranium from other minerals contained in the ore.</td>
</tr>
<tr>
<td>Water-cooled water-moderated power reactor (VVER)</td>
<td>A power reactor in which water is used as both a coolant and moderator. Russian NPPs typically use two versions of VVER reactors: VVER-440 and VVER-1000.</td>
</tr>
</tbody>
</table>
Dear reader,

You have read the public annual report of ROSATOM, which is intended for a wide range of stakeholders. We attach great importance to the opinion of the readers of our report. We would appreciate it if you helped improve the quality of the Corporation’s reports by completing the questionnaire below.

Please return the completed form by mail to the Communications Department at 24 Bolshaya Ordynka Street, Moscow, 119017 and/or by email (EAMamy@rosatom.ru).

1. Please assess the report using the following criteria:

   ACCURACY AND OBJECTIVITY
   - Excellent
   - Good
   - Satisfactory
   - Poor

   WAS YOUR OPINION INFLUENCED BY INDEPENDENT AUDITORS’ REPORTS AND THE STATEMENT OF PUBLIC ASSURANCE INCLUDED IN THE REPORT?
   - Yes
   - No

   COMPLETENESS AND RELEVANCE OF INFORMATION
   - Excellent
   - Good
   - Satisfactory
   - Poor

   REPORT STRUCTURE, EASE OF REFERENCE, WORDING
   - Excellent
   - Good
   - Satisfactory
   - Poor

2. Please specify which sections of the report you have found to be relevant and useful.

   __________________________________________________________

   __________________________________________________________

   __________________________________________________________

3. Which topics do you think should be covered in the next report?

   __________________________________________________________

   __________________________________________________________

   __________________________________________________________

4. Your recommendations and additional comments:

   __________________________________________________________

   __________________________________________________________

   __________________________________________________________

   __________________________________________________________
5. Please specify which stakeholder group you represent:

- [ ] Employee of ROSATOM
- [ ] Employee of an organization of ROSATOM
- [ ] Representative of the federal government
- [ ] Representative of a regional government
- [ ] Representative of a local government
- [ ] Representative of a customer/consumer of goods and services
- [ ] Representative of a non-governmental organization
- [ ] Representative of the media
- [ ] Representative of a business partner
- [ ] Representative of the federal government
- [ ] Representative of the media
- [ ] Representative of a business partner
- [ ] Representative of the expert community
- [ ] Representative of a contractor/supplier
- [ ] Other (please specify)

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www.rosatom.com

Public annual reports:

Official website for placement of orders for the procurement of goods, works and services for ROSATOM:
http://zakupki.rosatom.ru/

Official group on VKontakte:
http://vk.com/rosatomru

Official blog on Twitter:
hhttps://twitter.com/rosatomglobal

Official community page on Facebook:
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Official channel on YouTube:
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