



1

STRATEGIC REPORT

225.3

BILLION KWH

LOW-CARBON ELECTRICITY
OUTPUT AT NUCLEAR AND WIND
POWER PLANTS IN RUSSIA

GRI 2-22 STATEMENT OF THE DIRECTOR GENERAL

Dear readers,

You are reading ROSATOM’s public annual report for 2022 prepared in accordance with Russian and international public reporting standards.

Amid political and economic pressure on our country, ROSATOM successfully accomplishes complex and non-standard tasks set by the government. Indeed, despite the challenges, ROSATOM’s team has achieved impressive results across all areas of its operations, including the fulfilment of government tasks, international cooperation and the development of new high-technology products to enhance Russia’s technological sovereignty.

In 2022, ROSATOM traditionally fulfilled 100% of tasks under the state defence order. I would also like to highlight the fact that Russian nuclear power plants set a new record for electricity generation totalling 223.4 billion kWh. This was achieved due to the optimisation of duration of scheduled repairs at NPP power units, among other things. Despite a decline in international cargo transit along the

Northern Sea Route, the nuclear-powered icebreaker fleet exceeded the target for cargo traffic by 3% as it transported 34.117 million tonnes of cargo.

One of ROSATOM’s key strategic goals is to increase the share of its products and services on global markets. In 2022, revenue from overseas orders reached USD 11.8 billion, up by 31% year on year. ROSATOM remains a leader on the global market for new NPP construction, with 23 power units at the construction stage. In the reporting year, concreting was started at the sites of five new power units in Turkey, China and Egypt. A licence was obtained for the construction of two Russian-design power units with VVER-1200 reactors in Hungary. Overall, we currently operate in more than 50 countries worldwide.

ROSATOM is actively developing new high-technology businesses, such as nuclear medicine, additive manufacturing, wind power, electric transport, etc. Revenue from these businesses increased considerably compared to the previous year.



INTEGRAL ASSESSMENT OF PERFORMANCE AGAINST ROSATOM’S KEY PERFORMANCE TARGETS FOR 2022

ROSATOM actively participates in initiatives aimed at enhancing Russia’s technological sovereignty. These efforts were accelerated in 2022. A project was launched to develop energy-saving technologies; the Corporation proposed an initiative to build a new shipyard for Arctic shipbuilding. ROSATOM is actively involved in the development of domestically designed solutions for critical information infrastructure across all industry sectors.

The reporting year marked the 15th anniversary of a historic decision of the President of the Russian Federation on the establishment of State Atomic Energy Corporation Rosatom. Over the years, ROSATOM has played a crucial role in the achievement of Russia’s national development goals. I am convinced that, despite global turbulence and a changing international business environment, ROSATOM will continue to take advantage of emerging opportunities to develop its own business and enhance Russia’s technological sovereignty. We have everything we need to achieve this goal: highly

skilled specialists and a personnel training system, diverse engineering and production infrastructure covering the entire life cycle, government support and a diversified business model.

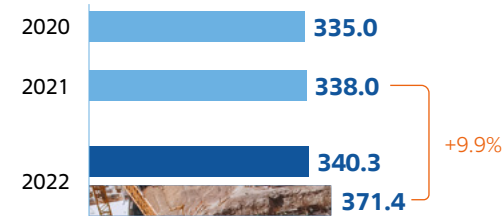


Alexey Likhachev
Director General of ROSATOM

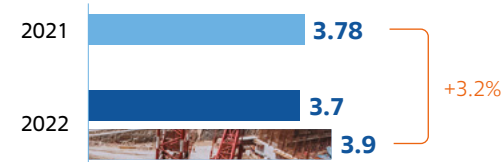
Key Results in 2022

Key performance indicators set by the Supervisory Board

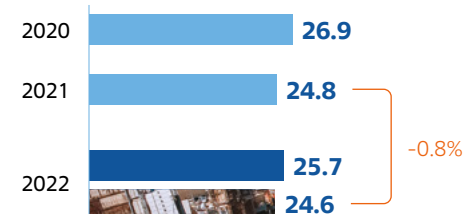
Adjusted free cash flow of ROSATOM, RUB billion



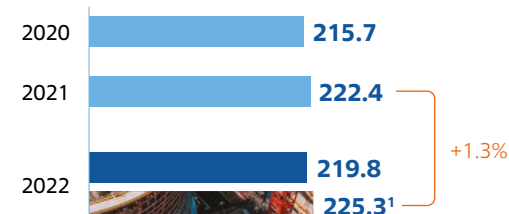
Consolidated labour productivity, RUB million/person



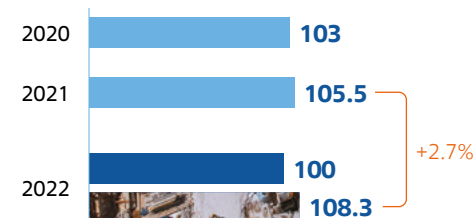
Unit semi-fixed costs (as a percentage of revenue), %



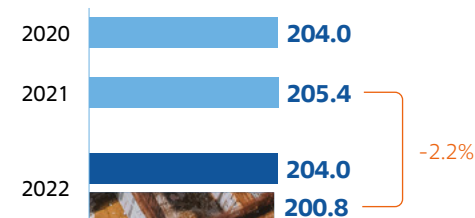
Power generation, billion kWh



Performance against the targets of JSC Rosenergoatom's investment programme, %



Portfolio of overseas orders covering the entire life cycle, USD billion

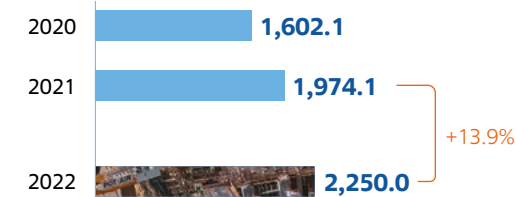


1. The figures for 2020 and 2021 reflected nuclear power generation in the Russian Federation; the figure for 2022 also includes wind power generation in addition to nuclear power generation. Nuclear power generation in the Russian Federation in 2022 totalled 223.4 billion kWh.

■ Target 2022

■ Actual 2022

ROSATOM's 10-year portfolio of orders for new products (outside the scope of the Corporation), RUB billion



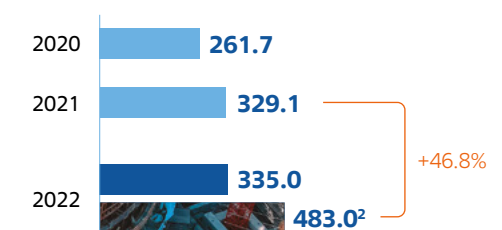
Foreign revenue, USD million



EBITDA, RUB billion



Revenue from new products (outside the scope of the Corporation), RUB billion



Fulfilment of government orders, %



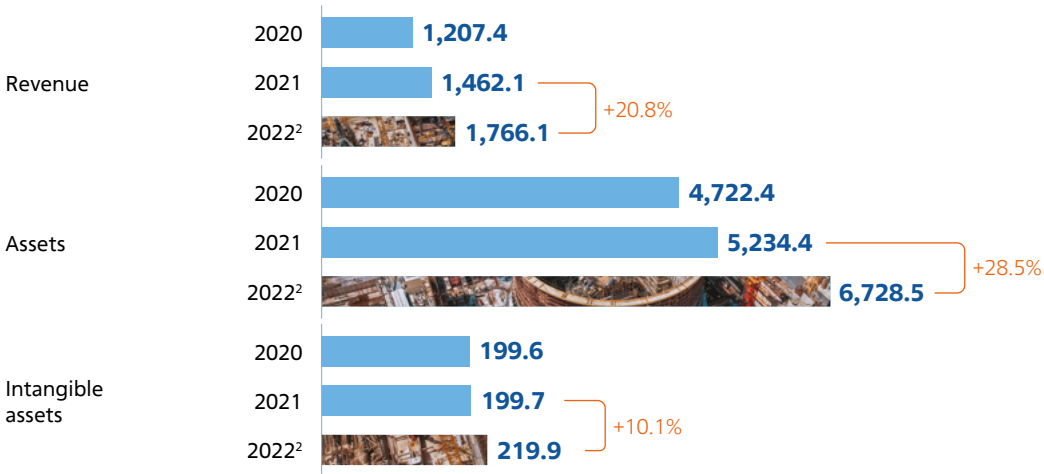
Absence of events rated at level 2 or higher on the INES scale



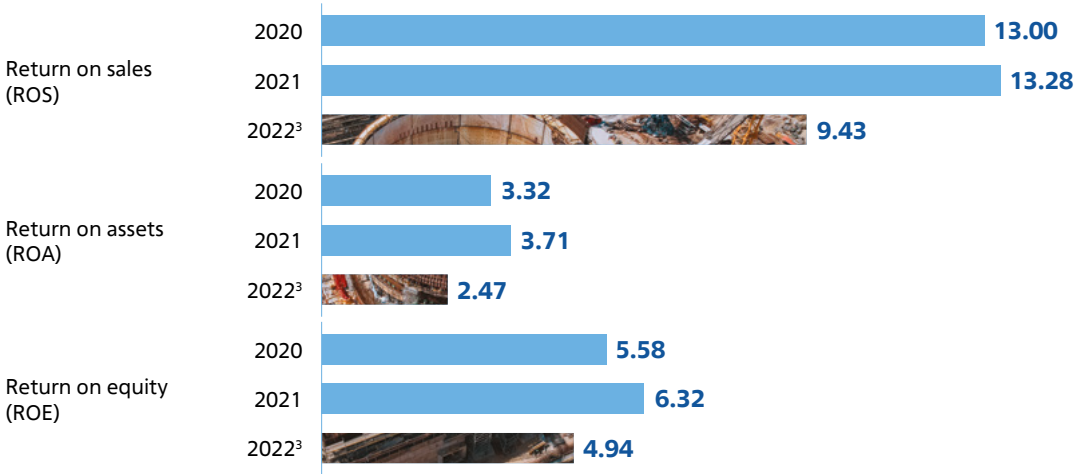
1. Not including the revenue of MC Delo.
2. Not including the revenue of MC Delo.

GRI 2-6 Financial and Economic Performance¹

Key financial results, RUB billion



Profitability ratios, %



1. Data have been provided on the part of the scope of IFRS consolidation of ROSATOM for which information is publicly available. Comparative data on key financial indicators and profitability ratios for 2021 have been recalculated due to the fact that in 1Q 2022, the Group carried out common control transactions involving a business acquisition in the mechanical engineering segment. In accordance with the Group's accounting policy, the financial results of the acquired business have been retrospectively reflected in the financial statements at book value, as recognised in the consolidated IFRS financial statements of the transferring entity.
2. A 20.8% increase in revenue compared to 2021 was achieved mainly due to an increase in revenue from heat and power generation and capacity, transportation services and the integration of new businesses.
3. Profitability ratios decreased in 2022, primarily due to a year-on-year decline in profit in the reporting period.

KEY EVENTS IN 2022

NPP and WPP construction

- May**
 - A permit was obtained for the construction of the Kuzminskaya WPP in the Stavropol Territory.
- June**
 - The government of the Chukotka Autonomous District and JSC NovaWind signed an agreement on cooperation in the implementation of wind power projects. A permit was obtained for the construction of the 95 MW Trunovskaya WPP in the Stavropol Territory.
- July**
 - Official ceremonies were held to mark the start of concreting at the site of power unit No. 1 of El Dabaa NPP in Egypt (20 July) and the start of concreting of the foundation of power unit No. 2 (November 2022).
 - On 21 July, principal works were started at the construction site of power unit No. 4 of Akkuyu NPP in Turkey.
- August**
 - An agreement was signed with a Vietnamese company An Xuan Energy to jointly implement a wind power project in the Son La Province.
 - The Hungarian Atomic Energy Authority issued a permit for the construction of two power units equipped with VVER-1200 reactors at Paks II NPP.
- December**
 - The Berestovskaya WPP in the Stavropol Territory was put into operation.

Small nuclear power plants

- September**
 - The engineering design of the RITM-200N reactor unit was developed.

New products and technological sovereignty

- July**
 - The Corporation obtained a registration certificate for the Onyx radiation therapy facility based on a linear electron accelerator.



● **August**

- The first industrial facilities forming part of the Nuclear Research and Technology Centre in El Alto, Bolivia, started pilot operation.

● **October**

- The construction of the first lithium-ion battery ‘gigafactory’ was started in the Kaliningrad Region.
- The development of the first stage of a data centre in Innopolis (Tatarstan) was started.

● **October**

- X5 Group acquired licences for the use of an RPA platform, Atom. RITA, designed by ROSATOM to configure and support software robots.

● **November**

- The development of technologies for stable isotope production based on fractional distillation and chemical isotope exchange was initiated.

● **December**

- The construction of a new building of the Federal State Budgetary Institution Dmitry Rogachev National Medical Research Centre of Paediatric Haematology, Oncology and Immunology of the Russian Ministry of Health was completed.

○ **Business development**

● **January**

- JSC Quadra – Power Generation was included in the scope of ROSATOM. It supplies heat and electricity to regions of the Central Federal District.

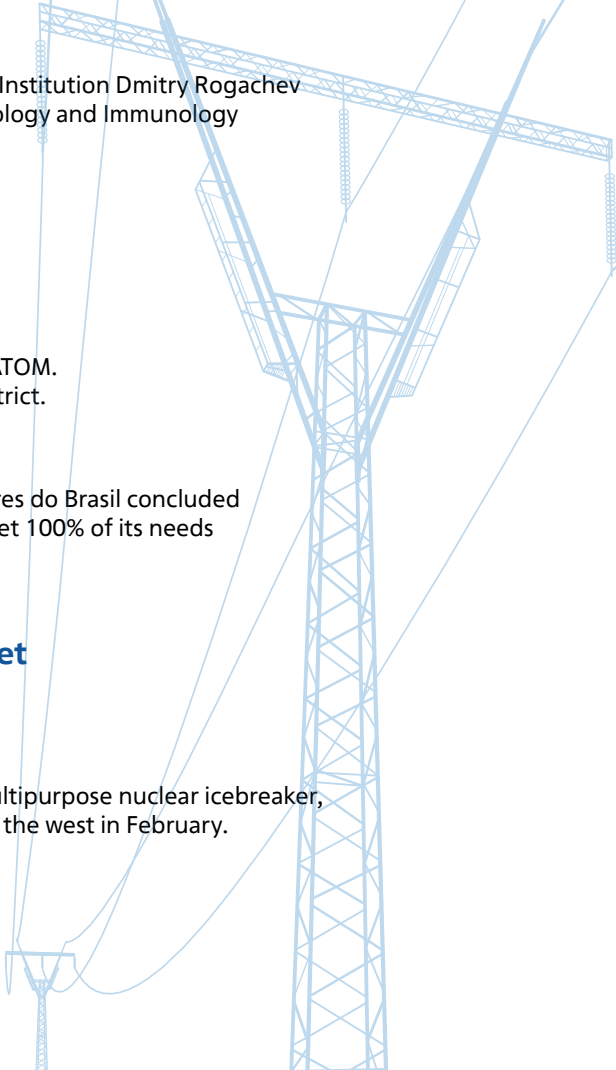
● **December**

- ROSATOM and a Brazilian state-owned company Industrias Nucleares do Brasil concluded a contract for the supply of uranium products for Angra NPP to meet 100% of its needs between 2023 and 2027.

○ **Development of the Arctic and the icebreaker fleet**

● **February**

- For the first time in the history of Arctic navigation, the flagship multipurpose nuclear icebreaker, *Arktika*, escorted a convoy of low-ice-class vessels from the east to the west in February.



● **June**

- A federal law was adopted granting ROSATOM powers related to navigation management along the Northern Sea Route¹.

● **November**

- The national flag was raised on the second follow-on Project 22220 nuclear icebreaker, *Ural*, and the third icebreaker, *Yakutia*, was launched.

○ **Environmental protection**

● **March**

- FSUE FEO (an organisation of ROSATOM), the federal operator responsible for the management of hazard class 1 and 2 waste, started to provide services to facilitate the safe management of hazardous waste in the Russian Federation using the digital platform of the federal state information system for tracking hazard class 1 and 2 waste and monitoring its management.

● **April**

- The main stage of the site restoration project was started at the Krasny Bor landfill in the Leningrad Region.

○ **Research and innovations**

● **April**

- The Russian poloidal field coil (for plasma containment) for the ITER international project underwent the final test.

● **September**

- The conversion of the BN-800 reactor at power unit No. 4 of Beloyarsk NPP to uranium/plutonium MOX fuel was 93% completed.

● **December**

- The welding of the support plate for the BREST-OD-300 fast reactor, which is being built in Seversk (Tomsk Region) as part of the Proryv Project, was started.

1. Federal Law No. 184-FZ of 28 June 2022 on Amending Article 5.1 of the Merchant Shipping Code of the Russian Federation and the Federal Law on State Atomic Energy Corporation Rosatom.

1.1. BUSINESS STRATEGY

1.1.1 Business context

Trends in the development of the nuclear industry

The development of the nuclear industry is influenced by a number of factors, including¹:

- Global population growth from 7.9 billion people in 2022 to 8.5 billion people by 2030 and an increase in the share of urban population from 57% to 60%;
- Global GDP growth of around 3% per year;
- Growth of global electricity output and consumption. Global electricity output is expected to increase by 22.9% compared to 2021 and reach 34.8 TWh as early as in 2030, with the Asia Pacific region accounting for two thirds of the growth;
- Accelerating greenhouse gas accumulation. In 2022, carbon dioxide emissions reached a new high of more than 36.8 billion tonnes. In 2022, the increase in emissions totalled less than 1%, well below the 6% growth in 2021, which was due to an accelerated economic recovery after the start of the COVID-19 pandemic. The level of global carbon dioxide emissions remains stable, which necessitates more decisive action to accelerate the transition to clean energy and achieve climate action targets.

The development of low-carbon power generation, including nuclear power, is a necessary prerequisite for reducing emissions and achieving international climate targets. In recent years, environmental aspects of the electricity industry have come under closer scrutiny, which has driven an increase in the share of low-carbon power in the global energy mix. In 2022, amid price shocks, rising inflation and disruptions to traditional energy supply chains, the global commitment to low-carbon and sustainable energy solutions was reaffirmed and strengthened. The zero-emissions strategy adopted by major economies will significantly accelerate the electrification of the global economy, which will necessitate active development of all zero-carbon energy sources, including nuclear power generation.

ROSATOM has identified two groups of factors that have the most significant impact on the Corporation's global operations:

The economic and geopolitical situation. Although global economic growth outpaces that of the Russian economy, as a global company ROSATOM sets itself higher growth targets, despite persisting political pressure.

The technological landscape. Global technology trends form a separate set of challenges for the development of the industry. New technologies are evolving rapidly and shaping global markets; trends that started to emerge as recently as five to ten years ago are accelerating, as exemplified by the rapid development of renewable energy generation, exponential growth of the scale of digital transformation in manufacturing, and growing markets for new materials and manufacturing solutions. The rate of innovation is also accelerating, and, as a result, technological solutions become obsolescent increasingly fast. The Corporation's strategy takes into account both the current set of global technology trends and the level of their development.

1. Data from the World Bank, the IMF, the IEA World Energy Outlook 2022 (Stated Policies Scenario), IEA CO₂ Emissions in 2022, and the IAEA.

In the long term, the global nuclear power industry as an energy source will remain in demand. In February 2022, the European Commission adopted a resolution on the inclusion of nuclear power in the EU Green Taxonomy, a classification of sustainable activities for investors. The International Energy Agency¹ forecasts an increase in installed nuclear capacity from the current level of 393.8 GW² to 471 GW by 2030.

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 have imposed CO₂ emission fees. Projects to install CO₂ capture and utilisation systems at thermal power plants in order to minimise emissions are expected to be developed in the future. However, current estimates show that an increase in the LCOE of thermal power plants by more than 40-60% will make them economically unviable.

Due to these factors, nuclear power will remain in demand in the long term.

ROSATOM's competitive position

The competitiveness of services provided by ROSATOM is based on its unique facilities, technical capabilities and human resources, as well as the experience of coordinating R&D and design organisations. 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. In 2022, ROSATOM was the largest global market player in terms of the portfolio of overseas NPP construction projects (34 power units).

For more information on ROSATOM's main competitors, see the section 'Markets Served by ROSATOM'.

1.1.2. Long-term strategic goals

ROSATOM's business strategy until 2030 has been developed based on the goals set by the government for the civilian branch of the nuclear industry; it was updated in 2020 and approved by ROSATOM's Supervisory Board on 28 April 2020.

ROSATOM's development is based on the long-term technological policy, which involves mastering new-generation nuclear energy 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 conversion and enrichment services, nuclear fuel fabrication, etc.).

ROSATOM's competitive advantages:

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

ROSATOM's mission is to leverage the achievements of nuclear science and modern high technology for the benefit of humanity.

1. IEA, World Energy Outlook 2022 (STEPS).
2. Power Reactor Information System (PRIS) developed by the IAEA (<https://pris.iaea.org>).

The global energy crisis caused by geopolitical tensions and restrictive policies adopted by certain countries was a major external factor in 2022. Most countries responded to the crisis by closely focusing on energy security, diversifying the energy mix and increasing investment in clean energy sources.

For ROSATOM as a global player on the nuclear technology and wind power markets, this opens up opportunities for further expansion into international markets, primarily with product offers focused on zero-carbon energy and targeted at emerging markets.

ROSIATOM's strategy provides it with sufficient flexibility in its development to enable it to leverage the opportunities arising in the industry.

ROSIATOM's mission reflects the development model that it has prioritised: the Corporation leverages the research, technological and manufacturing capabilities that it has developed over the years and continues to create new technologies that can help to improve the standard of living around the world.

ROSIATOM's operations facilitate the implementation of the global sustainable development agenda. The Corporation contributes to the achievement of the UN Sustainable Development Goals through its product line and its efforts to ensure the sustainability of internal environmental, social and governance processes.

For details, see the section 'Sustainable Development Management'.

ROSIATOM's business strategy provides general guidelines for the long term, shapes the target vision for 2030 and sets a framework for development.

ROSIATOM's vision is to become a global technological leader. Accordingly, the Corporation intends to expand the scale of its business to match existing global technological leaders.

By 2030, the Corporation intends to increase its revenue to RUB 4 trillion, with the share of new products in revenue expected to increase several times over; the Corporation also intends to expand its overseas footprint.

The vision provides an industry-wide focus on developing modern high technology and sets ambitious goals for each of the prioritised areas. Thus, the overall goal of expanding the scale of business is decomposed. In the sphere of nuclear power generation, this helps to maintain the continuity of strategic goals, enabling ROSIATOM to remain an undisputed leader in the global nuclear industry.

The vision also involves creating a governance system meeting international standards and easily adaptable to a changing environment; customer centricity, i.e. proactively identifying customer needs, and fully unlocking the potential of our employees by providing an environment for lifelong learning and developing programmes to attract the best talent.

ROSIATOM has set itself four 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, ROSIATOM is currently expanding its footprint in over 50 countries around the world and the long-term portfolio of overseas orders and increasing the corresponding revenue;
- **To reduce production costs and the lead time.** In order to develop the most competitive products, ROSIATOM will take further steps to reduce the duration of NPP construction and the levelised 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, ROSIATOM plans to increase the share of new businesses in revenue significantly by 2030;
- **To achieve global leadership in state-of-the-art technology.** ROSIATOM seeks to extend its global leadership beyond the nuclear industry. The Corporation intends to leverage its existing capabilities, the understanding of nuclear technologies and accumulated experience in order to diversify into new segments. In the future, ROSIATOM aims to rank among international companies perceived as global technological leaders.

For details on steps taken by the Corporation in order to increase its international market share, see the chapter 'Business Development Report'.

Necessary prerequisites for the implementation of the strategy

- Ensuring safe use of nuclear energy;
- Minimising the negative environmental impact;
- Non-proliferation of nuclear technologies and materials;
- Ensuring that the development of nuclear power is socially acceptable;
- Developing ROSIATOM'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.

Key strategy implementation risks

Key risks that can affect the achievement of strategic goals include:

- 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, as well as reputational risks);
- 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);
- Climate risks (including environmental risks and energy transition risks).

For details on the key risks, see the section 'Risk Management'.

1.2. SUSTAINABLE DEVELOPMENT MANAGEMENT

1.2.1. Key sustainable development results

In the context of sustainable development, it is important that sustainability should be recognised in official documents at the national level.

Nuclear power qualifies as ‘green’ in Russia’s Taxonomy and in China’s Green Bond Endorsed Projects Catalogue. Important developments in 2022 included the establishment of detailed criteria in the EU Sustainable Finance Taxonomy for nuclear power to qualify as a transitional activity. In late 2022, South Korea published a national Taxonomy, in which nuclear power is listed as a ‘green’ economic activity, provided that it meets a number of criteria. In addition, January 2023 saw the publication of the EAEU Taxonomy, in which nuclear power is also listed as a ‘green’ activity, provided that it meets basic sustainability criteria.

The sustainable development agenda is incorporated into ROSATOM’s Business Strategy until 2030. The promotion of the 17 UN Sustainable Development Goals is explicitly stated in the Strategy as a vital prerequisite for ROSATOM’s operation. In the course of its operations, ROSATOM is committed to global sustainable development priorities and adheres to the 10 principles of the UN Global Compact in the sphere of human rights, labour, the environment and anti-corruption. ROSATOM contributes to the achievement of the UN Sustainable Development Goals through its product line, its financial and economic performance and its efforts to ensure the sustainability of internal environmental, social and governance processes.

Executives’
Memorandum of
Commitment:



Sustainable development covers all employees in the industry; the Corporation regularly holds internal events and workshops on various aspects of sustainable development for its employees and executives, including events attended by ROSATOM’s Director General. This included a strategic session titled ‘Sustainability Principles in the Nuclear Industry’ held for top 30 executives in early 2022, which resulted in the drafting and publication of a memorandum of commitment of executives in the nuclear industry to the principles of sustainable development.

Since 2020, ROSATOM has been a member of the UN Global Compact International Network. In 2022, the Corporation also joined the National ESG Alliance, which comprises companies leading the Russian ESG agenda. The National ESG Alliance aims to maintain and develop the sustainable development agenda in Russia. As a member of the ESG Alliance, ROSATOM will contribute to the development of sustainability tools and practices, including full-scale involvement of the nuclear industry in national ESG initiatives.

The level of ROSATOM’s sustainability maturity is regularly confirmed by independent ESG ratings. More specifically, last year, the Russian Analytical Credit Rating Agency (ACRA) rated ROSATOM at ESG-3 and assigned it to the ESG-B category, which corresponds to a very high environmental, social and governance score (the assessment was solicited, and the Corporation participated in the rating process). The assessment took into account information on the performance of ROSATOM’s five key Divisions: the Mining, Sales and Trading, Fuel, Engineering and Power Engineering Divisions, given their significant contribution to the company’s overall performance.

ROSATOM continues to apply green finance instruments. 2022 saw the second placement of green bonds worth RUB 9 billion on the Moscow Exchange (the bonds were issued by JSC Atomenergoprom). Compliance of the bond issue with the Green Bond Principles of the International Capital Market Association (ICMA) and with the green finance criteria established by Decree No. 1587 of the Government of the Russian Federation dated 21 September 2021 was verified by the Expert RA rating agency. Overall, by year-end 2022, the Corporation had raised 19 external green loans (ESG loans and green bonds) totalling more than RUB 200 billion to refinance WPP construction projects and the Akkuyu NPP construction project (Turkey).



RUB BILLION

**TOTAL VALUE
OF GREEN
BONDS PLACED
IN 2022**

1.2.2. Assessment of greenhouse gas emissions

ROSATOM has conducted a pilot calculation of greenhouse gas emissions for 2022 for its entire corporate scope (Scope 1 and Scope 2) in accordance with international methodologies. In 2022, greenhouse gas emissions¹ totalled 20.4 million tonnes of CO₂e, including direct emissions (Scope 1) totalling 17.5 million tonnes of CO₂e.

The major share of the Corporation’s direct greenhouse gas emissions (about 88.5%) is produced by JSC RIR, which manages heat and power supply systems in the towns and cities in which ROSATOM operates (mainly coal- and gas-fired CHPPs) to ensure steady energy supply to consumers. As part of its efforts to improve energy efficiency, ROSATOM upgrades its power generation capacities.

1.2.3. ‘Green’ nuclear power: contribution to the climate agenda

The Corporation has singled out the climate agenda as a priority both because it is an essential aspect of sustainable development and given the important contribution of the nuclear power industry to reducing the carbon footprint in Russia and globally.

Nuclear power is characterised by one of the lowest levels of greenhouse gas emissions among existing power generation options and plays a fundamental role in combating climate change. This fact was reflected, among other things, in the final resolution of the 27th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP27) held in November 2022 in Sharm El Sheikh (Egypt). In 2022, a separate IAEA pavilion, #Atoms4Climate, was provided for the nuclear power industry at the conference venue for the first time in the history of the COP climate conferences.

ROSATOM participates in the Conference of the Parties to the United Nations Framework Convention on Climate Change, including as part of the official delegation of the Russian Federation. The highlight of the Corporation’s programme at COP27 in 2022 was the Energy Day on 15 November, including a public discussion titled ‘Nuclear Energy Contribution to the Prosperity of Africa’ held by ROSATOM on the sidelines of the conference. Its participants included speakers from Egypt, Nigeria, Ghana and South Africa.

1. Including PJSC Quadra – Power Generation, which was included in ROSATOM’s scope of consolidation in 2022.

EU Taxonomy Requirements for Nuclear Power:



As part of an analysis of ESG requirements for nuclear power, in 2022, ROSATOM conducted a detailed analysis of compliance of Russian nuclear technologies with the criteria established in the Complementary Delegated Act (CDA) to the EU Taxonomy. Compliance of Russian nuclear technologies and projects with the requirements of the EU Taxonomy has been confirmed through the following groups of criteria: confirmation of the minimum level of greenhouse gas emissions, safety guarantees for the NPP operation stage, commitment to closing the nuclear fuel cycle, and safe radioactive waste management and NPP decommissioning. The findings of the analysis are publicly available on ROSATOM’s website.

In Russia, nuclear power generation accounts for almost half of the total low-carbon power generation. NPPs currently in operation in Russia help to prevent greenhouse gas emissions exceeding 100 million tonnes per year, or about 7% of total emissions in the country.

Since 2017, ROSATOM has been developing the wind power business. At year-end 2022, the Corporation operated seven wind power plants with a total capacity of 780 MW in the Republic of Adygea, the Stavropol Territory and the Rostov Region.

Total contribution of the Corporation’s low-carbon power generation (NPPs and WPPs) to greenhouse gas emission savings in Russia:

Indicator	2020	2021	2022
Low-carbon power generation in Russia (ROSATOM’s NPPs and WPPs), billion kWh	215.9	223.6	225.3
Greenhouse gas emission savings in Russia (ROSATOM’s NPPs and WPPs), million tonnes of CO ₂ e	108.4	109.2	110.2

Since 2022, ROSATOM jointly with the Russian Ministry of Energy and other relevant government agencies has been participating in a major national-scale innovative project titled ‘Full Life Cycle Low-Carbon Energy’. This involves providing R&D support for the development and implementation of new approaches to developing full life cycle low-carbon energy with a focus on nuclear power generation, hydrogen energy, renewable energy and energy storage systems based on new domestically developed knowledge-intensive solutions and technologies.

GRI 2-23
GRI 2-24

1.2.4. Fulfilment of responsible business commitments. Sustainable processes

ROSATOM applies the Uniform Industry-Wide Policy on Sustainable Development¹, which sets out the objectives and key principles guiding the efforts of ROSATOM and its organisations in the sphere of health, safety and the environment, in the social sphere and in the sphere of corporate governance. In addition, in order to systematise sustainability initiatives in the industry, ROSATOM applies and regularly updates the Uniform Industry-Wide Methodological Guidelines on the Management of Sustainability Initiatives.

Regulations concerning every aspect of sustainable development have been approved in the industry. They define the key principles underlying environmental, social and governance initiatives of ROSATOM and its organisations, as well as the mechanisms for implementing these principles. These include the following documents adopted in ROSATOM and approved by ROSATOM’s Director General: the Environmental Policy¹, the Social Policy², the Code of Ethics and Professional Conduct³, the Anti-Corruption Policy⁴, etc. In 2022, ROSATOM developed and approved a Human Rights Policy⁵.

1. <https://rosatom.ru/upload/iblock/a42/a42fc60d74177edf55f9e4ec64618da3.pdf>
2. <https://rosatom.ru/upload/iblock/5c3/5c3ce2206d4406f2686f2e1fdec013c5.pdf>
3. <https://rosatom.ru/upload/iblock/278/278a5b347258378ee344cfe106806484.pdf>
4. <https://rosatom.ru/upload/iblock/d08/d08a5dc6dedea5cf251f81e14f8742d7.pdf>
5. <https://www.rosatom.ru/upload/iblock/685/68595993dc72b393b5a60aaa95548e5b.docx>
6. <https://rosatom.ru/journalist/729-П.pdf>

The Corporation’s sustainable development initiatives involve continuous process improvement, the implementation of health, safety and environmental projects, development of a supply chain management system, as well as personnel management and talent development. Progress on various aspects of sustainable development is monitored on a regular basis. Tools used for measuring the Corporation’s sustainability performance include ESG indicators approved in 2022 as part of an industry-wide library of ESG indicators. Indicators forming part of the library include both universal ESG metrics (such as greenhouse gas emissions, the share of recycled and reused water as a percentage of water withdrawal, the share of women in the industry’s workforce) and indicators specific to the nuclear industry (such as SNF processing volumes).

Sustainability principles are being implemented not only in ROSATOM but also in other organisations in the industry. Sustainability coordinators have been appointed in 24 holding companies and organisations in the industry; steps are being taken to operationalise the sustainable development agenda, and the relevant action plans are being implemented.

ROSATOM’s representatives participate in public discussions on sustainable development on Russian and international platforms. For instance, in 2022, they took part in discussions focused on sustainable development on platforms such as EXPO2020, COP27, SPIEF, and ‘Arctic: Today and the Future’.

Systematic steps are taken in the industry to inform employees about sustainability priorities and objectives; workshops and other events are held, and employee surveys are conducted. A section titled ‘Sustainable Development’ has been created on the intranet portal; it includes a Library of Industry Sustainability Practices designed to systematise existing approaches and enable organisations in the industry to share their experience.

GRI 2-26 Employees are informed about an industry-wide hotline which can be used for submitting reports, including complaints and enquiries from individuals and organisations, to safeguard their right to apply in person and to submit individual and group enquiries to protect the rights and legitimate interests of the company, its organisations and their employees.

GRI 2-17 In order to develop sustainability competences, in 2022, a face-to-face training programme on sustainable development was launched for employees in the industry at ROSATOM’s Corporate Academy. Representatives of 46 organisations of ROSATOM completed the training; the programme will be run on a regular basis. In addition, the sustainability section of ROSATOM’s online training system, RECORD Mobile, is systematically updated. The Supervisory Board did not undergo sustainability training in the reporting year.

ROSATOM adheres to the principle of maximum transparency and seeks to maintain a dialogue with stakeholders. More specifically, as part of its commitments as a member of the UN Global Compact International Network, in 2022, ROSATOM prepared its second sustainability report, which was published on the website of the UN Global Compact at <https://www.unglobalcompact.org>. The report has been rated ‘Active’, which means that ROSATOM monitors a number of ESG indicators and operates in accordance with the 10 principles of the UN Global Compact in the sphere of human rights, labour, the environment and anti-corruption.

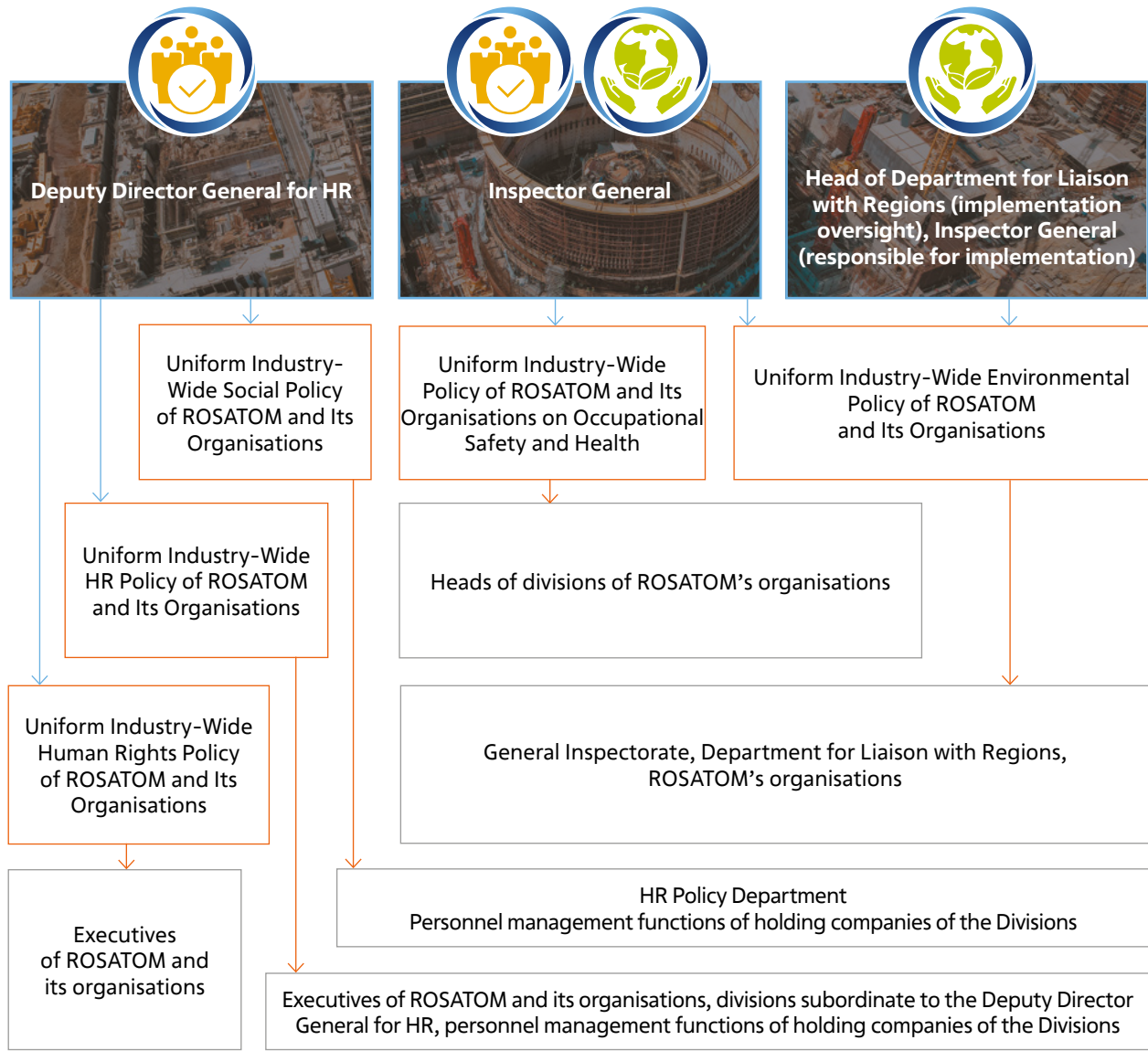
GRI 2-13 Allocation of responsibility for impact management
GRI 2-24 and implementation of the Corporation's policies



 Supervising executive

 Policy name

 Functions and organisations responsible for implementing the policy



 Economic impacts

 Social impacts

 Environmental impacts

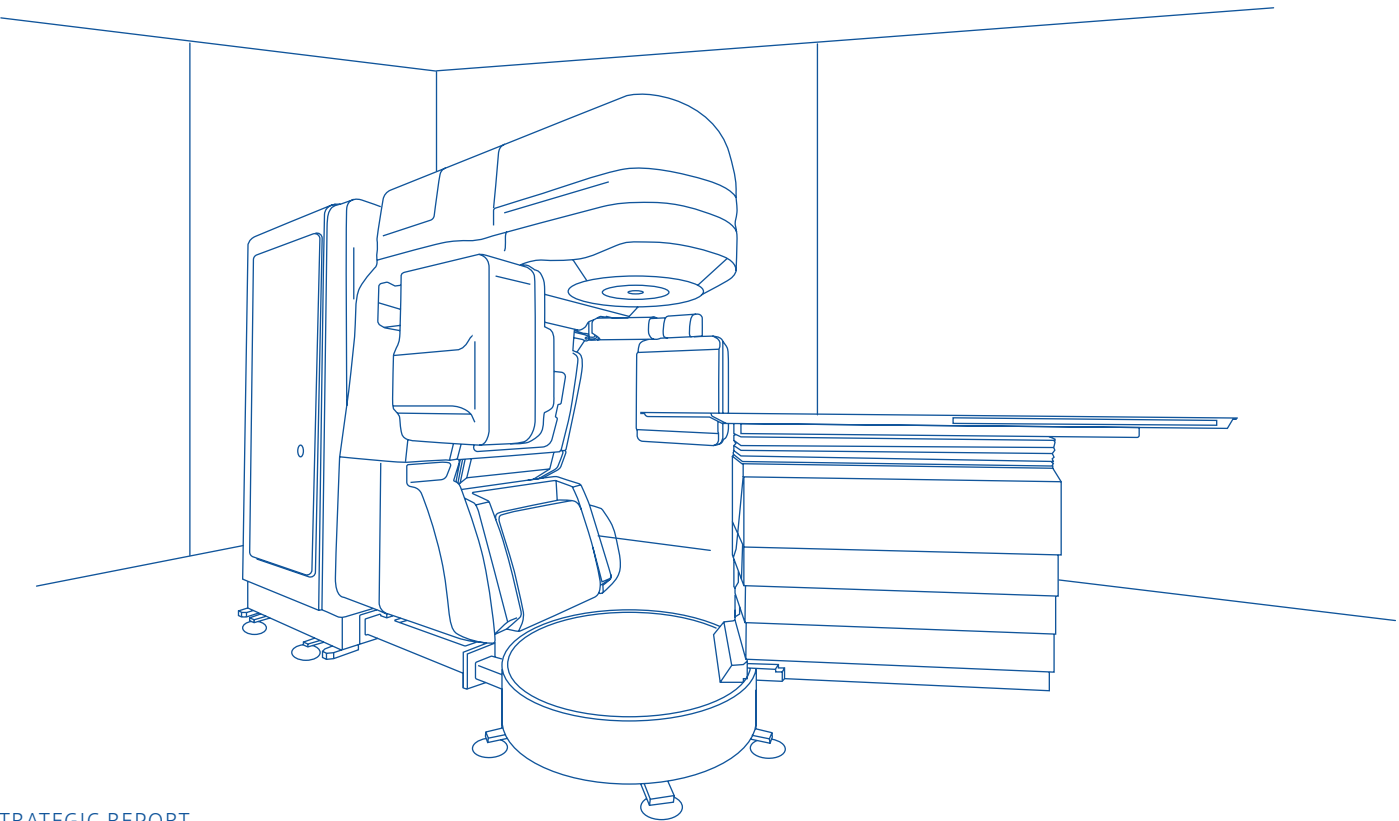
1.2.5. Sustainable products

As part of product line development in the industry, special emphasis is placed on environmental and climate performance of products and projects, value creation for end users and assessment of product solutions in terms of their alignment with sustainability priorities. More specifically, in order to enhance the sustainability of the product line, in 2022, ESG reporting requirements were incorporated into product strategies and strategic programmes.

The nuclear industry is one of the most knowledge-intensive and high-technology sectors. In addition to nuclear power, the Corporation is also developing other low-carbon products, including wind power generation, hydrogen energy technology, energy storage systems and digital solutions for the electric power industry. Nuclear technology also provides a basis for the development of solutions for nuclear medicine and isotope products, radiation processing technologies, environmental solutions, international logistics, etc.

As part of its focus on increasing the share of ‘green’ products in its product line, ROSATOM monitors ESG performance across its key product areas. To do so, ROSATOM has established an internal ESG certification procedure. In 2022, more than 20 product areas underwent certification, including small NPPs, wind power, the ‘smart city’, nuclear medicine, etc. In 2022, product areas that underwent internal sustainability certification and had their ‘green’ status confirmed accounted for about 40% of total revenue from new businesses.

For details, see the Sustainability Report.



1.3. VALUE CREATION AND BUSINESS MODEL

ROSATOM 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. Realising the importance of its operations for the economy and society, ROSATOM 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 ROSATOM, but also to the combination of economic, social and environmental impacts of ROSATOM on its stakeholders, society as a whole and the environment.

ROSATOM 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.

The business model is based on ROSATOM’s long-term business strategy. It forms part of the business value chain, which also includes:

- Available capitals;
- A governance system aimed at ensuring the most efficient use of the capitals;
- Operating results and their contribution to the long-term increase in the capitals, which is measured by performance against the targets set in the strategy.

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 diagram below 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 capital 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 (e.g. natural resources or public infrastructure) are owned jointly with other stakeholders. 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.

Capitals available as at 31 December 2021

Financial capital

Adjusted free cash flow:
RUB 338.0 billion
Revenue under IFRS:
RUB 1,462.1 billion

Manufactured capital

Number of power units in operation: **35**
NPP capacity factor: **83.18%**

Intellectual capital

Intangible assets under IFRS: **RUB 199.7 billion**
Number of foreign patents obtained by ROSATOM: **2,906**

Human capital

Average headcount: **288,500 people**
Personnel turnover rate: 10.0%
Average training hours per employee: **42.27**

Social and relationship capital

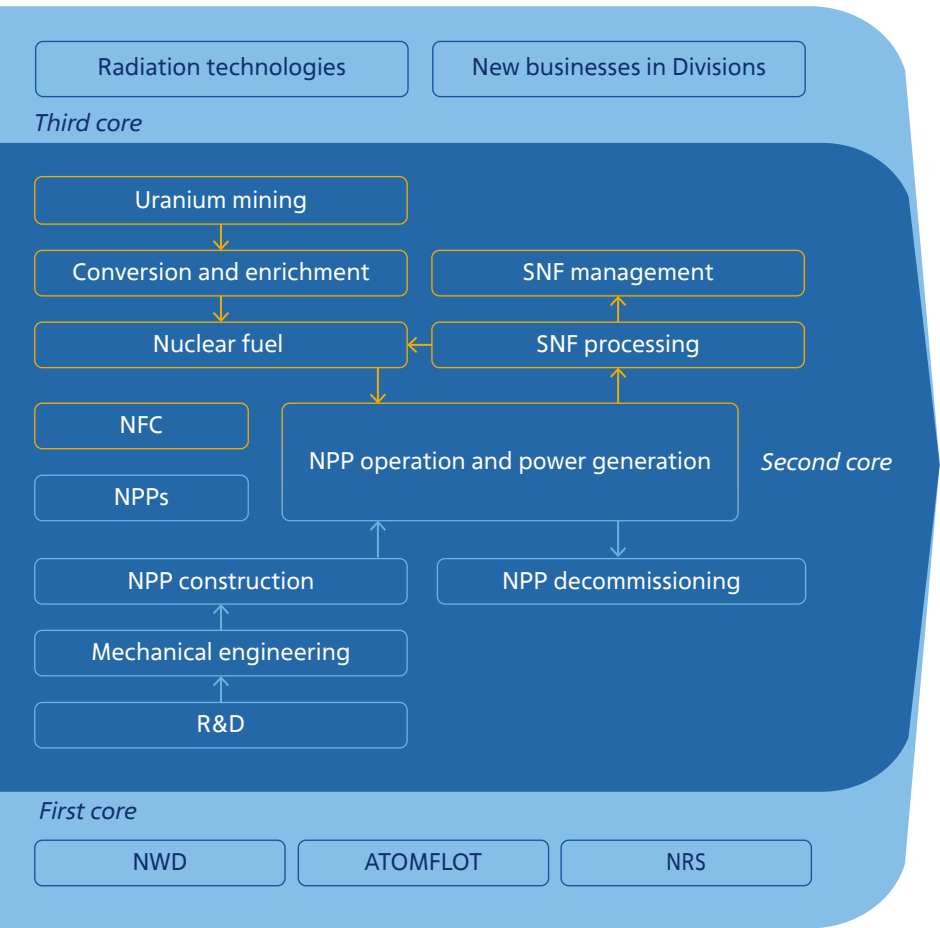
Level of support for nuclear power in Russia: **66%**
Taxes paid: **RUB 249.3 billion**

Natural capital

Water withdrawal from natural sources: **4,979.2 million m³**

ROSATOM's business model

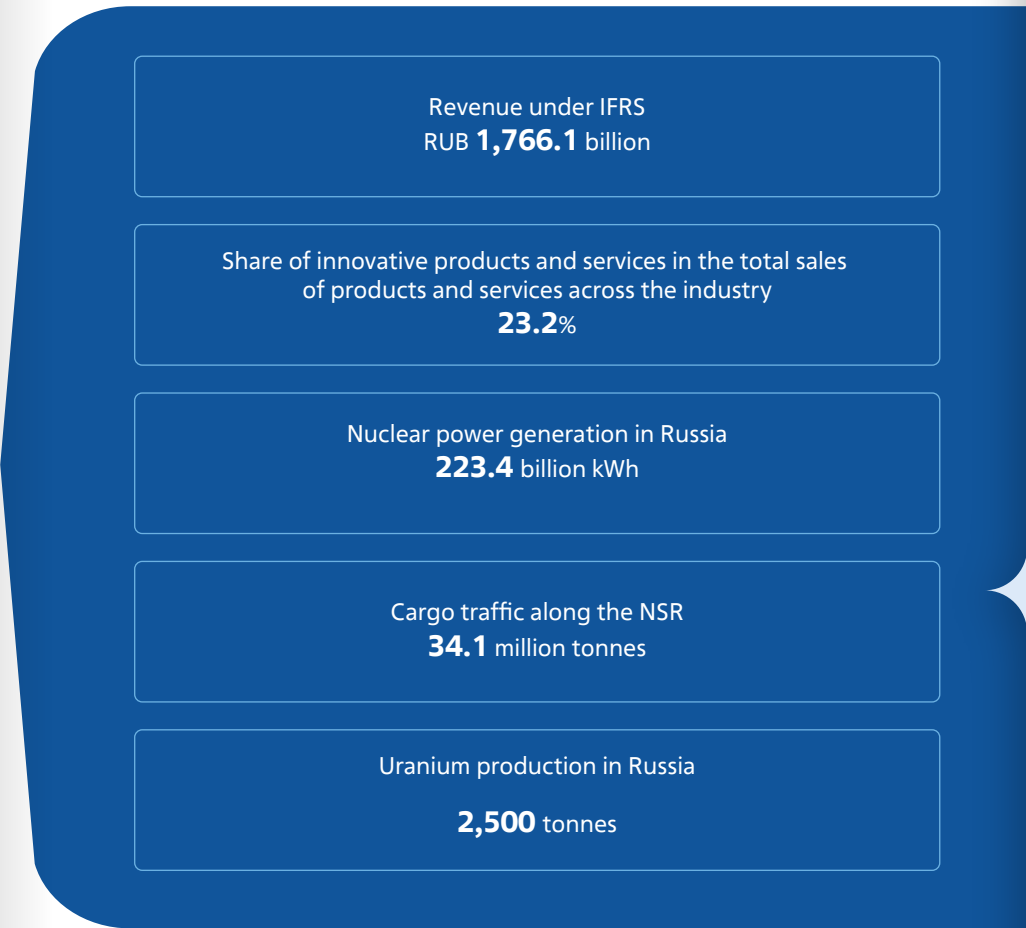
VALUE CREATION IN CORE BUSINESSES



Goals of the 2030 Strategy:

- 1. To increase the international market share
- 2. To reduce production costs and the lead time

KEY PRODUCTS (RESULTS IN 2022)



- 3. To increase the share of new products for the Russian and international markets
- 4. To achieve global leadership in state-of-the-art technology

Capitals available as at 31 December 2022

Financial capital

Adjusted free cash flow **+9.9%**
Revenue under IFRS **+20.8%**

Manufactured capital

Number of power units in operation during the year **+0%**
Capacity factor of Russian NPPs **+3.6%**

Intellectual capital

Intangible assets under IFRS **+10.1%**
Number of foreign patents obtained by ROSATOM **+8.4%**

Human capital

Average headcount **+14.1%**
Personnel turnover rate **+6%**
Average training hours per employee **-5.2%**

Social and relationship capital

Level of support for nuclear power in Russia **+11 p.p.**
Taxes paid **+16.9%**

Natural capital

Water withdrawal from natural sources **+11.2%**



Value creation results

Indicator	2020	2021	2022	2022/2021, %
FINANCIAL CAPITAL				
Adjusted free cash flow, RUB billion	335.0	338.0	371.4	+9.9%
Revenue under IFRS, RUB billion	1,207.4	1,462.1	1,766.1	+20.8%
MANUFACTURED CAPITAL				
Number of power units in operation during the year ¹ , pcs.	36	35	35	+0%
Capacity factor of Russian NPPs, %	81.07	83.18	86.21	+3.6%
INTELLECTUAL CAPITAL				
Intangible assets under IFRS, RUB billion	199.6	199.7	219.9	+10.1%
Share of innovative products in revenue, %	25.0	25.7	23.2	-9.7%
Number of foreign patents obtained by ROSATOM, applications for foreign patents submitted and registered under the established procedure, registered trade secrets (know-how), pcs.	2,562	2,906	3,150	+8.4%
HUMAN CAPITAL				
Average headcount, '000 people	276.1	288.5	329.2	+14.1%
Personnel turnover rate, %	12.0	10.0	10.6	+6%
Average training hours per employee	30.65	42.27	40.05	-5.2%
LTIFR	0.09	0.08	0.11	+37.5%
SOCIAL AND RELATIONSHIP CAPITAL				
Level of support for nuclear power in Russia, %	53	66	77	+11 p.p.
10-year portfolio of overseas orders, USD billion	138.3	139.9	135.9	-2.9%
Taxes paid, RUB billion	249.9	249.3	291.4	+16.9%
NATURAL CAPITAL				
Water withdrawal from natural sources, million m ³	6,059.2	4,979.2	5,536.1	+11.2%

1. Excluding the floating thermal nuclear power plant.

Benefits provided to stakeholders in 2022

Government level

Tax payments to budgets of all levels **RUB 291,427 million**

National projects and programmes involving ROSATOM:

- Housing and Urban Environment;
- Education;
- Culture;
- Ecology;
- Clean Water;
- Demographic Situation;
- Small and Medium-Sized Businesses;
- Safe and High-Quality Roads;
- Healthcare;
- Digital Economy of the Russian Federation;
- Science;
- Labour Productivity and Employment Support;
- Sports as a Way of Life;
- Modern School;
- Efficient Region;
- Every Child’s Success;
- Government Programme ‘Development of the Nuclear Power and Industry Complex’;
- Comprehensive Programme ‘Development of Technical Capabilities, Technology and Scientific Research in the Use of Nuclear Energy in the Russian Federation until 2024’.

Corporate level

Nuclear power generation in Russia: **223.4 billion kWh**

Number of events rated at level 1 or higher on the INES scale: **0**

Expenditure on scientific research: **RUB 10.3 billion**

Procurement from SMEs: **RUB 312.9 billion**

Average monthly salary: **RUB 107,200 per month**

Expenditure on corporate social programmes for employees: **RUB 15.2 billion**

Total number of students studying at universities under arrangements with organisations in the industry:

- More than **8,700** students completed internships and work placements in ROSATOM’s enterprises;
- About **2,500** university and college graduates were hired in the industry.

Social level

Jobs created: **6,389**

The Smart City platform is being rolled out in **102 towns and cities**; 12 regional projects

Expenditure on environmental protection: **RUB 24.65 billion**

Energy cost savings: **RUB 560.68 million**

Direct greenhouse gas emissions in Russia: **17,503,400 tonnes of CO₂ equivalent**

Waste processed by ROSATOM’s enterprises: **30,447,400 tonnes**

1.4. MARKETS SERVED BY ROSATOM

In 2022, ROSATOM ranked:

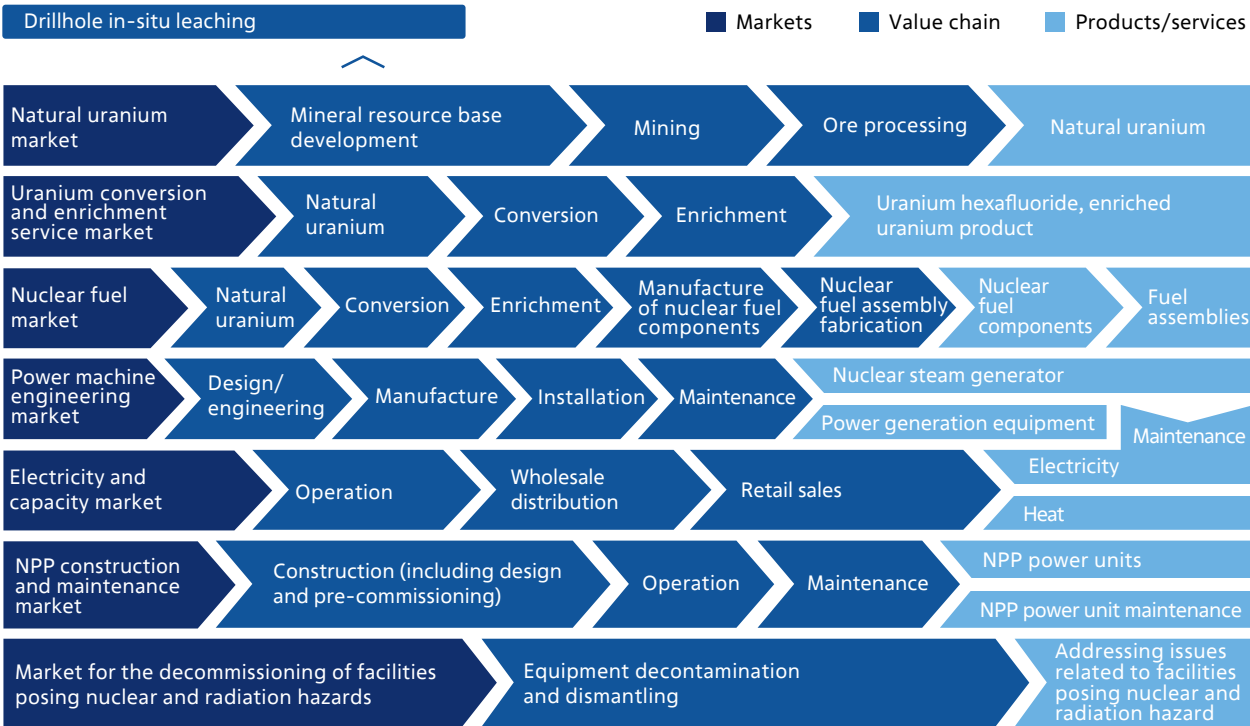
- First in the world in terms of the number of NPP power units in the portfolio of foreign projects (34 power units);
- First on the global uranium enrichment market (35%);
- Second in the world in terms of uranium production (14% of the market);
- Third on the global nuclear fuel market (17%).

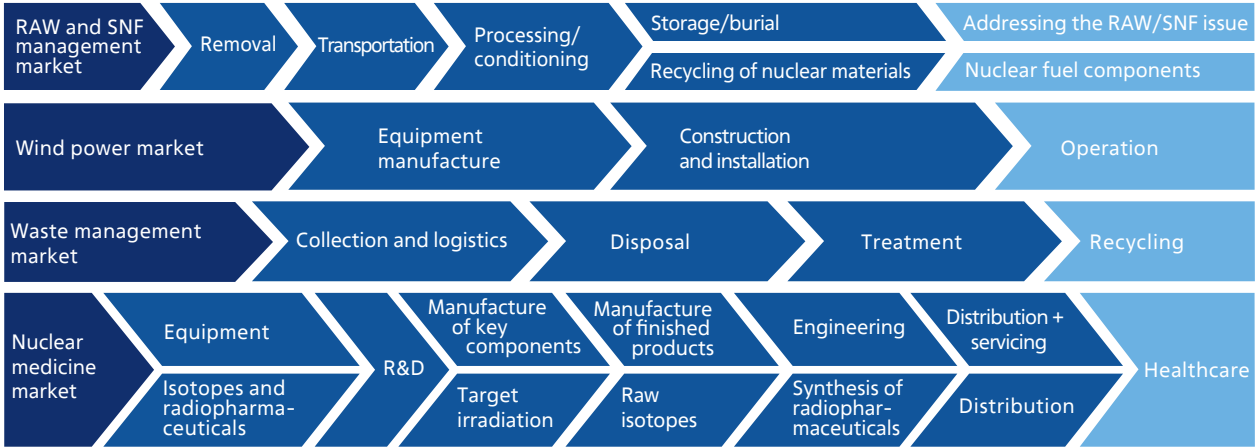
ROSATOM’s vision is to become a global technological leader. Accordingly, the Corporation intends not only to rapidly develop its business in traditional segments, but also to take active steps towards entering new high-technology markets as a leading research and technology company.

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 (both traditional and new ones).

GRI 2-6 Markets served by ROSATOM and value chains

In the reporting year, there were no changes in the value chain, including the supply chain.





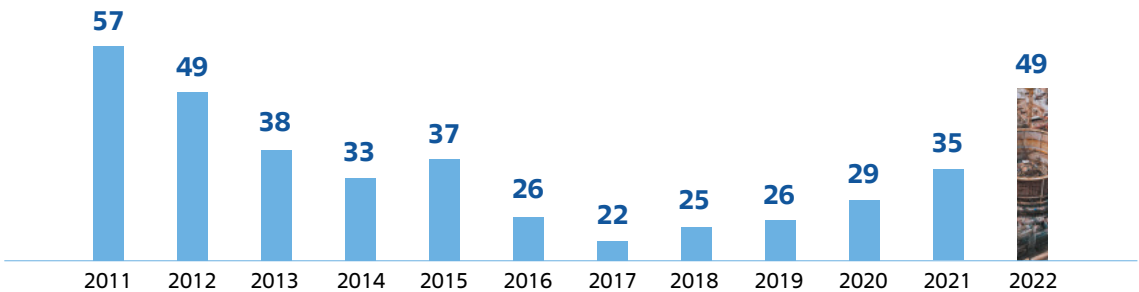
Natural uranium market

Forecast for changes in uranium demand by 2030

In 2022, global reactor demand for uranium totalled 63,500 tonnes¹. At the same time, global demand taking into account commercial and strategic stockpiling not intended for current consumption is estimated at 74,300 tonnes.

According to UxC, in 2022, average spot market quotations for uranium increased by 42% to USD 49/lb of U₃O₈. The rise in market prices was driven by geopolitical tensions and continued uranium buying by financial investors. In April 2022, spot quotations reached USD 63.75/lb of U₃O₈ for the first time since the Fukushima nuclear disaster (11 March 2011). During the months that followed, amid limited demand from energy companies, quotations were driven primarily by demand from intermediaries and financial investors, whose activity was limited by the ability to raise financing.

Average annual spot market quotations for natural uranium, USD/lb of U₃O₈



Sources: input data from UxC²²; average values have been calculated by JSC Atomredmetzoloto.

1. Hereinafter, data on the uranium market from a report by UxC (UMO Q1 2023) are used.
2. UxC, LLC (UxC) is an independent international company specialising in market analysis, research and forecasting covering the entire nuclear fuel cycle (<https://www.uxc.com/>).

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 base case forecast of the World Nuclear Association (WNA), global reactor demand for uranium will increase to 70,200 tonnes by 2025 and to 79,400 tonnes by 2030.

Natural uranium market overview

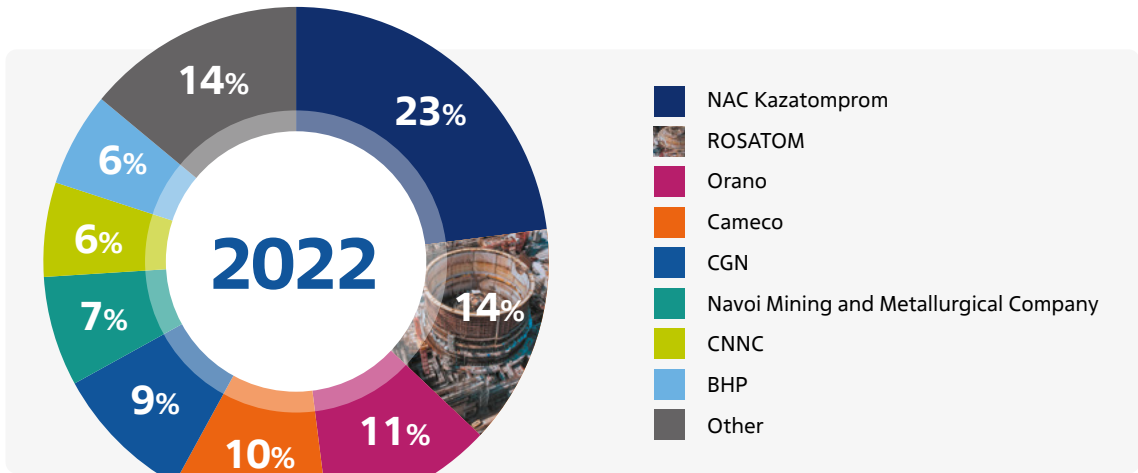
In 2022, global uranium production increased by 6% to 50,400 tonnes, with nine major companies, namely NAC Kazatomprom (Kazakhstan), CNNC and CGN (China), JSC Atomredmetzoloto and Uranium One (companies of ROSATOM), Orano (France), Cameco (Canada), Navoiyuran State Enterprise (Uzbekistan) and BHP (Australia – UK) accounting for about 85% of global production.

NAC Kazatomprom has been the largest uranium mining company globally since 2010 (23% of global production in 2022). In 2022, ROSATOM ranked second in the world in terms of uranium production.

Supplies from secondary sources (inventories of energy companies and some states, reparation of depleted uranium hexafluoride, reprocessed uranium, etc.) in 2022 were estimated at 24,000 tonnes of natural uranium equivalent.

According to the UxC forecast, in 2023, global uranium production will total 56,000 tonnes, while supply from secondary sources will total about 14,000 tonnes. Global production of natural uranium is expected to increase by 2030 due to rising demand. Supply from secondary sources will total about 7,000 tonnes of natural uranium equivalent in 2030.

Largest players on the natural uranium market in 2022



Source: company reports, UxC

Uranium conversion and enrichment market

Products and services offered on the market include uranium hexafluoride (UF₆), uranium conversion services, enriched uranium product and uranium enrichment services.

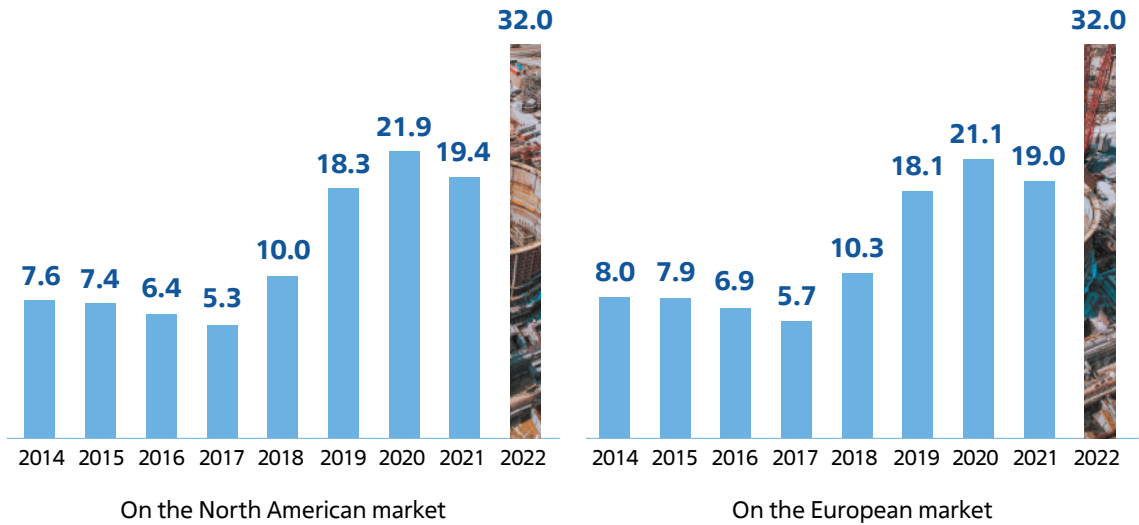
Forecast for changes in demand for uranium conversion services by 2030

According to the base case scenario of the World Nuclear Association, in the reporting year, global reactor demand for uranium conversion services totalled about 63,000 tonnes.

In 2022, average annual spot quotations on the North American and European markets rose by 65% and 68% respectively, while average annual long-term quotations increased by 34% and 35% respectively.

The increase in quotations was caused mainly by market concerns over the availability of material, including given the limited conversion capacities of Western producers.

Average annual spot market quotations for conversion services, USD/kg of uranium



The development of nuclear power generation until 2030 will have a positive impact on the market for uranium conversion services. According to the base case scenario of the World Nuclear Association, global demand for conversion services may grow to 67,000 tonnes by 2025 and 75,000 tonnes by 2030.

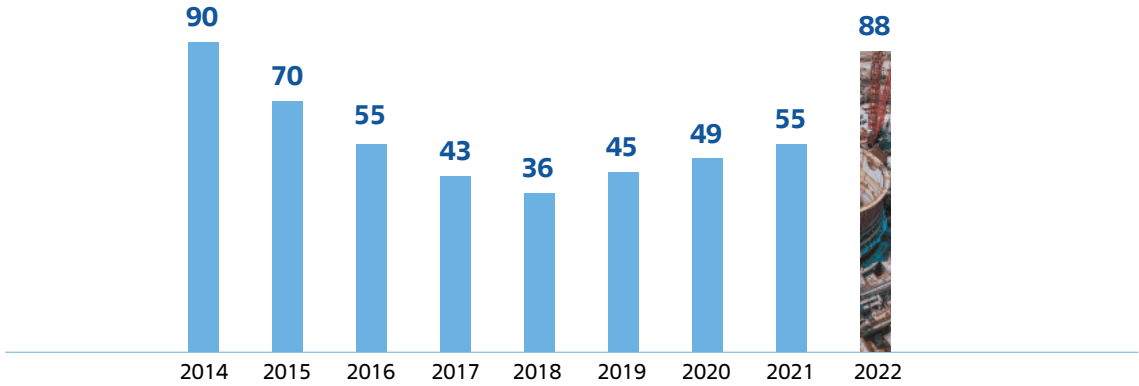
Forecast for changes in demand for uranium enrichment services by 2030

According to the World Nuclear Association, in 2022, global reactor demand for enrichment totalled about 52 million separative work units (SWU)¹. In 2022, average annual spot market quotations rose by 61%, while long-term quotations soared by 88%. Their growth was driven mainly by market concerns over the availability of enrichment services, including given the limited capacities of Western producers.

1. Report by the World Nuclear Association, 2022 (at a tails assay of 0.22%). ROSATOM estimates this figure at 55 million SWU at a tails assay of 0.18% (which is equivalent to 49 million SWU at a tails assay of 0.22%).

The development of nuclear power generation until 2030 will have a positive impact on the market for uranium enrichment services. According to the base case scenario of the World Nuclear Association, global demand for enrichment will grow to 55 million SWU by 2025 and 63 million SWU by 2030.

Average annual spot market quotations for enrichment services, USD/SWU



Uranium conversion and enrichment market overview

Along with ROSATOM, key players on the global market for uranium conversion services include Orano (France), Cameco (Canada), CNNC (China) and Converdyn (US).

The main players on the global market for uranium enrichment services include ROSATOM (35% of the global market), URENCO (UK, Germany, Netherlands; 33%), Orano (France) and CNNC (China) (13% each). Together, they control more than 90% of the market. At present, all players use modern gas centrifuge technology for uranium enrichment.

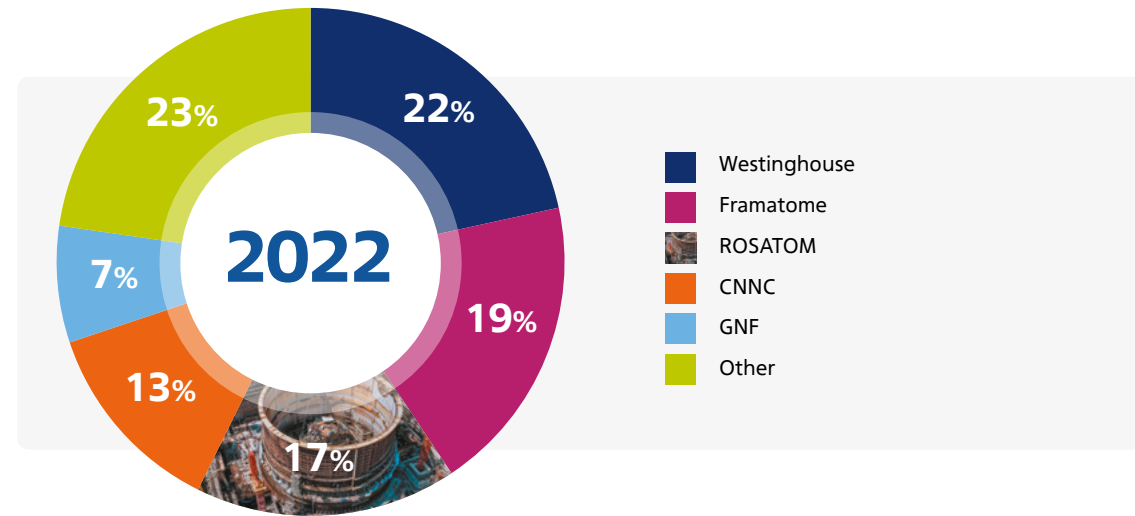
Nuclear fuel fabrication market

According to ROSATOM’s estimates, in 2022, the global nuclear fuel market capacity totalled 10,200 tonnes of heavy metal (tHM), with fuel for light-water and other reactors requiring uranium enrichment accounting for ~7,200 tHM (including ~1,200 tHM of fuel for water-cooled water-moderated power reactors (VVERs)) and fuel for heavy-water reactors accounting for ~3,000 tHM.

As the reactor fleet will be expanding, the demand for fabrication services may increase to 12,500 tHM by 2030.

Global suppliers on the fabrication market include Westinghouse (with a market share of 22%), Framatome (Areva until 2018, with a market share of 19%), ROSATOM (17%), CNNC (13%) and Global Nuclear Fuel (7%).

Shares of players on the nuclear fuel fabrication market, %



In the reporting year, Russian nuclear fuel fully met the demand of Russia and a number of partners, including Belarus, Armenia and some Central European countries, for reactor fuel. ROSATOM also partially met the demand of Finland, India, China and a number of other countries for reactor fuel.

Entering new nuclear fuel markets

In 2022, the Corporation continued to take steps towards entering the market 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 2022, the Corporation continued the transition to the use of uranium/plutonium MOX fuel in the BN-800 reactor at power unit No. 4 of Beloyarsk NPP. The formation of a core fully loaded with MOX fuel at the power unit will be completed in 2023. In addition, fuel for start-up core loading and for the first reloading of CFR-600, the first high-power fast neutron reactor currently under construction in China, was manufactured and shipped to the customer.

The Corporation continues to implement the Proryv (Breakthrough) Project. It involves building a fuel fabrication/refabrication module, which will produce mixed nitride uranium/plutonium fuel. In 2022, fuel assemblies with removable containers, which will enable the testing of nitride fuel up to design limits, and an assembly for materials testing containing samples of materials for advanced fast reactor cores were loaded into the BN-600 reactor at Beloyarsk NPP. In addition, in 2022, the first MNUP fuel assemblies with BN-1200-sized fuel elements were produced, to be loaded for testing into the BN-600 reactor.

For details, see the section 'Research and Innovations'.

Power machine engineering market

Power machine engineering helps to ensure reliable electricity supply and thus meets a basic need of the modern economy.

In 2022, the Russian market saw a relative decline in industrial output, which affected all segments of mechanical engineering. The Russian power machine engineering industry demonstrated a mixed performance across key product groups. In the steam turbine equipment segment, a downward trend continues, with production declining by 33.2%¹ in 2022 following a 67% decrease in 2021. In the steam generation equipment segment, a 207% rise in production in 2021 was followed by a 68.6% decline in 2022. In the gas turbine equipment segment, output increased by 43.9% in 2022 following a 60% decrease in 2021. This was driven by the adaptation of the power machine engineering market after foreign producers had left Russia and unfriendly countries had imposed sanctions.

The Mechanical Engineering Division of ROSATOM is one of the largest power machine engineering companies in Russia. In 2022, ROSATOM increased its share on the Russian power machine engineering market in terms of revenue from 42% to more than 43.2%.

The core competence of the Mechanical Engineering Division is the supply of full sets of reactor and turbine island equipment for nuclear power plants. In 2022, equipment produced by the Division was used at 19% of power units globally. Enterprises forming part of the Mechanical Engineering Division produce reactor equipment for 39% of large power units under construction globally.

Given that foreign suppliers have left the Russian market, this provides ROSATOM with additional opportunities to actively develop new businesses.

NPP construction and operation market

In recent years, key trends in the development of the global electricity market include heightened scrutiny of environmental aspects of the electric power industry and an increase in the share of zero-carbon power generation in the global energy mix. Countries seek to reduce the share of power plants using fossil fuels, such as coal and gas, and to develop renewable energy sources, such as solar and wind power plants, etc. Despite a surge in renewable power generation, its stability in the absence of expensive energy storage systems remains an unresolved issue. As a result, nuclear power generation is currently one of the most reliable, cheapest and most environmentally friendly sources of electricity. The International Energy Agency forecasts that by 2030, the global installed capacity of NPPs will reach 471 GW², which reflects steady growth of nuclear power generation.

In 2022, nuclear power accounted for about 10% of global electricity generation. According to the IAEA, in 13 states, more than a quarter of electricity demand is met by nuclear power generation. Countries with the largest share of nuclear power generation include France (69%), Slovakia (52%) and Belgium (47%).

According to the IAEA³, as at 31 December 2022, 439 power reactors with a total capacity of 393.8 GW were in operation (including the suspended Japanese reactors). Another 57 reactors were under construction.

1. Estimates based on data from the Federal State Statistics Service.

2. IEA, World Energy Outlook 2022 (Stated Policies Scenario).

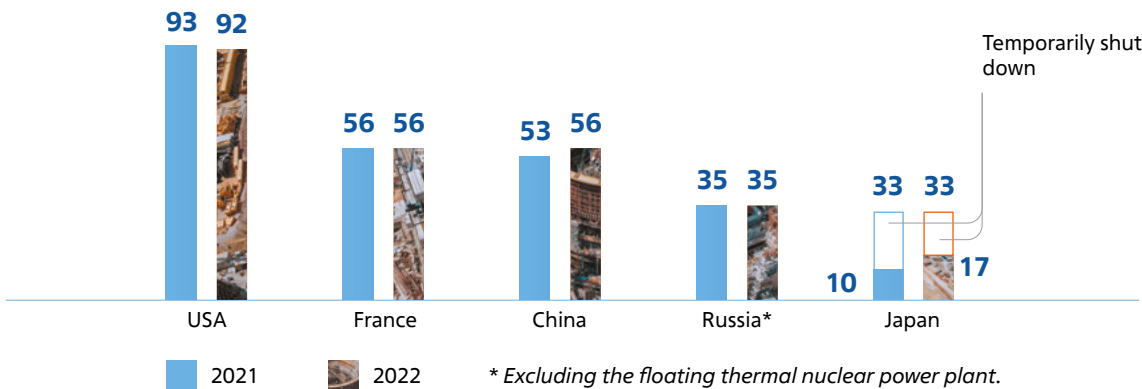
3. Power Reactor Information System (PRIS) developed by the IAEA (<https://pris.iaea.org>).

In 2022, 35 power units of 10 NPPs and the floating thermal nuclear power plant were in operation in Russia, with their installed capacity totalling 29.6 GW. In 2022, ROSATOM ranked second among nuclear power generation companies globally in terms of installed NPP capacity, surpassed only by the French EDF. Russia ranks fourth in the world in terms of the number of NPP power units in operation.

Light-water reactors (VVER, PWR, BWR, LWGR) are the main type of reactors currently in operation in the world. They make up 92% of the global market (as a percentage of the total installed capacity).

According to the IAEA, new nuclear power generation capacities connected to the grid globally in 2022 totalled 6.1 GW. At present, demand for NPP construction comes primarily from Asian countries, which is due to rapidly growing electricity consumption in this region. ROSATOM is taking active steps to expand its footprint on the overseas market as a leader in terms of the number of NPP construction projects.

Leading countries by the number of operating NPP power units in 2021 and 2022, at year end



NPP servicing market

ROSATOM provides NPP maintenance services covering the entire life cycle: it assists in the development of nuclear infrastructure, provides personnel training and supplies equipment for training centres, provides engineering and technical support at the commissioning and operation stages, carries out maintenance, repairs and upgrades, supplies spare parts and equipment and extends the service life of NPPs.

Key end markets in this segment include foreign countries where there are Russian-design power units in operation or under construction, namely Armenia, Bangladesh, Belarus, Bulgaria, Hungary, Egypt, India, China, Slovakia, Turkey, Finland and the Czech Republic.

In the reporting year, the portfolio of power units serviced by the Corporation comprised 48 Russian-design NPP power units abroad.

Furthermore, the Corporation is a market leader in China, Bulgaria and Armenia, acting as a general contractor for life extension, scheduled preventive maintenance and equipment modernisation at NPPs equipped with VVER reactors.

ROSATOM's rivals on this market include national operators and local service companies forming part of or partnered with local energy corporations, as well as large international companies (Framatome, Engie, Westinghouse, Afry, etc.).

To consolidate its position on the NPP servicing market, the Corporation has initiated and continues its localisation efforts in key regions by creating partnerships and joint ventures with local market players or establishing subsidiaries.

ROSATOM is exploring localisation opportunities in other regions of operation (Turkey, Egypt, Bangladesh, etc.) and plans to develop a line of NPP servicing products by 2030.

For details, see the chapter 'Business Development Report'.

Market for RAW and SNF management, processing and disposal

By the end of 2022, the volume of spent nuclear fuel (SNF) accumulated globally totalled about 330,000 tonnes of heavy metal (tHM). Most countries have chosen to postpone SNF management efforts, which necessitates long-term SNF storage 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 encourages the development of the waste processing and temporary waste storage market.

Key players on the SNF storage market are Holtec (US), Orano (France), GNS (Germany) and SKB (Sweden).

ROSATOM promotes its own radioactive waste (RAW) and SNF management solutions as part of an integrated offer for a balanced nuclear fuel cycle. The Corporation's basic solution in the field of SNF management involves spent fuel processing.

Orano and ROSATOM are the leaders on the SNF processing market.

ROSATOM's development plans include expanding SNF processing capacities at the sites of FSUE Mining and Chemical Plant and FSUE Mayak Production Association. The development of this market is closely linked to the improvement of the relevant technologies and the use of regenerated SNF processing products in the nuclear fuel cycle. A reduction in the cost of processes and improved efficiency of separation of SNF components will significantly increase processing volumes.

The market for permanent disposal of SNF and high-level waste (HLW) is still at an early stage of development. There are no operating HLW disposal facilities at present. The possible use of deep repositories is being actively examined by the countries that have chosen the policy of direct SNF disposal: Sweden, Finland, the US and Canada.

Market for the decommissioning of facilities posing nuclear and radiation hazards

The decommissioning of facilities posing nuclear and radiation hazards (nuclear decommissioning) is becoming a promising segment of the global nuclear technology market. Throughout the history of nuclear power and industry, a large number of facilities has been built worldwide whose service life will soon expire. Their decommissioning requires special competences.

IAEA documents set out two approaches to nuclear decommissioning: 'immediate dismantling' and 'deferred dismantling'. Over the past decade, a growing number of countries have adopted the 'immediate dismantling' strategy, as its total cost is lower compared to 'deferred dismantling'. Countries pursuing the 'immediate dismantling' strategy include France, Italy, Germany, Slovenia, Sweden, Finland and Switzerland. The US and the UK apply both strategies at different facilities. Japan has adopted the 'deferred dismantling' strategy.

By the end of 2022, about 210 power units had been shut down in the world. According to ROSATOM’s estimates, by 2030, the number of shut-down power units will reach 300 (the NPP construction activity peaked in the 1970s and 1980s, and in the 2030s the service life of many units will have reached 60 years). The service life of many of the NFC facilities supplying nuclear fuel to NPPs is also nearing its end.

The market for the decommissioning of facilities posing nuclear and radiation hazards is growing steadily (with an average CAGR of 7.3%); the potential market size is estimated at more than USD 200 billion.

The market growth is driven by the following factors:

- The continued trend towards NPP decommissioning in developed countries;
- The rising cost of projects;
- Stricter environmental requirements for projects and an increased focus on safety matters.

Key market players include ROSATOM, Energy Solutions (US), Westinghouse (US), Orano (France), Bechtel (US), Studsvik (Sweden), AECOM (US), GNS (Germany), Cavendish Nuclear (UK), North Star (US), Siempelkamp (Germany), Onet Tech (France) and Holtec (US).

In 2022, ROSATOM’s operations on this market underwent major changes. Due to geopolitical constraints, the largest market segments (Europe, the US and Japan) became unavailable, with the size of the available market reduced by more than 80%.

Despite the above constraints, ROSATOM continues to develop this business area. Its geographical focus has shifted to the CIS, Latin American and Asian markets. The Corporation focuses on RAW management projects, given their significant synergy with decommissioning operations. As part of these efforts, the Corporation is taking steps to enhance its product offer by establishing an engineering centre specialising in the decommissioning of facilities posing nuclear and radiation hazards and RAW management. The key task of this entity will be the transfer of foreign decommissioning technologies.

In Russia, ROSATOM is decommissioning power units No. 1, 2 and 3 of Novovoronezh NPP, power units No. 1 and 2 of Leningrad NPP, power units No. 1 and 2 of Beloyarsk NPPs, power unit No. 1 of Bilibino NPP and power unit No. 1 of Kursk NPP, which have been shut down. It is also participating in NPP decommissioning in a number of European countries and is decommissioning nuclear fuel cycle facilities, namely enrichment, conversion and fuel fabrication plants.

In 2022, ROSATOM (through JSC TVEL) continued to promote cooperation in the back-end segment among the CIS countries. This involved developing and approving a RAW Management Strategy in the Republic of Belarus and preparing for NPP decommissioning in Armenia and Kazakhstan.

For details, see ‘Performance of the Fuel Division in 2022’.

Electricity and capacity market in the Russian Federation

Expansion on the electricity and capacity market in the Russian Federation remains one of ROSATOM’s top priorities. The Corporation is one of the key power generation companies in Russia. In addition, the local market is important in terms of obtaining references for new technological solutions for their subsequent global implementation.

In 2022, electricity consumption in the Unified Power System of Russia totalled 1,106.3 billion kWh as against 1,090.4 billion kWh in the previous year (up by 1.5%).

Nuclear power plants maintained their role in terms of meeting base load demand in the Unified Power System of Russia, with nuclear power generation reaching a new all-time high of 223.4 billion kWh in 2022 (as against 222.4 billion kWh in 2021). The increase in nuclear power generation was mainly driven by a reduced duration of scheduled repairs at power units. As a result, in the reporting year, the Corporation managed to remain a leader among power generation companies, with the share of nuclear power generation in the country’s total electricity output (in the Unified Power System of Russia) totalling 19.9%. ROSATOM’s key goal remains to ensure safe and reliable operation of nuclear power plants and remain a leader in terms of its share in electricity output in the country’s energy mix.

In early 2022, ROSATOM became a major player on the thermal power market. As a result of the acquisition of PJSC Quadra – Power Generation, the total power generation capacity of thermal power plants (TPPs) managed by the Corporation exceeded 4 GW, while their heat generation capacity exceeded 19,000 Gcal/h. Power and heat generation at the TPPs totalled 16.2 billion kWh and 30 million Gcal respectively (2021: 3.3 billion kWh and 7.5 million Gcal respectively). The TPPs supplied power and heat to regions of the Siberian, Ural and Central Federal Districts.

In addition, ROSATOM builds and operates wind power plants in Russia. The portfolio of wind power plants to be built by ROSATOM by the end of 2027 totals 1.7 GW, with 780 MW already put into operation. In 2022, electricity output from ROSATOM’s WPPs totalled 1.96 billion kWh (2021: 1.2 billion kWh).

In addition to NPP, TPP and WPP operation, the Corporation also sells electricity. In the reporting year, JSC Atom Energy Trade continued to operate as the power supplier of last resort in the Kursk, Tver, Smolensk and Murmansk Regions, while LLC REC continued to operate as the power supplier of last resort in the town of Zheleznogorsk (Kursk Region) and became a supplier of last resort in the Republic of Khakassia as from 1 September 2022. JSC Atom Energy Trade and LLC REC provide services to more than 60,000 legal entities and more than 2 million households in Russia.

In 2022, retail electricity sales by the branches and standalone divisions of JSC Atom Energy Trade and LLC REC totalled 16.8 billion kWh, up by 5% compared to 2021 (16.0 billion kWh).

For details, see ‘Performance of the Power Engineering Division in 2022’.

Wind power market

The global wind power market is growing steadily in terms of both capacity additions and investment activity. In 2021, wind power capacity increased by more than 92 GW, while in 2022, the increase exceeded 74 GW¹.

According to the most conservative estimates by the International Energy Agency, wind power capacity will increase from 0.93 TW in 2022 to 1.83 TW in 2030 and 3.56 TW by 2050². Wind power capacity additions may average 110 GW per year.

The wind power market is highly competitive and consolidated. The top 10 turbine manufacturers accounted for 75% of the total capacity of onshore and offshore WPPs commissioned in 2022, with major players, such as Vestas, Siemens Gamesa, Gold Wind, GE and Envision, accounting for about 42%. In 2022, investments in renewable energy increased by 16% compared to 2021 and reached USD 0.5 trillion for the first time, with about USD 200 billion allocated for wind power projects³.

1. IRENA, Renewable capacity statistics 2023.
2. IEA, World Energy Outlook 2022.
3. IRENA, Global landscape of renewable energy finance

On the global wind power market, ROSATOM plans to become an integrated wind power project developer. In order to accomplish its objectives, in June 2021, ROSATOM's Strategic Council approved a programme titled 'Renewable Energy: Foreign Markets', which was revised in September 2022 taking into account geopolitical factors. In accordance with the programme, the portfolio of overseas projects will total 700 MW by 2024 and 5 GW by 2030 (across the onshore and offshore wind power and solar power segments). ROSATOM has selected Southeast Asia, Africa and the CIS countries as its target markets.



ROSATOM'S SHARE ON THE RUSSIAN WIND POWER MARKET

As part of the Russian programme to support renewable energy based on capacity supply agreements on the wholesale market, the capacity of onshore WPPs to be commissioned by the end of 2024 is expected to total 2.74 GW, with a further 3.9 GW to be commissioned between 2025 and the end of 2035. According to ROSATOM's estimates, by 2035, the total installed capacity of onshore WPPs in Russia might reach 7 GW.

The portfolio of wind power plants to be built by ROSATOM by the end of 2027 as part of the Wind Power Strategic Programme totals 1.7 GW, with 780 MW already put into operation.

In 2022, the 60 MW Berestovskaya WPP was put into operation and started to supply electricity on 1 January 2023. The construction of two WPPs with installed capacity totalling 220 MW (the Kuzminskaya WPP (160 MW) and stage 1 of the Trunovskaya WPP (60 MW) was started in the Stavropol Territory.

ROSATOM's share on the Russian wind power market totals about 34%.

For details, see the chapter 'Business Development Report'.

Nuclear medicine market

In the reporting year, the global nuclear medicine market totalled ~USD 13.2 billion and is expected to exceed USD 33 billion by 2030 (this figure refers to the total value of healthcare services provided globally).

The global market for nuclear medicine equipment totals USD 2.9 billion and is expected to reach USD 5.6 billion by 2030.

The volume of the Russian nuclear medicine market exceeds RUB 100 billion, and the market is expected to grow steadily until 2030 and reach ~RUB 162 billion: according to ROSATOM's forecasts, the growth rate will total up to 8–9% per year, given an increase in compulsory health insurance contributions. In the coming years, key growth drivers will continue to include the implementation of the Healthcare National Project, nuclear medicine procedures and high-technology healthcare services being prescribed more often, as well as the development of healthcare infrastructure and, more specifically, the construction of nuclear medicine centres specialising in radionuclide diagnostics and therapy. In a number of Russian regions, steps are being taken or plans have been developed to provide existing healthcare institutions with state-of-the-art nuclear medicine equipment for diagnostics and therapy.

ROSATOM sees considerable potential for the development of nuclear medicine services for the general public. The Corporation has initiated projects to create a network of radionuclide therapy and nuclear medicine centres in Russia and abroad, which will provide high-quality healthcare services to patients.

ROSATOM is a major supplier of isotopes and radiopharmaceuticals for nuclear medicine in Russia. 30% of the world's reactor units producing medical radioisotopes are located in Russia. ROSATOM accounts for 25% to 50% of global radioisotope production (for some types of radioisotope products, its share totals 100%). The Corporation's long-term goal is to rank among the top five global suppliers of isotope products for medical applications, including brand-name radiopharmaceuticals and generic drugs.

In addition, the Corporation is a major player on the market for medical device sterilisation using radiation processing technologies.

ROSATOM also produces and actively upgrades medical equipment for diagnostics and therapy. By 2030, the Corporation plans to become a National Champion in a number of segments, including MRI equipment, 6 MeV and 18 MeV linear particle accelerators, cyclotron and radiochemistry facilities, SPECT scanners and brachytherapy equipment.

For details, see the chapter 'Business Development Report'.

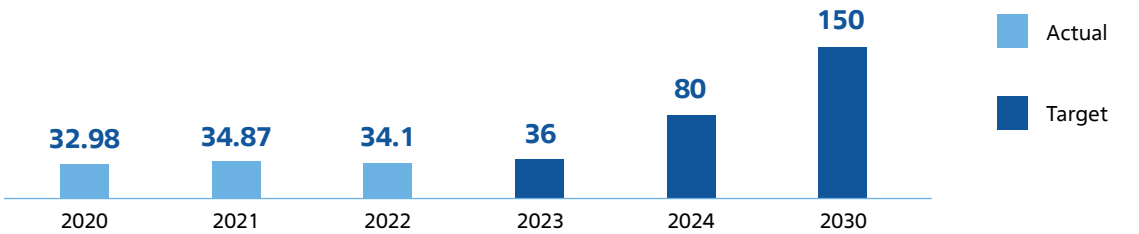
Market for cargo transportation along the Northern Sea Route

Mineral extraction, oil and gas production in the Arctic are projected to grow significantly, resulting in an increase in cargo traffic along the Northern Sea Route (NSR) from 34.1 million tonnes in 2022 to 80 million tonnes in 2024 and 150 million tonnes in 2030.

Global cargo traffic can become a driver for further growth of cargo transportation along the NSR in the long term (after 2030). Cargo transportation along the NSR provides a number of advantages compared to traditional routes via the Suez and Panama Canals (the distance between Northern Europe and East Asia is reduced by up to 39%, while the distance between the western coast of North America and Northern Europe is reduced by up to 28%).

For details, see the section 'Development of the Northern Sea Route'.

Actual cargo traffic and targets set under the Northern Sea Route Development Federal Project



Waste management market

ROSATOM is supporting the development of an integrated system for the management of hazard class 1 and 2 waste in Russia. This initiative has been launched under the Infrastructure for the Management of Hazard Class 1 and 2 Waste Federal Project, which forms part of the Ecology National Project. Hazard class 1 and 2 waste includes 485 types of waste, such as mixtures of inorganic salts, oxides, hydroxides, acids (waste from the metals, manufacturing and mechanical engineering industries), mercury-containing waste (mercury-vapor lamps and mercury thermometers, as well as mercury-containing industrial waste), and waste containing organic components. About 350,000 tonnes of this waste is generated in the country every year.

As from 1 March 2022, new rules for the management of hazard class 1 and 2 waste came into force in Russia. FSUE FEO (an enterprise of ROSATOM), which has been appointed federal operator responsible for the management of hazard class 1 and 2 waste, collects, transports, processes, recycles and treats these types of waste across Russia. As from 1 March, waste-generating enterprises that have their own hazard class 1 and 2 waste management capacities are registered in the federal state information system for tracking hazard class 1 and 2 waste and monitoring its management (FGIS OPVK) and submit information on the entire life cycle of hazardous waste, from its generation to the confirmation of its processing at specific facilities. Waste-generating enterprises that do not have their own hazard class 1 and 2 waste management capacities are registered in the FGIS OPVK system as from 1 March and conclude a contract with the federal operator, which provides the full range of the relevant waste management services on a turnkey basis.

At year-end 2022, about 59,000 users were registered in the system, including 34,400 waste-generating organisations, as well as operators providing hazardous waste transportation and management services.

In addition, as part of the Federal Project, ROSATOM is developing infrastructure for hazard class 1 and 2 waste processing, namely a network of environmental technology parks, which will be equipped with the best state-of-the-art safe technological solutions.

The Corporation has started to build seven modern industrial facilities (environmental technology parks), four of which will be built at chemical weapons destruction sites, while the remaining three are greenfield facilities. The environmental technology parks will have a total throughput of 350,000 tonnes of waste, which will help to address the national shortage of capacities for the processing of these classes of waste.

In fact, this will provide a resource base for a new circular economy in Russia. The design and selection of process lines is underpinned by the principle that recycling is a priority: two thirds of all waste will be recycled, and the resulting materials will be commercialised. The first two environmental technology parks in the Kurgan and Saratov Regions are scheduled to be put into operation by the end of 2023. In 2024, the Corporation will launch environmental technology parks in the Kirov Region and the Udmurt Republic, as well as greenfield facilities in the Irkutsk, Tomsk and Nizhny Novgorod Region.

For details, see the chapters ‘Business Development Report’ and ‘Safety Report’.

1.5. INTERNATIONAL COOPERATION

Key results in 2022

- 17 intergovernmental agreements were concluded, including an intergovernmental agreement with Belarus on cooperation in SNF management.
- Official ceremonies were held to mark the start of concreting at power units No. 1 and 2 of El Dabaa NPP in Egypt and power unit No. 4 of Akkuyu NPP in Turkey.
- A meeting of the President of the Russian Federation Vladimir Putin with the IAEA Director General Rafael Grossi was arranged. A series of interdepartmental consultations with the IAEA on ensuring the safety and security of Zaporozhye NPP were arranged.
- The Corporation and organisations in the industry took part in major industry events held under the auspices of the IAEA, including the IAEA General Conference and the Nuclear Harmonisation and Standardisation Initiative launched by the IAEA Director General.

ROSATOM’s international activities are aimed at expanding the international legal framework governing the peaceful use of nuclear energy and at cooperating with government agencies of foreign countries and international organisations in order to promote Russian nuclear technologies and enable the Russian nuclear industry to consolidate its position on the global nuclear energy market.

In 2022, these efforts were carried out amid unprecedented large-scale illegitimate sanctions imposed by the West. ROSATOM prioritised matters related to all aspects of nuclear safety and security and focused on fulfilling all its international commitments and meeting contractual schedules agreed with customers.

1.5.1. Expanding the international legal framework for cooperation and supporting major overseas projects

In 2022, ROSATOM continued to take steps to expand the international legal framework for cooperation and to provide support for major overseas projects.

17 intergovernmental and interdepartmental agreements were signed (18 in 2021; 16 in 2020).

Despite the special conditions related to external restrictions and the epidemiological situation, ROSATOM fulfils all its international commitments to build Russian-design nuclear facilities abroad.

ROSATOM cooperated with the Federal Customs Service of Russia to facilitate uninterrupted product exports in order to fulfil its commitments as part of international projects.

During the pandemic, employees were rotated at overseas NPP construction sites in Bangladesh, Belarus, Egypt and Turkey according to schedule. Before pandemic-related restrictions on the crossing of Russia’s border were lifted, about 16,000 people were transported across the border in cooperation with the Office of the Government of the Russian Federation, the Russian Ministry of Foreign Affairs, the Border Service of the Federal Security Service of the Russian Federation and other agencies.

Cooperation with key foreign partners

Asia

China



Political support continued to be provided for the implementation of the strategic package for Russian-Chinese cooperation, including the construction of power units No. 7 and 8 of Tianwan NPP, power units No. 3 and 4 of Xudabao NPP and the Chinese experimental fast neutron reactor (CFR-600), as well as the supply of nuclear fuel for these five reactors.

As part of efforts to expand bilateral cooperation, provisions on continued serial construction of NPPs equipped with VVER reactors in China, development of cooperation on fast neutron reactors and the closed nuclear fuel cycle, SNF reprocessing, RAW management and basic science were incorporated into the Road Map for High-Quality Development of Russian-Chinese Trade in Goods and Services by 2024 adopted during the visit of the President of the Russian Federation Vladimir Putin to China in February 2022.

On 29 August 2022, the 26th meeting of the Nuclear Subcommittee under the Russian-Chinese Commission on Preparing Regular Meetings of the Prime Ministers was held via video conferencing.

India



Support was provided for the ongoing projects to build power units No. 3–6 of Kudankulam NPP. The development of the legal framework was initiated in order to expand strategic partnership with the Indian party in the sphere of nuclear power and industry and the peaceful use of nuclear energy for non-energy applications.

ROSATOM suggested to the Indian party that cooperation should be established as part of existing international commitments on joint projects such as serial construction of Russian-design NPP power units with high-power VVER reactors in India, construction of Russian-design small NPP power units in India, construction of a Nuclear Research and Technology Centre based on a Russian-design high-power research reactor in India, cooperation in the NFC, etc.

Bangladesh



ROSATOM continued to implement the project to build the country’s first nuclear power plant, Rooppur NPP. In October 2022, an official ceremony was held at the NPP site as the reactor vessel was moved into final position at power unit No. 2.

Expert teams started to discuss the specifications for the project to build a Russian-design high-power research reactor in Bangladesh.

Myanmar



Intergovernmental memoranda were signed on the provision of training for Myanmar’s nuclear specialists and on shaping a positive public opinion on nuclear energy in Myanmar.

An interdepartmental road map for nuclear cooperation in 2022 and 2023 was signed. The document sets out specific steps to expand the bilateral legal framework for cooperation, develop a project to build a small NPP, develop the country’s nuclear infrastructure and provide training and education for local personnel.

CIS

Armenia



A Comprehensive Programme of Russian-Armenian Cooperation on Energy and Non-Energy Projects was signed in April 2022 as part of the official visit of the Prime Minister of the Republic of Armenia Nikol Pashinyan to Russia. The document reflects the parties’ intention to continue to upgrade the NPP currently in operation and further explore opportunities for the construction of new Russian-design nuclear power units in Armenia.

Belarus



ROSATOM continued to provide support for the construction of power unit No. 2 of the Belarusian NPP.

ROSATOM provided assistance to the Belarusian party in implementing the national strategy for the management of SNF from the Belarusian NPP, which involves building a national RAW repository. An intergovernmental agreement on cooperation in SNF management was signed.

The discussion of the project to build a Nuclear Research and Technology Centre based on a multipurpose nuclear research reactor in Belarus and energy storage projects continued.

Kazakhstan



An Indicative Road Map for the Implementation of Key Activities for 2022 and 2023 as Part of the Project to Build a Large NPP in Kazakhstan was signed; the document outlines stages of work focused on engineering surveys, the assessment of nuclear infrastructure, gaining public acceptance for nuclear power, and the drafting of the relevant intergovernmental agreement.

A memorandum of cooperation in personnel training for Kazakhstan’s nuclear power industry and related industries was signed.

Kyrgyzstan



A memorandum of cooperation in the construction of a small NPP in Kyrgyzstan and the road map for the implementation of the project were signed. The documents stipulate specific steps in the development of the small NPP construction project, including the pre-feasibility study, the development of nuclear infrastructure, personnel training and gaining public acceptance for nuclear power.

Europe

Turkey



An official ceremony was held to mark the start of concreting in the reactor building of power unit No. 4 of Akkuyu NPP.

A Memorandum of Understanding was signed by the Ministry of Treasury and Finance of the Republic of Türkiye, ROSATOM and Akkuyu Nuclear JSC; the document is aimed at building and securing long-term financial reserves for project implementation on the terms and conditions that are acceptable to both parties.

As agreed by the Presidents of Russia and Turkey, in late 2022, working consultations were held with the Turkish party concerning a project to build a new nuclear power plant, Sinop NPP, in Turkey.

Hungary 	<p>As part of the project to build Paks II NPP, a Road Map of Key Activities for 2022 and 2023 was signed. It defines the scope of work and the timing of activities to be implemented in order to start the concreting at power unit No. 5 of Paks II NPP.</p> <p>The Regulations on the Joint Steering Committee (JSC) established pursuant to the Russian-Hungarian intergovernmental agreement on cooperation in the peaceful use of nuclear energy were signed. The document sets out the goals and objectives, the composition and the procedure for holding JSC meetings to address strategic issues related to the implementation of the agreement, including the project to build Paks II NPP.</p>
Serbia 	<p>Preparations continued as part of the three-phase project to build a Centre for Nuclear Science, Technology and Innovation in Serbia. A package of documents was prepared in order to establish a joint venture which involves the Russian party developing the business plan and the financial and economic model for the project.</p>
Middle East and North Africa	
Egypt 	<p>Official ceremonies were held to mark the start of concreting at power units No. 1 and 2 of El Dabaa NPP in July and November 2022.</p> <p>The Russian Ministry of Foreign Affairs assisted in opening a branch of the Ministry of Manpower of Egypt in the vicinity of the NPP construction site; the branch will be responsible for issuing work permits to Russian and foreign specialists in Egypt.</p>
Latin America	
Bolivia 	<p>Support was provided for communication concerning bank guarantees between JSC State Specialised Design Institute, which acts as the general contractor for the project to build a Nuclear Research and Technology Centre in Bolivia, and Bolivian partners. ROSATOM assisted in organising and holding a meeting of the joint working group on personnel with the Bolivian Ministry of Energy in October 2022.</p>
Nicaragua 	<p>A road map was signed for establishing cooperation between Russia and Nicaragua in the peaceful use of nuclear energy. The document formalises agreement on the next steps in developing a legal framework for cooperation, building a Nuclear Research and Technology Centre in Nicaragua, personnel training for the country's nuclear industry, developing nuclear infrastructure and implementing joint geothermal, hydropower and wind power projects.</p>
Central and Southern Africa	
Burundi 	<p>A road map was signed for establishing cooperation between Russia and Burundi in the peaceful use of nuclear energy. The document stipulates specific steps to be taken by both parties between 2022 and 2024 in order to explore potential projects focused on non-energy applications of nuclear energy in Burundi and assess the prospects for nuclear power generation in the country.</p>
Zimbabwe 	<p>A memorandum of cooperation was signed; the document stipulates measures aimed at human resource development for the nuclear industry of the Republic of Zimbabwe.</p>

1.5.2. Cooperation with international organisations

Despite a challenging global political situation, ROSATOM continued to participate in international organisations and forums in order to contribute to developing international rules and standards on nuclear power.

Commitments to pay contributions to the IAEA and the OECD NEA were met in full using funds from the federal budget.

Implementation of the industry-wide programme to train Russian personnel for international organisations continued in cooperation with the IAEA, the World Association of Nuclear Operators (WANO) and the ITER Organisation. In 2022, three Russian specialists from the pool of experts formed as part of the programme were hired by specialised international organisations.

International Atomic Energy Agency (IAEA)

In 2022, ROSATOM's cooperation with the IAEA was focused primarily on ensuring the safety and security of Zaporozhye NPP (ZNPP). Preparations were made for a meeting between the President of the Russian Federation Vladimir Putin and the IAEA Director General Rafael Grossi; several rounds of interdepartmental consultations were held with the IAEA, including in the context of the establishment of a nuclear safety and security protection zone around ZNPP and the permanent presence of IAEA experts at ZNPP.

ROSATOM played a key role in the events of the 66th session of the IAEA General Conference. Resolutions adopted following the conference accommodate the interests of the Russian nuclear industry.

ROSATOM's experts participated in all specialised international conferences and meetings held by the IAEA. 1,370 Russian experts participated in more than 380 events held by the IAEA (due to the pandemic, some of them were held online). 25 events under the auspices of the IAEA were held in Russia (including in the online format).

On the initiative of ROSATOM, the Government of the Russian Federation made a decision to make contributions towards the implementation of the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO) run by the IAEA from 2023 through 2025, which will enable the Russian Federation to retain its status as a major donor under the project.

Financing and participation of Russian organisations in major IAEA projects continued as part of the Technical Cooperation Programme, the Nuclear Security Fund, the Russian Safeguards Support Programme and the Programme of Action for Cancer Therapy.

JSC Rosenergoatom and the IAEA launched a joint project to translate IAEA safety standards into Russian.

Work was underway as part of the Nuclear Harmonisation and Standardisation Initiative launched by the IAEA Director General.

In order to promote Russian approaches to formulating international legal norms governing the construction and operation of nuclear facilities, ROSATOM in cooperation with the Russian Ministry of Foreign Affairs and the Federal Environmental, Industrial and Nuclear Supervision Service of Russia (Rostekhnadzor) participated in the assessment of applicability of existing IAEA safety standards to small modular reactors initiated by the IAEA. Proposals for amendments to these standards taking into account the special characteristics of Russian-design nuclear installations were drafted and presented at the meetings of the relevant IAEA committees in June 2022.

Nuclear Energy Agency of the Organisation for Economic Cooperation and Development (OECD NEA)

Although the OECD Council decided to suspend Russian membership in the OECD NEA as from 11 May 2022, Russia continued to participate in a number of joint projects and international institutions under the auspices of the OECD NEA which are relevant to the Russian nuclear industry and which maintain a professional and non-politicised attitude.

ROSATOM sought to maintain the highest possible level of cooperation with the OECD NEA, including the payment of Russia’s membership fee in order to enable Russia to regain the status of a full OECD NEA member in the future.

Commission of the CIS Member States on the Peaceful Use of Nuclear Energy (Atom-CIS Commission)

As part of the implementation of the CIS Intergovernmental Target Programme for Remediation under the auspices of the Atom-CIS Commission, assistance was provided to the Kyrgyz and Tajik parties in ensuring the safety of former uranium mining facilities. In Kyrgyzstan, the construction of infrastructure required for the decommissioning of dilapidated tailings dams has been completed at remediation sites. In Tajikistan, measures forming part of the Programme are being implemented ahead of schedule.

The implementation of the Action Plan under the Agreement on Cooperation between the CIS Member States to Ensure Preparedness in the Event of a Nuclear Accident continued. An Agreement on Information Exchange between the CIS Member States during Radiation Monitoring was drafted; the agreement is aimed at integrating national alert systems.

A Nuclear Infrastructure Development Programme of the CIS Member States and the relevant implementation plan were prepared and approved.

ROSATOM’s experts actively participated in the work of the Council of Executives of Nuclear Safety Regulators in the CIS Countries and Organisations Providing Scientific and Technical Support.

To support talented students from the CIS member states studying ‘nuclear’ disciplines, ROSATOM launched a scholarship programme.



1.5.3. Strengthening the nuclear non-proliferation regime and export control

In 2022, ROSATOM took steps to enhance the efficiency of the export control system in the industry.

In 19 organisations of ROSATOM involved in international trade, 34 export control specialists underwent training and obtained certification from the FSTEC of Russia in accordance with Article 24.1 of Federal Law No. 183-FZ of 18 July 1999 on Export Control.

Seven organisations of ROSATOM piloted the DIRECT.Compliance information system for managing export control processes. It is expected that, following testing, in 2023, the information system will be rolled out in the industry on an industrial scale.

ROSATOM continued to improve the Reference Book on the KKS System, which is a systematised framework for equipment identification used in NPP design, and to develop a mechanism for the use of the Reference Book by the Federal Customs Service of Russia in order to optimise customs clearance procedures.

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

ROSATOM provided support for the participation of the Russian delegation in the Nuclear Suppliers Group (NSG). Proposals for amending the NSG control lists were reviewed.

Pursuant to the order of the Government of the Russian Federation dated 16 July 2022, ROSATOM provided expert support in the sphere of the peaceful use of nuclear energy for the Russian interdepartmental delegation at the Tenth Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons held at the UN headquarters in New York between 1 and 26 August 2022. During the event, emphasis was placed on Russian approaches to the development of large-scale nuclear power generation, fast reactors, closing the NFC, mobile NPPs, as well as the operation of the International Uranium Enrichment Centre in Angarsk.

1.5.4. Developing the network of ROSATOM’s representative offices affiliated with embassies and trade missions abroad

ROSATOM’s representatives continued to work in Russian embassies and trade missions and under the Permanent Mission of the Russian Federation to International Organisations in Vienna (Austria). In 2022, overseas representatives worked in 13 foreign countries and supported ROSATOM’s overseas projects. This involved engaging with the governments of the host countries on a wide range of issues, including support for high-level negotiations, and rotation and vaccination of employees involved in overseas construction projects.

1.5.5. Challenges in the reporting period and mechanisms for addressing them

In 2022, ROSATOM jointly with the relevant ministries and government agencies took steps to consolidate Russia’s position on the global nuclear energy market and promote Russian nuclear technology abroad. These efforts were carried out amid growing pressure on the Russian Federation, including sanctions imposed by unfriendly countries, which significantly transformed the external environment for the operation of the Russian nuclear industry.

In order to ensure business continuity of ROSATOM and its organisations, the main emphasis was placed on measures to minimise the impact of sanctions on the Russian nuclear industry and develop a resilient business model in the new environment.

1.5.6. Plans for 2023 and beyond

ROSATOM will continue to develop the international legal framework to enable the Russian nuclear industry to secure its foothold in its traditional countries of operation and to enter the market in new countries.

The Corporation will continue to cooperate in personnel training for international organisations with the IAEA, the ITER Organisation and WANO.

ROSATOM plans to intensify its efforts (including work with specialised international organisations and institutions) to make nuclear power more acceptable for society and shape a positive public perception of it.

1.6. PERFORMANCE OF GOVERNMENT FUNCTIONS

1.6.1. Performance of the Nuclear Weapons Division

Fulfilment of the state defence order

The operations of ROSATOM’s Nuclear Weapons Division (NWD) as part of the state armament programme and the state defence order (hereinafter referred to as SDO) are aimed at maintaining Russia’s nuclear capabilities (in terms of both their scope and quality) at a level that ensures the implementation of Russia’s nuclear deterrence policy.

ROSATOM’s NWD organisations fulfilled the SDO for 2022 in full.

Operations in the civilian sector

NWD organisations contribute to the manufacture of civilian products and help to ensure Russia’s technological sovereignty. In 2022, the integrated KPI target for new products was exceeded by 44.1%. In 2022, revenue of NWD organisations from new products (outside the scope of the Corporation) totalled RUB 74.21 billion, while the 10-year portfolio of orders for new products (outside the scope of the Corporation) reached RUB 173.50 billion.



In order to increase the share of high-technology civilian products in the revenue of NWD enterprises to 50% by 2030, the NWD has revised scenario assumptions for planning the ramp-up of production of high-technology civilian products by the NWD in the medium term and until 2030 taking into account changes in the global geopolitical environment.

As part of efforts to promote technological sovereignty and diversify the operations of NWD organisations, 10 product strategies were developed for new businesses in 2022, with the target for revenue until 2030 set at RUB 225.5 billion.

NWD organisations closely cooperate with all of ROSATOM’s Divisions and contribute to the implementation of product strategies and strategic programmes, including Electric Mobility, Hydrogen Energy, Additive Manufacturing, and Automated Process Control Systems.

Measures to improve the performance of NWD organisations

ROSATOM’s NWD is a leader in terms of identification and registration of intellectual property rights over R&D results. In 2022, 222 decisions were made concerning the form of legal protection of intellectual property (IP), including 142 inventions, 23 utility models, 21 trade secrets, three industrial designs, four integrated circuit layouts and 29 computer software programs.

46 items of intellectual property were commercialised, including the TIANOX device for inhaled nitric oxide therapy, the LOGOS software suite and components for ITER.



Other developments in the sphere of NWD operations, including contribution to Russia’s technological sovereignty

In 2022, consolidated revenue from other products of NWD enterprises totalled RUB 106.5 billion.

GRI 3-3 Proposals were formulated and effective and adequate representation of Russian interests was ensured as part of the work of the UN Committee on the Peaceful Uses of Outer Space with regard to matters related to nuclear power sources (this included attendance and presentations at the 59th session of the Scientific and Technical Subcommittee, the 61st session of the Legal Subcommittee and the 65th session of the Committee, as well as multiple intersessional meetings of the Working Group on the Use of Nuclear Power Sources in Outer Space). ROSATOM’s representatives participated in the drafting of a final report on the outcomes of the multi-year work plan of the Working Group on the Use of Nuclear Power Sources in Outer Space.

Strategies for new businesses are being implemented in the following areas: Security Systems, Machine Tool Industry, Laser Technology, Superconductivity, New Materials for Electrical Engineering, Large Electrical Machines, Special Medical Equipment, Power Converters and Electronics, Automotive Electronics, etc. Furthermore, growth targets have been set for high-technology civilian products of the NWD, and a pool of projects has been formed.

On 23 December 2022, 10 TIANOX devices for inhaled nitric oxide therapy were donated to the Vishnevsky Central Military Clinical Hospital.

1.6.2. Law drafting

The Corporation contributed to the transformation of legislation necessitated by the need to protect Russia’s national interests due to hostile actions of foreign governments and international organisations. It also participated in the development of mechanisms for supporting the economy, including the simplification of permitting and licensing procedures established by Russian legislation and defining the special features of the legal regime applied to the procurement of goods, work and services for government and municipal needs, fulfilment of the SDO, urban planning and development, etc.

The relevant bills were reviewed by the Corporation as part of both its participation in the meetings of the Legislative Commission of the Government of the Russian Federation and the review of laws and other regulations submitted for approval.

In order to centralise the powers related to managing the Northern Sea Route (NSR), including the deployment of icebreakers, in ROSATOM and establish a single NSR navigation management centre at the federal state budgetary institution (FSBI) controlled by the Corporation, ROSATOM drafted and supported the adoption of Federal Law No. 184-FZ of 28 June 2022 on Amending Article 5.1 of the Merchant Shipping Code of the Russian Federation and the Federal Law on State Atomic Energy Corporation Rosatom.

This Federal Law has also enabled the development of a flexible permitting mechanism for regulating navigation along the NSR, which involves not only issuing and revoking permits but also suspending, renewing and amending them, which, in turn, makes it possible to take into account climate change to enable safe navigation amid growing maritime traffic along the NSR and an increase in vessel size and capacity, and provides optimal conditions for consignors.

Overall, in the reporting year, the Corporation reviewed about 400 bills, amendments, drafts of official comments and opinions of the Government of the Russian Federation, as well as other legislative initiatives affecting various aspects of operations of ROSATOM and its organisations, including the following federal laws:

- 1. Federal Law No. 268-FZ of 14 July 2022 on Amending the Federal Law on Industrial and Consumer Waste and Certain Laws of the Russian Federation, which clarifies individual provisions concerning the management of hazard class 1 and 2 waste by waste-generating organisations themselves.
- 2. Federal Law No. 541-FZ of 19 December 2022 on Amending the Urban Development Code of the Russian Federation and Article 18.1 of the Federal Law on the Protection of Competition, which is aimed at lowering administrative barriers and speeding up the design, construction (renovation) and commissioning of not only certain nuclear facilities, but also healthcare, energy, production and transportation facilities using X-ray equipment and inspection systems, as well as facilities where sealed radionuclide sources are used for production and research.
- 3. Federal Law No. 510-FZ of 5 December 2022 on Amending the Federal Law on Internal Sea Waters, Territorial Sea and Contiguous Zone of the Russian Federation, which regulates matters related to foreign naval vessels and other government vessels sailing in Russia’s internal waters along the NSR.
- 4. Federal Law No. 172-FZ of 11 June 2022 on Amending the Federal Law on the State Defence Order, which is aimed at providing optimal conditions for rapidly placing the SDO by requiring contractors and general contractors responsible for product supplies under the SDO, as well as entities for which the acceptance of the SDO or the conclusion of contracts is mandatory (single suppliers (contractors) to provide information on product prices under the SDO at the request from the public contracting authority or the general contractor.

- 5. Federal Law No. 210-FZ of 28 June 2022 on Amending Articles 8 and 12 the Federal Law on the State Defence Order, which has enabled the Government of the Russian Federation to determine standard terms and conditions of SDO contracts.
- 6. Federal Law No. 159-FZ of 11 June 2022 on Amending Article 1 of the Federal Law on the Procurement of Goods, Work and Services by Certain Types of Legal Entities, which addresses legal gaps in regulation in the course of procurement from related parties by customers with a complex vertically integrated structure.
- 7. Federal Law No. 160-FZ of 11 June 2022 on Amending Article 3 of the Federal Law on the Procurement of Goods, Work and Services by Certain Types of Legal Entities and the Federal Law on the Contract System of the Federal and Municipal Procurement of Goods, Work and Services, which is aimed at preventing conflicts of interest between the bidder and the customer in the course of procurement for government and municipal needs and for the needs of certain types of legal entities.
- 8. Federal Law No. 390-FZ of 7 October 2022 on Amending the Federal Law on Industrial Policy in the Russian Federation, which formalises approaches to determining the cost of construction of sea-going, inland and mixed type (river/sea) vessels with funding provided fully or partially from the federal budget, the budgets of constituent entities of the Russian Federation and local budgets.
- 9. Federal Law No. 395-FZ of 7 October 2022 on Amending the Federal Law on Departmental Security Services, which clarifies the scope of activities of in-house security services and the categories of facilities protected by in-house security services, and takes into account the special features of protection of the facilities of ROSATOM and its organisations, etc.

In 2022, the Corporation continued to participate in the drafting of the new versions of the Code on Administrative Offences and the Procedural Code of the Russian Federation and in the reform of supervision and control activities (the ‘regulatory guillotine’) by participating in working groups on energy, the environment and the use of natural resources, construction, housing and utilities, and intellectual property.



BILLS REVIEWED BY ROSATOM

Plans for 2023

ROSATOM’s plans for 2023 and beyond in the sphere of law drafting include the following:

- Revising the Corporation’s powers and functions, including those pertaining to the management of federal property;
- Improving Russian legislation pertaining to federal government supervision of the use of nuclear energy;
- Improving the procedure for the transfer of movable and real property situated within the boundaries of priority development areas, including those established in closed administrative and territorial formations in the nuclear industry;
- Other areas for improving legal regulation affecting the interests of ROSATOM and its organisations, including legislation on the use of nuclear energy.

1.6.3. Government Programme ‘Development of the Nuclear Power and Industry Complex’

In 2022, the Government Programme of the Russian Federation ‘Development of the Nuclear Power and Industry Complex’ was being implemented.

The implementation of the Government Programme is aimed at supporting the achievement of national development goals set by the President of the Russian Federation.

The specifications of the Government Programme have been signed off by its Steering Board (minutes No. 2 of the meeting of the Steering Board of the Government Programme dated 23 December 2022) and approved under the resolution of the Prime Minister of the Russian Federation Mikhail Mishustin dated 30 December 2022. The specifications of structural elements forming part of the Government Programme were approved under the established procedure in December 2022.

All metrics of the Government Programme, as well as metrics, results and milestones of its structural elements approved in 2022, including those of federal projects forming part of the Comprehensive Programme ‘Development of Technical Capabilities, Technology and Scientific Research in the Use of Nuclear Energy in the Russian Federation until 2024’, were achieved in full.

The integral assessment of progress in the implementation of the Government Programme and its efficiency for 2022 stood at 99.96%.

1.6.4. Implementation of federal target programmes

In 2022, ROSATOM’s organisations implemented measures forming part of two federal target programmes (FTPs).

Funding for the implementation of the FTPs (for the part of their scope on which information is publicly available)	Amount, RUB '000
Total funding, including:	44,339,407.7
From the federal budget	22,009,685.6
From extra-budgetary sources	22,329,722.1

1.6.5. State property management and restructuring of non-core assets

Summary of property of ROSATOM and its organisations

As at 31 December 2022, ROSATOM kept records of the following assets and property:

- Property transferred to ROSATOM as asset contributions of the Russian Federation pursuant to resolutions of the President of the Russian Federation and the Government of the Russian Federation;
- Assets of joint-stock companies whose shares are partly owned by the Russian Federation, with ROSATOM exercising the relevant shareholder powers on behalf of the Russian Federation;
- Assets of limited liability companies in whose authorised share capital ROSATOM has interests;
- Assets of ROSATOM’s private institutions;
- Assets of federal state unitary enterprises with regard to which ROSATOM exercises ownership powers;
- Assets of joint-stock companies whose shares are owned by ROSATOM.

Real property owned by ROSATOM’s organisations is recorded in the Automated Property Management System of ROSATOM (APMS).

As at 31 December 2022, the records of real property of nuclear organisations in the APMS covered 394 organisations, including 13 federal state unitary enterprises (FSUEs) with an authorised capital totalling RUB 323,615.41 million.

The APMS contains information on items of real property and the relevant documents; all real property over which ROSATOM and its organisations have proprietary rights or which they own under the law of obligations are required to be recorded.

ROSATOM exercises ownership rights on behalf of the Russian Federation with regard to:

- Property under the economic management of federal state unitary enterprises included in the list approved by the President of the Russian Federation pursuant to Article 5 of the Law on State Atomic Energy Corporation Rosatom;
- Assets allocated to federal state unitary enterprises (government stockpiles of raw materials and fissionable materials managed in accordance with paragraph 1 of Article 12 of the Law on State Atomic Energy Corporation Rosatom and the Regulations on Government Stockpiles of Special Feedstock and Fissionable Materials approved by Decree No. 693-24 of the Government of the Russian Federation dated 19 August 2011).

ROSATOM’s property

ROSATOM’s assets have certain special characteristics. More specifically, in accordance with paragraph 9 of Article 3 of the Law on State Atomic Energy Corporation Rosatom, foreclosure of certain property of ROSATOM¹ is prohibited.

ROSATOM is authorised to exercise ownership rights with regard to federal property on behalf of the Russian Federation. Federal property under the economic management of federal state unitary enterprises is recorded on their balance sheet. Federal property acquired as part of the exercise of the rights of a public contracting authority is recorded in ROSATOM’s budgetary accounting records.

Property of enterprises under ROSATOM’s jurisdiction

As at 31 December 2022, there were 13 federal state unitary enterprises under ROSATOM’s jurisdiction.

In 2022, none of ROSATOM’s federal state unitary enterprises were reorganised.

To enable effective use of real property and protect the rights and legitimate interests of owners and holders of these rights, in 2022, ROSATOM monitored the registration of title to real property used by federal state unitary enterprises.

Performance of government functions related to state property management by ROSATOM in 2022 involved monitoring the registration of title to real property held by the Russian Federation by federal state unitary enterprises under ROSATOM’s jurisdiction, as well as land regularisation.

In 2022, the Russian Federation registered its title to 90 items of real property (buildings and structures).

As at 31 December 2022, enterprises under ROSATOM’s jurisdiction concluded a total of 310 agreements granting a lease of real property with a total floor space of 616,110 m².

1. According to the list approved by Decree No. 346 of the Government of the Russian Federation dated 6 May 2008 on Measures for Implementing Decree No. 369 of the President of the Russian Federation dated 20 May 2008.

According to reports of enterprises under ROSATOM’s jurisdiction, as at 31 December 2022:

Total number of items of real property under the economic management of the enterprises, pcs.	13,372
Total floor space of the items of real property under the economic management of the enterprises, ‘000 m ²	46,923.08
Initial book value of the items of real property under the economic management of the enterprises, RUB ‘000	316,210,402.64
Residual book value of the items of real property under the economic management of the enterprises, RUB ‘000	259,310,029.62
Total number of land plots used by the enterprises, pcs.	2,330
Total area of land plots used by the enterprises, hectares	90,645.34
Cadastral value of the land plots, RUB ‘000	248,986,460.66
Authorised capital of the federal state unitary enterprises, RUB million	323,615.41

Property of ROSATOM’s organisations

34 non-core assets owned by joint-stock companies in which ROSATOM has a shareholding exceeding 25% were restructured in 2022. More specifically, 32 assets were sold; two assets were liquidated (written off). Proceeds from the sale of these non-core assets totalled RUB 358 million.

240 non-core assets owned by joint-stock companies in which ROSATOM has a shareholding totalling less than 25% and by companies whose shares are held by ROSATOM on behalf of the Russian Federation were restructured in 2022. More specifically:

- 56 assets were sold;
- 176 assets were transferred free of charge to the government and municipalities;
- 8 assets were liquidated (written off).

Proceeds from the sale totalled RUB 278.16 million.

As at 31 December 2022, ROSATOM’s organisations concluded a total of 2,670 agreements granting a lease of real property with a total floor space of 3,256,960 m².

According to reports of ROSATOM’s organisations, as at 31 December 2022:

Total number of items of real property owned by the organisations, pcs.	28,287
Total floor space of the items of real property on the balance sheet of the organisations, ‘000 m ²	53,106.06
Initial book value of the items of real property, RUB ‘000	951,530,619.26
Residual book value of the items of real property, RUB ‘000	734,372,707.19
Total number of land plots used by the organisations, pcs.	4,730
Total area of land plots used by the organisations, hectares	88,980.48
Cadastral value of the land plots, RUB ‘000	159,700,726.56

1.7. DEVELOPMENT OF THE NORTHERN SEA ROUTE

1.7.1. ROSATOM’s powers related to development and operation of the Northern Sea Route

Key results in 2022

- Targets for the Northern Sea Route Development Federal Project were achieved. Cargo traffic totalled 34.1 million tonnes (against a target of 32 million tonnes).
- The second follow-on multipurpose nuclear icebreaker, *Ural*, was accepted into service.
- The Federal State Budgetary Institution Northern Sea Route General Administration was established.
- The scope of surveys along the NSR reached an all-time high in modern Russian history: seafloor topography surveys covered 45,158 linear kilometres.
- The development of a digital ecosystem for the NSR was initiated.

ROSATOM has been assigned the functions of the infrastructure operator of the Northern Sea Route (NSR). Its responsibilities include managing navigation along the NSR, building infrastructure facilities, providing navigational and hydrographic support and ensuring the safety of navigation in the challenging Arctic environment.

The Corporation supervises the implementation of the Northern Sea Route Development Federal Project, which forms part of the Comprehensive Plan for Upgrading and Expanding Core Infrastructure until 2024¹, and manages the Northern Sea Route 2030 Federal Project forming part of the Government Programme of the Russian Federation ‘Development of the Nuclear Power and Industry Complex’.

The Corporation participates in the implementation of the Integrated Action Plan to Enforce the Principles of the State Policy of the Russian Federation in the Arctic until 2035 and the Strategy for Developing the Russian Arctic Zone and Ensuring National Security until 2035 (hereinafter referred to as the Plan), as well as an initiative for social and economic development of the Russian Federation until 2030 titled ‘Year-Round Northern Sea Route’, as approved by Order No. 2816-r of the Government of the Russian Federation dated 6 October 2021.

In addition, the Corporation participates in the implementation of the NSR Infrastructure Development Plan until 2035 approved by Order No. 2115-r of the Government of the Russian Federation dated 1 August 2022. The Plan outlines a large scope of measures ranging from the development of infrastructure for large-scale investment projects and preparations to enable transit navigation along the NSR to addressing healthcare issues and providing personnel for navigation in the Arctic.

The Federal State Budgetary Institution Northern Sea Route General Administration (NSR General Administration FSBI) was established in August 2022. Its principal objective is to manage navigation along the Northern Sea Route. The institution is tasked with:

- Providing icebreaker support and escorting vessels along the NSR;
- Developing navigation routes for vessels and deploying the icebreaker fleet along the NSR taking into account the hydrometeorological situation, navigational and ice conditions;
- Issuing, suspending, renewing, amending and terminating permits for navigation along the NSR.

1. Developed in accordance with Decree No. 204 of the President of the Russian Federation on National Goals and Strategic Objectives of the Russian Federation until 2024 dated 7 May 2018.

1.7.2. Escorting vessels and handling cargo traffic along the Northern Sea Route

Russia owns the world’s only nuclear-powered icebreaker fleet and has a long track record in the construction and operation of nuclear icebreakers. The nuclear-powered icebreaker fleet managed by ROSATOM participates in projects in the Arctic that are strategically important for Russia’s economic development.

As at 31 December 2022, the nuclear-powered icebreaker fleet included:

- Three Project 22220 nuclear icebreakers equipped with a RITM-200 integral reactor unit whose power exceeds 80,000 h.p.: *Arktika* (put into service in 2020), *Sibir* (put into service in 2021) and *Ural* (put into service in 2022);
- Two nuclear icebreakers with 75,000 h.p. two-reactor nuclear propulsion units: *Yamal* and *50 Let Pobedy*;
- Two nuclear icebreakers with a 50,000 h.p. one-reactor nuclear propulsion unit: *Taymyr* and *Vaygach*;
- *Sevmorput*, a nuclear-powered LASH carrier with a 40,000 h.p. one-reactor nuclear propulsion unit;
- *Imandra* and *Lotta* floating maintenance bases;
- *Serebryanka*, a motor vessel intended for liquid RAW management and SNF transportation; *Rossita*, a motor vessel used for SNF and RAW transportation; and *Rosta-1*, a radiation monitoring vessel;
- The fleet providing port services to gas tankers in challenging ice conditions:
- Two ice-class tugboats, *Pur* and *Tambey*;
- Two icebreaking tugboats, *Yuribey* and *Nadym*;
- A port icebreaker, *Ob*.

Under the Northern Sea Route Development Federal Project, cargo traffic along the NSR is projected to reach 80 million tonnes per year by 2024. By 2030, cargo traffic may increase to 150 million tonnes per year. The total capacity of seaports situated along the NSR should reach 83 million tonnes per year by 2024 and 115 million tonnes per year by 2030.

In the reporting year, the targets set for the Federal Project were met ahead of schedule, with cargo traffic totalling 34.1 million tonnes (against a target of 32 million tonnes), including 24 million tonnes transported by vessels escorted by nuclear icebreakers.

Maritime traffic along the NSR between 2020 and 2022

Indicator	2020	2021	2022
Number of vessels, pcs.	497	712	726
Total gross tonnage, million tonnes	34.9	49	39

In February 2022, the flagship multipurpose nuclear icebreaker, *Arktika*, escorted low-ice-class vessels (the *Inzhener Trubin* and *Polar King* motor vessels) from the east to the west. This is the first time in the history of Arctic navigation that this has been done at this time of year. This voyage has demonstrated that the Corporation is ready to escort Arc5 ice-class vessels along the entire length of the Northern Sea Route at this time of year.

In 2022, the Corporation was selected by the Ministry for the Development of the Russian Far East and Arctic to undertake subsidised near-coastal voyages from European Russia to the Far Eastern regions and back. As part of this task, in 2022, two round-trip voyages were made from ports in European Russia to Far Eastern ports and back.

1.7.3. Construction of new icebreakers and the auxiliary fleet

To handle the growing cargo traffic along the Northern Sea Route, ROSATOM is upgrading its icebreaker fleet on a large scale.

In the reporting year, the second follow-on Project 22220 multipurpose nuclear icebreaker, *Ural*, was accepted into service; it is equipped with a RITM-200 integral reactor unit with propulsion power totalling 60 MW (more than 80,000 h.p.).

By year-end 2022, two more Project 22220 multipurpose nuclear icebreakers, *Yakutia* and *Chukotka*, were under construction; they are scheduled to be commissioned in 2024 and 2026 respectively. In the reporting year, an official ceremony was held to mark the launch of the third follow-on multipurpose nuclear icebreaker, *Yakutia*.

In the Far East, the construction of a unique Project 10510 icebreaker, *Rossiya*, with propulsion power totalling 120 MW (more than 160,000 h.p.) is underway. This icebreaker will enable year-round operation in the High Arctic, mainly in its eastern sector, which is characterised by the most challenging ice conditions.

The construction of a floating maintenance dock for Project 22220 multipurpose nuclear icebreakers is underway (the construction was started in June 2021). Under the terms of the contract, the construction, including the delivery of the floating dock to the port of Murmansk, will take 29 months.

The construction of a fleet of port vessels to provide towing services at the offshore liquefied natural gas (LNG) transshipment facility continued in the reporting year. The terminal will enable efficient transportation of LNG produced as part of Arctic LNG 2 and other projects by facilitating its transshipment from Arc7 ice-class LNG carriers onto other vessels. To enable the continuous operation of the offshore LNG transshipment facility, five Arc4 ice-class tugboats will be built.

Extending the service life of icebreakers

In 2022, steps were taken to validate the extension of the service life of nuclear-powered vessels that are currently in operation; this involved inspecting safety-critical systems and equipment in accordance with the Programme of Preparations for an Extended Service Life developed for each nuclear icebreaker.

Sections of steam generators were repaired on the *Yamal*, *50 Let Pobedy* and *Taymyr* nuclear icebreakers and the *Sevmorput* nuclear-powered container ship.

Two reactor cores were reloaded on the *Yamal* nuclear icebreaker.

Maritime traffic along the Northern Sea Route is growing year by year. Service life extension measures enable the Corporation to fulfil its contractual obligations.

Nuclear and radiation safety

In the course of operation of its nuclear-powered icebreaker fleet, ROSATOM attaches great importance to environmental safety and preserving marine and coastal ecosystems. Accordingly, in 2022, ROSATOM continued to take steps in order to put the fundamental principles of the Uniform Industry-Wide Environmental Policy into practice and accomplish specific environmental objectives related to minimising the environmental footprint, including addressing ‘nuclear legacy’ issues.

In the reporting year, 19 spent fuel assemblies (SFAs) previously stored in the SNF storage caissons of the *Lepse* floating maintenance base were removed from the special storage site, loaded onto a special train and sent to FSUE Mayak Production Association for processing.

Site	Number of removed TUK-108/1 transportation packages with SNF from nuclear submarines, pcs.	Number of transportation packages loaded onto special trains and sent to FSUE Mayak Production Association for processing, pcs.	Placed into temporary storage, pcs.
Andreev Bay	42	42	0
Village of Gremikha	10	5	5

Systematic implementation of the environmental policy enables ROSATOM to monitor activities in the sphere of environmental protection and environmental safety, focus on environmental issues and implement timely corrective measures to address them in order to ensure compliance with environmental laws.

Digitisation

Enterprises continued the transition to prioritised use of Russian software: the transition to the use of the Astra Linux user-friendly operating system and the My Office software suite was completed. Similar changes were made with regard to software required for the operation of IT infrastructure (database management systems, virtualisation systems, etc.). Targets for the procurement and use of Russian software were met. The work will be continued in 2023 and 2024.

The development of an initiative to build an information system for maintenance planning was started; it is aimed at reducing the lead time for the maintenance and repairs of nuclear icebreakers, enhancing control over compliance with the maintenance and repair schedule, enabling efficient planning of the maintenance and repairs of nuclear icebreakers, and making this process more controllable and transparent.

1.7.4. Navigational and hydrographic support and construction of port infrastructure

Navigational and hydrographic support of navigation along the NSR

In 2022, navigational and hydrographic support for navigation along the NSR was provided under the Northern Sea Route Development Federal Project, which forms part of the Comprehensive Plan for Upgrading and Expanding Core Infrastructure until 2024, in accordance with the Plan of Navigational and Hydrographic Support (NHS) of Navigation along the Northern Sea Route, in Seaports Located along the Northern Sea Route and in Port Approaches for 2022 (hereinafter referred to as the NHS Plan) approved by ROSATOM and coordinated with the Federal Agency for Maritime and River Transport.

In 2022, the scope of surveys along the NSR reached an all-time high in modern Russian history. During the 2022 summer/autumn navigation season, seafloor topography surveys covered a total of 45,158 linear kilometres. Although the hydrometeorological situation and ice conditions posed significant challenges to navigation in 2022, all targets set for hydrographic operations in the NHS Plan were met.

In the future, surveys will continue at a rapid pace in order to increase the number of recommended routes along the NSR.

In accordance with the NHS Plan, in 2022, standalone power sources were installed on nine light beacons, 137 sea buoys were installed and removed, and maintenance of 188 onshore aids to navigation was carried out.

In 2022, 18 onshore beacons situated along the Yenisei River were upgraded and equipped with a system for monitoring the operation of lighting and optical equipment. A control station was installed in Saint Petersburg.

The infrastructure of seven stations of the GLONASS/GPS global navigation satellite system (GNSS) situated on the coast and on islands along the NSR was maintained, operated and developed, including six GNSS monitoring and correction stations on Oleny Island, Cape Sterlegov, Andrey Island, Stolbovoy Island, Kamenka Island and in the estuary of the Indigirka River, as well as the control station in Dikson.

An extensive upgrade of the *Grigoriy Mikheyev* research vessel was successfully completed in the reporting year. This involved replacing main equipment on the vessel and improving its habitability.

A government contract was secured for the technical upgrade of the second research vessel, *Petr Kottsov*. Old equipment is being dismantled, and preparations are being made for the installation of new equipment. The completion of the work and the handover of the vessel to the customer are scheduled for 2023.

The third research vessel, *Alexey Maryshev*, is being prepared for an upgrade; the work is scheduled to start in 2023.

A new Ice3 class Project E35.G hydrographic survey boat, *Yury Babayev*, and two Ice3 class Project BLV03 buoy tenders, *Vsevolod Peresypkin* and *Aleksandr Parfenov*, were accepted into service.

Pursuant to Decree No. 499 of the Government of the Russian Federation dated 31 March 2021 on Budget Investment Using Federal Budget Allocations for the Construction of an Arc7 Ice-Class Flagship Vessel, a government contract was secured and the construction of an Arc7 ice-class buoy tender for hydrographic surveys was started. The vessels are designed to operate in ports situated along the NSR, enable safe navigation, develop port infrastructure, and to position, service and deliver navigation and radio equipment and specialists to onshore facilities.

1.7.5 Construction and management of infrastructure facilities of the Northern Sea Route

Utrenniy terminal for LNG and stable gas condensate

In 2022, despite the tight construction schedule, challenging climatic conditions and a short period of ice-free navigation, construction work started in 2020 at the facilities of the Utrenniy terminal for liquid natural gas (LNG) and stable gas condensate that are under federal ownership (the Arctic LNG 2 project) was completed in full.

As part of dredging in the basin and the approach canal of the Utrenniy terminal (site No. 2 of the seaport of Sabetta), more than 24 million m³ of material was excavated.

The construction of the Southern and Northern Ice Protection Structures with a total length of more than 4.4 kilometres was successfully completed. In order to build the ice protection structures, a total of 5,759 piles were driven. The volume of hydraulic structures embedded in concrete totalled 155,000 m³.

In the reporting year, a navigation safety system was built, and the construction of a building for government inspection services, including a checkpoint on the Russian border, was completed.

The Corporation started dredging in the basin of the Utrenniy terminal and the construction of ice protection structures in 2019 and in the autumn of 2020 respectively.

The Utrenniy terminal should become fully operational in 2023.

Construction of the basin for the cargo berth and the canal of an offshore coal terminal at the Syrdasayskoye deposit

In 2022, design documentation was prepared for facilities under federal ownership as part of the project to build the basin for the cargo berth and the canal of an offshore coal terminal at the Syrdasayskoye deposit. The project involves building facilities under federal ownership, including dredging the basin of the cargo berth from the natural depth to the level of minus 16.0 metres according to the Baltic Height System (BHS) to enable the docking and handling of design vessels (*Admiral Schmidt* and *Vitus Bering*-class bulk carriers) at the cargo berth, and dredging the canal intended for loaded vessels leaving the terminal in order to increase its depth to minus 16.2 metres in the BHS. The proposed operations were approved by the Federal Agency for Fishery; a positive opinion was obtained following a state environmental expert review. The design documentation is undergoing a state expert review, including the verification of construction cost estimates; the work is scheduled to be completed in 2023.

Plans for 2023 include securing a government contract and meeting physical targets for the scope of work as part of the project to build the basin for the cargo berth and the canal of an offshore coal terminal at the Syrdasayskoye deposit¹.

Hydrometeorological monitoring system

In 2022, design documentation was prepared for a system for the monitoring of hydrometeorological factors affecting navigation safety within the Sea Canal in the Gulf of Ob and on the approaches to it. The proposed operations were approved by the Federal Agency for Fishery, and a positive opinion was obtained following a state environmental expert review. The design documentation is undergoing a state expert review, including the verification of construction cost estimates; the work is scheduled to be completed in 2023.

Construction of infrastructure for the placement of MFPUs and construction of a marine terminal on Cape Nagloynyn

The Corporation jointly with LLC GDK Baimskaya is implementing an investment project to develop the Baimskaya Ore Zone (in accordance with Comprehensive Plan No. 14480p-P51 dated 28 December 2021, as approved by the Deputy Chairman of the Government of the Russian Federation, Representative of the President of the Russian Federation in the Far Eastern Federal District Yuriy Trutnev).

1. In accordance with Order No. 4404-r of the Government of the Russian Federation dated 31 December 2022.

In 2022, the required front-end engineering and design work was completed for facilities under federal ownership forming part of onshore and hydraulic structures of the marine terminal in order to build infrastructure for the placement of FPU's on Cape Nagloynyn in the seaport of Pevek. The proposed operations were approved by the Federal Agency for Fishery; a state environmental expert review and a state expert review of the design documentation, including the verification of construction cost estimates, are underway; the work is scheduled to be completed in 2023.

Plans for 2023 also include securing a government contract for the construction of infrastructure for the placement of FPU's and for the construction of facilities under federal ownership forming part of the adjacent cargo terminal on Cape Nagloynyn in the seaport of Pevek. Plans for 2023 include completing the design work and obtaining an opinion following a state expert review of the design documentation, including the verification of construction cost estimates.

Under the government contract for construction to be secured for the project, construction materials are to be purchased and delivered to the construction site along with construction machinery in 2023.

Maintenance dredging along the NSR

Maintaining the specified (design) characteristics of a basin shaped earlier is a major priority, given the need to provide the required conditions for navigation. Accordingly, maintenance dredging is carried out on an annual basis as part of statutory activities, which involve repairs, maintenance and upgrades of existing and construction of new hydraulic structures and other port facilities, including transshipment facilities and terminals along the NSR.

In 2022, maintenance dredging was carried out in order to ensure safe navigation in the basins of the seaport of Sabetta and the Utrenniy terminal, with 1.11 million m³ of material dredged.

Plans for 2023 include excavating 1.48 million m³ of material as part of maintenance dredging in the basins of the seaport of Sabetta and the Utrenniy terminal.

Digitisation of navigational and hydrographic support

Efficient and timely performance of the tasks assigned to the Corporation in the sphere of navigational and hydrographic support along the NSR requires a high degree of process automation and digitisation focused primarily on hydrographic surveys (seafloor topography mapping) and the processing of their results, as well as generating and updating navigational data and maps to enable safe navigation and business operations along the NSR.

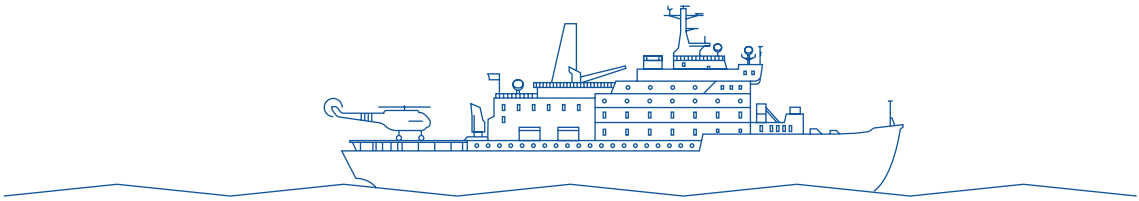
The Corporation has modern automated hydrographic systems based on multibeam echo sounders, which enable seafloor topography mapping along the NSR. Seafloor topography data are collected and processed and reports are prepared using state-of-the-art licensed software, such as QPS Qinsy, QPS Qimera 2 and Civil 3D. This equipment and software make it possible to conduct hydrographic surveys along the NSR, process the relevant data and prepare reports within the shortest possible time frame and to a high standard in accordance with the requirements of Publication S-44 of the International Hydrographic Organisation (IHO), *Standards for Hydrographic Surveys*.

Reports on the findings of hydrographic surveys provide a basis for compiling and updating digital maps and navigational information, including in the form of electronic navigational charts (ENCs) and digital reference datasets (DRDSs) covering the NSR that are compliant with applicable IHO standards. This is done using state-of-the-art software, dKart Editor.

In 2022, a set of ENCs comprising 259 cells and covering the entire NSR was kept up to date.

The Corporation is the only organisation in Russia that compiles digital cartographic information in the form of DRDSs compliant with Annex A of IHO Publication S-65, *High Density (HD) ENC Production and Maintenance Guidance*, adopted by the IHO in 2020 and provides it to mariners. DRDSs are created for individual areas of the NSR for which official ENCs do not provide bathymetric details and depth contours that are sufficient for safe navigation and vessel manoeuvring and the official ENC producer is unable to promptly adjust them (e.g. for seaport areas and approaches to them where there are areas of minimal under-keel clearance and/or vessel manoeuvrability is restricted). In 2022, 31 new DRDSs were created, and all DRDSs comprising a total of 313 cells were kept up to date.

The ENCs and DRDSs are provided to mariners and updated in strict compliance with the requirements of IHO Publication S-57, *IHO Transfer Standard for Digital Hydrographic Data*, and IHO Publication S-63, *IHO Data Protection Scheme*. In 2022, a total of 46 large-capacity vessels, primarily LNG tankers and nuclear icebreakers, as well as the Marine Operations Headquarters, were provided with up-to-date ENCs and DRDSs. DRDSs for the Gulf of Ob, including the Sea Canal and the basin of the seaport of Sabetta, are the most sought-after by mariners and are updated annually based on seafloor topography data.



1.7.6. Navigation management along the Northern Sea Route

Pursuant to Federal Law No. 184-FZ of 28 June 2022, the Merchant Shipping Code of the Russian Federation has been amended to grant powers related to navigation management along the NSR to ROSATOM.

To do so, the Federal State Budgetary Institution Northern Sea Route General Administration (NSR General Administration FSBI) has been established by Order No. 2019-r of the Government of the Russian Federation dated 23 July 2022; its primary objective is to manage navigation along the NSR.

NSR General Administration FSBI comprises the Marine Operations Headquarters (which is responsible for providing icebreaker support, developing navigation routes along the NSR and escorting vessels along these routes, as well as deploying nuclear icebreakers along the NSR) and the Department of Licensing Activities (which is responsible for issuing permits for navigation along the NSR, including their suspension, renewal, amendment and termination, and the provision of information on the hydrometeorological situation, navigational and ice conditions along the NSR).

NSR General Administration FSBI has been authorised to issue permits for navigation along the NSR, suspend, renew, amend and terminate such permits¹.

In the reporting year, a new version of the Rules of Navigation along the NSR dated 21 September 2022 came into force, whereby permits for navigation along the NSR are issued by ROSATOM or its subordinate organisation.

Between 29 June² and 31 December 2022, ROSATOM and NSR General Administration FSBI reviewed 750 applications for navigation along the NSR.

The Council of the NSR Shipping Participants and the Interdepartmental Commission on NSR Navigation Management were established in 2022. The Council discusses and formulates proposals for improving the efficiency of communication and cooperation between investment project operators, shipping companies transporting cargo along the Northern Sea Route and ROSATOM as the NSR infrastructure operator. In 2022, cargo traffic along the NSR totalled 34.117 million tonnes. In 2022, cargo traffic along the NSR exceeded the target set for the Northern Sea Route Development Federal Project by more than 2 million tonnes. An increase in cargo traffic along the NSR driven by Russian companies in 2022 totalled 966,000 tonnes, or 3% compared to 2021.

The growth of cargo traffic throughout 2022 was driven primarily by LNG transportation. LNG transportation increased by 1.2 million tonnes (1,258,000 tonnes) compared to 2021; container traffic increased by 226,000 tonnes, while bulk cargo traffic grew by 109,000 tonnes. Cargo traffic associated with infrastructure construction for the projects of Russian customers also continues to grow. In 2022, the first three batches of coal mined at the Syrdasayskoye deposit were shipped. More than 100,000 tonnes of commodities were shipped eastwards along the NSR. In addition, in 2022, a programme of subsidised near-coastal voyages was implemented. The *Sevmorput* nuclear-powered LASH carrier made two round-trip voyages from ports in European Russia to Far Eastern ports. In 2023, the programme of subsidised round-trip voyages will be continued.

On instruction from the Russian President Vladimir Putin, in 2022, ROSATOM, the Ministry for the Development of the Russian Far East and Arctic and major Russian consignors signed trilateral agreements providing for the construction of the necessary infrastructure along the NSR and the handling of annual cargo traffic. Projections of cargo traffic between 2030 and 2035 reflected in the agreements are higher than those set in the NSR Development Plan until 2035 approved by Order No. 2115-r of the Government of the Russian Federation dated 1 August 2022. This reflects the huge potential of the NSR and its development prospects. Seven nuclear-powered vessels operate along the NSR to provide icebreaker support for Arctic investment projects, including three Project 22220 icebreakers that are the most powerful in the world: *Arktika*, *Ural* and *Sibir*.

Preparations are underway for launching year-round eastward navigation along the NSR.

Experimental voyages are made eastwards from the port of Sabetta in order to gain experience in escorting vessels of this class, develop the relevant tactics and study the hydrometeorological and ice conditions for navigation along the eastern section of the NSR for vessels of this kind.

The launch of year-round navigation along the NSR will enable a significant increase in cargo traffic along this route and will provide access to new promising markets, helping to ensure Russia's economic security.

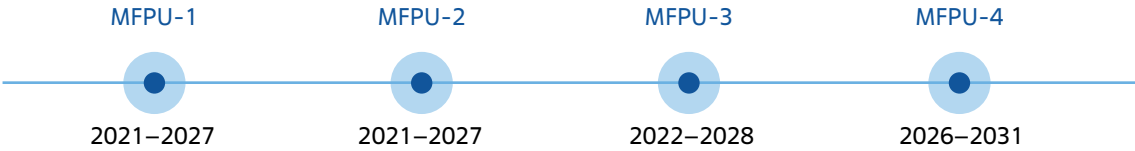
1. Pursuant to Order No. 1/22-NPA of ROSATOM dated 2 August 2022.
2. Date of official publication of Federal Law No. 184-FZ of 28 June 2022.

GRI 3-3 1.7.7. New areas of activity

Power ships based on modernised floating power units

The implementation of the comprehensive plan for the investment project to develop the Baimskaya Ore Zone continued. ROSATOM will supply four (three plus one) modernised floating power units (MFPU) based on RITM-200S reactor units with installed capacity of up to 110 MW each.

Construction time frame:



In 2022, the MFPU design stage was completed. The engineering design for the MFPU was successfully presented to ROSATOM's R&D Board No. 1. The development of working designs was initiated.

LLC GDK Baimskaya, a company of KAZ Minerals Group, is the investor in the project to develop the Baimskaya Ore Zone. The Baimsky Mining and Processing Plant is expected to start production by the end of 2027; its ore processing capacity is projected at 70 million tonnes per year. JORC resources at the Peschanka deposit, which is situated within the boundaries of the Baimskaya Ore Zone, are estimated at 9.9 million tonnes of copper and 16.6 million ounces of gold.

Environmental monitoring along the NSR

In 2022, further progress was made on the project to conduct comprehensive studies and environmental safety monitoring above and below water along the NSR in line with global best practices. The project is focused on near-coastal and transit Arctic shipping, as well as NSR port infrastructure at the construction and operation stage.

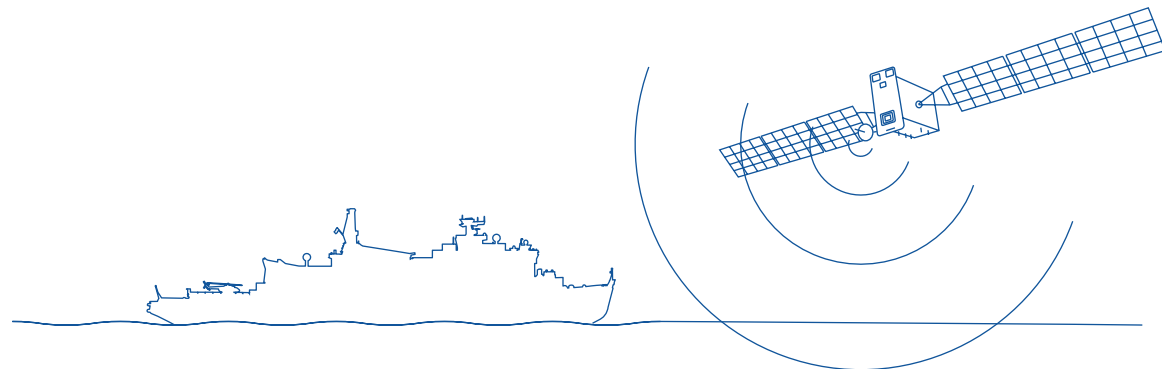
Specialists from the Marine Research Centre of Lomonosov Moscow State University carried out environmental monitoring at 50 sites along the Northern Sea Route; digital services for environmental safety monitoring of the NSR based on remote sensing data were tested and proved to be efficient.

The project will remain relevant as it supports sustainable development in the region; it will require a further scale-up amid the expansion of commercial operations in the Arctic and emerging new challenges related to climate change in the Arctic.

In 2022, the crew of the *Sevmorput* nuclear-powered container ship assisted a representative of the Murmansk Marine Biological Institute of the Russian Academy of Sciences (MMBI RAS) with data collection along the NSR. The ship went from Saint Petersburg to Petropavlovsk-Kamchatsky via Murmansk. Studies conducted during the voyage were focused on assessing the status of populations of sea mammals, birds and polar bears along the entire length of the Northern Sea Route. Cooperation with ROSATOM's enterprises has enabled Russian scientists to carry out a full-scale observation of key components of ecosystems across the Arctic from the Barents Sea to the Chukchi Sea for the first time in 15 years. This will make it possible to assess their current status and build models in order to forecast their further development for the coming decades.

1.7.8. Plans for 2023 and for the medium term

- To meet the targets set under the Northern Sea Route Development and NSR 2030 Federal Projects for cargo traffic and the total capacity of seaports situated along the NSR;
- To continue the construction of Project 22220 multipurpose nuclear icebreakers and the Project 10510 icebreaker;
- To commission the floating dock for Project 22220 multipurpose nuclear icebreakers;
- To commission five Arc4 ice-class tugboats;
- To complete the upgrade of the *Petr Kottsov* research vessel and put it into service;
- To complete the construction of the *Yury Osokin* hydrographic survey boat and put it into service;
- To update (keep up to date) 259 navigational charts covering the NSR; to update (keep up to date) 313 DRDSs. To compile 35 new DRDSs; to maintain (upgrade) 319 aids to navigation and seven monitoring and correction stations;
- To provide navigational and hydrographic support along the NSR covering 45,252 kilometres;
- To maintain and operate GLONASS monitoring and correction stations;
- To additionally equip the border checkpoint in the seaport of Sabetta (in the Utrenniy terminal) with communications, security and special monitoring systems;
- To build the basin of section 4 of the berth in the Utrenniy terminal;
- To build facilities under federal ownership as part of the project to develop the Syrdasayskoye coal deposit;
- To amend the design documentation and subsequently carry out dredging within the required scope as part of stage 2 of the renovation of the Sea Canal;
- To complete design work as part of the project to build an offshore coal terminal on Cape Nagloynyn in the seaport of Pevek and secure the relevant government contract for construction;
- To carry out maintenance dredging along the NSR;
- To commission the first two floating power units in the area of Cape Nagloynyn by 2027, with the third and fourth units to be commissioned by 2028 and 2031 respectively;
- To carry out environmental monitoring along the NSR.



1.8. IMPLEMENTATION OF THE ECOLOGY NATIONAL PROJECT

The Ecology National Project is a national project of the Russian Federation for the period from 2019 through 2024 aimed at creating a safe and comfortable living environment, dismantling the most hazardous legacy facilities that cause environmental damage and developing a system for hazardous waste management.

As part of the Ecology National Project, ROSATOM is responsible for the implementation of the Infrastructure for the Management of Hazard Class 1 and 2 Waste Federal Project and participates in the implementation of the Clean Country and Preservation of Lake Baikal Federal Projects.

1.8.1. Implementation of the Infrastructure for the Management of Hazard Class 1 and 2 Waste Federal Project

As part of the Federal Project, ROSATOM is developing an integrated system for hazard class 1 and 2 waste¹ management:

- An information system for tracking this waste and monitoring its management;
- The relevant waste management infrastructure.

As from 1 March 2022, FSUE FEO (an organisation of ROSATOM), which is the federal operator responsible for the management of hazard class 1 and 2 waste, arranges safe waste transportation and management on a turnkey basis for waste-generating enterprises that lack the relevant capacities.

In 2022, about 59,000 users were registered in the federal state information system for tracking hazard class 1 and 2 waste and monitoring its management (FGIS OPVK), which was put into operation in December 2021. Thus, at year-end 2022, 34,400 waste-generating organisations, as well as operators providing hazardous waste transportation and management services were operating in the digital environment.

The main principles underlying the operation of the digital platform include the monitoring of environmental safety and public health, proper government record-keeping of hazard class 1 and 2 waste management across its life cycle, and offering all market players a convenient ‘one-stop shop’ solution enabling them to monitor processes in real time on any device.

The system has been integrated with information systems such as the ESIA Gosuslugi integrated identification and authentication system, the Nalog 3 automated information system, GLONASS and the PTK Goskontrol hardware and software system for government supervision, which eliminates the need for double data entry.

The FGIS OPVK system has made it possible to establish a federal framework for the management of hazard class 1 and 2 waste in electronic form, which will inform development forecasting models for the industry.

ROSATOM’s key task as part of the Federal Project is to build seven environmental technology parks. Four of these industrial facilities are to be built at former chemical weapons destruction sites in the Kirov, Kurgan and Saratov Regions and the Udmurt Republic, while the remaining three are greenfield facilities that will be built in the Irkutsk, Tomsk and Nizhny Novgorod Regions.

1. Hazard class 1 and 2 waste includes mixtures of inorganic salts, oxides, hydroxides, acids (waste from the metals, manufacturing and mechanical engineering industries), mercury-containing waste (mercury-vapor lamps and mercury thermometers, as well as mercury-containing industrial waste); effluents from industrial enterprises, organic waste, mixed and composite organic and inorganic waste.

The environmental technology parks will have a total throughput of 350,000 tonnes of waste, which will help to address the national shortage of capacities for the processing of highly hazardous waste. This will provide a resource base for a new circular economy in Russia.

The design and selection of process lines is underpinned by the principle that recycling takes priority over waste treatment: more than two thirds of all waste will be recycled, and the resulting materials will be commercialised.

As part of the Infrastructure for the Management of Hazard Class 1 and 2 Waste Federal Project, in 2022:

- Preparatory, construction and installation work was carried out in the Saratov and Kurgan Regions (the Gorny and Schuchye facilities); main steel structures were assembled; the construction of new buildings and deliveries of process equipment were started. In addition, construction was started in the Kirov Region and the Udmurt Republic (the Maradykovsky and Kambarka facilities); preparatory work was carried out;
- Positive opinions following state expert reviews and construction permits were obtained for industrial facilities to be built in the Irkutsk and Tomsk Regions (the Vostok and Western Siberia facilities); construction contracts were concluded, and preparatory work was started. A contract was concluded for the development of design documentation and the construction of the RG Centre industrial facility in the Nizhny Novgorod Region.

The seven state-of-the-art environmental technology parks are scheduled to be commissioned by the end of 2024.

1.8.2. Implementation of the Clean Country Federal Project

As part of the Clean Country Federal Project, ROSATOM is working to mitigate environmental risks posed by legacy sites in the Leningrad and Irkutsk Regions.

Krasny Bor landfill remediation

The Krasny Bor landfill was in operation between 1968 and 2014; it was used as an environmental facility enabling smooth operation of industrial enterprises in Leningrad (Saint Petersburg) and the Leningrad Region. The landfill has an area of 67.4 hectares, including a 46.7-hectare waste storage area. It was used for the disposal of both liquid and solid hazard class 1 to 4 industrial toxic waste. During the operation of the landfill, 70 landfill cells were built by 2014; they contain 1.7 million tonnes of highly toxic waste. There are also other sources of contamination at the site that make a negative impact on the environment and the local community; these include soil from temporary storage sites and unused or contaminated utility systems (pipelines, pontoons, fire hydrants, etc.).

The following work was performed in 2022 under government contract No. 2/2022EI dated 25 April 2022 for the reparation of historical environmental damage caused by the Krasny Bor landfill:

- Detailed designs were developed;
- The construction of a sheet pile retaining wall was started as part of the construction of a cut-off wall;
- The landfill site was prepared for the technical stage of remediation;
- A surface runoff collection tank was built;
- Foundations were prepared for the construction of buildings for the collection and treatment of surface runoff and for an office and amenity building;
- Bund walls around open landfill cells were reinforced.

The construction phase was initiated on 25 April 2022 as part of ROSATOM's Days in the Federation Council of the Federal Assembly of the Russian Federation.

The reparation of historical environmental damage at the landfill site involves building a 3.5-kilometre-long buried multi-layer cut-off wall around the landfill body and the treatment of 340,000 m³ of liquid and paste-like waste stored in open landfill cells. The waste will be treated using a unique technology and dedicated infrastructure for the handling of complex waste. As a result, the contents of the open landfill cells will be treated to ensure that they meet statutory limits for discharge into a fishery.

Residual liquid waste will be treated using a lithification plant, with secondary waste processed into a safe adaptive geocomposite material, which will be used for the subsequent site rehabilitation.

The rehabilitation will involve the construction of a multipurpose landfill cap and topsoil restoration, as well as the construction of storm water runoff and leachate drainage and treatment systems.

The site will become completely safe by 2025.

Remediation of the former Usolyekhimprom industrial site

The work carried out by ROSATOM on instruction from the President of the Russian Federation is unique in terms of scope and technology. The work is supported by ROSATOM's established safety culture and expertise in radioactive waste management, as well as the use of unique innovative solutions for the decommissioning of challenging industrial facilities.

Top-priority measures implemented by ROSATOM have made it possible to lift the state of emergency in Usolye-Sibirskoye. In parallel with the implementation of the top-priority measures, a comprehensive site remediation project has been developed. Positive opinions have been obtained for key facilities following state expert reviews.

In 2022, the first stage of work involving the dismantling of 204 buildings and structures was completed four months ahead of schedule. Furthermore, cost savings were achieved, enabling the dismantling of an additional 37 facilities.

ROSATOM is aware of the complexity of tasks facing it and the scale of site contamination; accordingly, it actively cooperates with the Russian Academy of Sciences and leading specialised research institutes.

Overall, the remediation of the industrial site will involve dismantling 368 buildings, structures and utility lines with a total structural volume of 6.1 million m³. Construction waste generated during the dismantling will be crushed, and the resulting inert materials will be used for insulation during the remediation of the sludge dump.

To prevent the leakage of pollutants beyond the boundaries of the landfill site with groundwater, the project involves the construction of a cut-off wall.

The remediation of a 200-hectare sludge dump containing 3.6 million m³ of sludge from chemical plants will involve creating levelling and horizontal waterproofing layers to ensure secure waste isolation.

Work on the 660,000 m³ municipal landfill will involve the shaping of the landfill body and waterproofing.

The remediation of a system of sludge ponds will involve the dismantling of capital facilities and utility networks.

The elimination of an oil lens will involve the treatment of oil-contaminated soil through biodegradation of petroleum products.

In 2026, the site will become safe and suitable for setting up new manufacturing operations.

1.8.3. Implementation of the Preservation of Lake Baikal Federal Project

Remediation of the site of the Baykalsk Pulp and Paper Mill

ROSATOM is implementing a project aimed at environmental improvement of Lake Baikal, which involves reducing the area of land with a high and extremely high level of environmental contamination. The project involves work at three sites that pose a hazard to the ecosystem of Lake Baikal:



- The Solzansky landfill (108.5 hectares; 4,212,500 m³ of waste);
- The Babkhinsky landfill (45.3 hectares; 2,382,000 m³ of waste);
- The site of the former wastewater treatment facilities, including industrial spaces where black liquor is stored (35.27 hectares; 290,000 m³ of liquid containing black liquor).

Top-priority measures have been implemented at the BPPM site to lower the water level above the sludge layer. To do so, local wastewater treatment facilities have been installed; utility networks have been built for collecting water above the sludge layer from the landfill sites and discharging treated water into the centralised sewerage system of the town of Baykalsk. These measures have helped to prevent an environmental catastrophe that could have damaged the unique ecosystem of Lake Baikal, namely the overflow of sludge water and contamination of Lake Baikal with hazardous waste from OJSC BPPM.

In 2022, the water level above the sludge layer in landfill cells was lowered by 60 centimetres. About 70,000 m³ of sludge water was treated and transferred to municipal wastewater treatment facilities in Baykalsk. Positive opinions were obtained following state expert reviews of design documentation for the reparation of historical environmental damage at the site of the former wastewater treatment facilities of the Baykalsk Pulp and Paper Mill and the Babkhinsky landfill, which makes it possible to start the work.

Design work for the Solzansky landfill has been suspended in order to carry out additional evaluation of technological solutions (R&D), in accordance with the decision of the Government of the Russian Federation.

OJSC Baykalsk Pulp and Paper Mill (OJSC Baykalsk PPM or BPPM) is situated on the southern shore of Lake Baikal in the Slyudyansky District of the Irkutsk Region. The enterprise was put into operation in 1966. Two landfill sites were built for waste disposal (the Solzansky and Babkhinsky landfills), where a series of storage tanks were installed. Over more than 40 years of operation of the mill, more than 6 million tonnes of industrial waste, mainly lignin sludge (insoluble solid fibre residue from the pulping process), were accumulated in 13 landfill cells. In addition, the captive CHPP of the enterprise produced a large amount of ash as a result of coal combustion. Solid household waste and construction waste was also dumped into the landfill cells. A major environmental hazard is also posed by black liquor, which is stored mainly at BPPM’s wastewater treatment facilities.

Introduction of new technologies

A unique system of geochemical barriers has been developed jointly with Lomonosov Moscow State University to prevent the leakage of pollutants into the environment.

The innovative approach developed by specialists from Lomonosov Moscow State University for the treatment of contaminated groundwater involves building a wall made from a reactive material across the contaminated stream. Contaminated groundwater is filtered by passing through the wall as a result of a natural gradient.

The construction of a cut-off wall with a high sorption capacity will make it possible to:

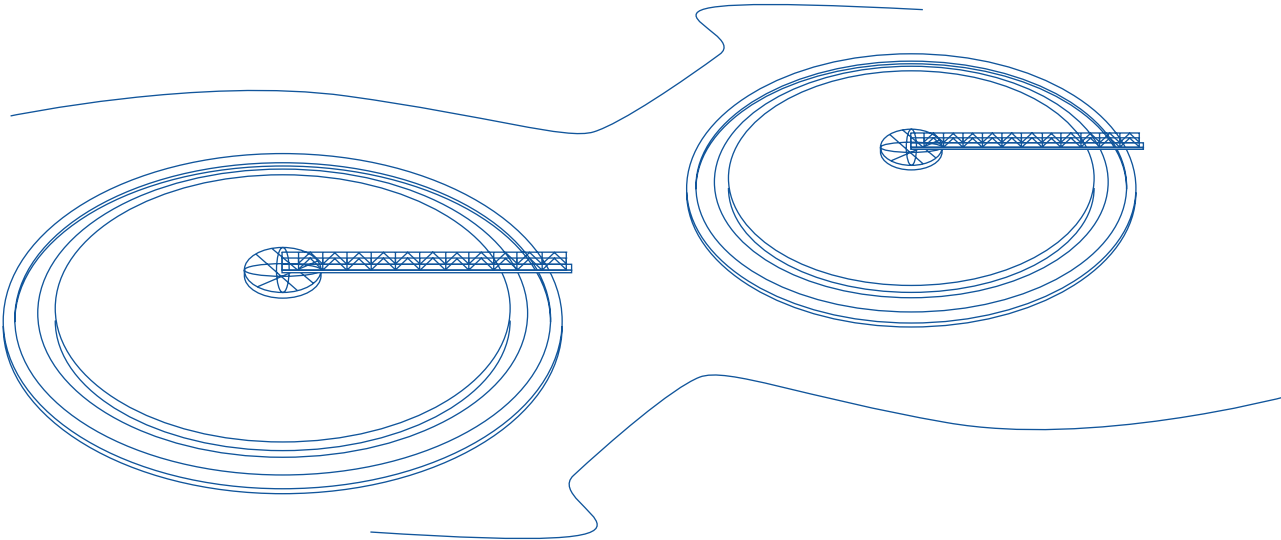
- Prevent the leakage of pollutants with groundwater and protect the Angara and Belaya Rivers from contamination;
- Gradually clean up the site as the soil will be rinsed by precipitation and the washed-out pollutants will be absorbed by the geochemical barrier;
- Prevent underground contamination.

Plans for 2023 and until 2030

In 2023, ROSATOM will continue to build infrastructure facilities to enable the safe management of hazard class 1 and 2 waste. The Gorny and Schuchye sites will be commissioned in December 2023.

By the end of 2024, all seven industrial facilities will be operational.

In 2023, the Corporation will continue to take steps to repair environmental damage caused by legacy sites. Measures to repair historical environmental damage at the Krasny Bor landfill site are scheduled to be completed in 2025; work in the Usolye-Sibirskoye municipality and at the Babkhinsky landfill of OJSC BPPM is scheduled for completion in 2026, while work at the site of the central wastewater treatment facilities is to be completed in 2027.



1.9. DIGITAL TRANSFORMATION

Key results in 2022

- 10 pilot projects were implemented in the sphere of end-to-end digital technologies and data management, with benefits totalling RUB 105.88 million.
- An international version of the Logos product was developed.
- Multi-D products were included in the Unified Register of Russian Computer Software and Databases.
- The Multi-D ESB product was launched on the market.

1.9.1. Uniform Digital Strategy

The Corporation is implementing a Uniform Digital Strategy (UDS). ROSATOM was the first Russian state-owned corporation to approve a strategy of this kind in 2018. The UDS is regularly updated taking into account changes in the internal and external environment. Key stakeholders in the implementation of the UDS include ROSATOM's organisations, as well as partner companies that are potential consumers of ROSATOM's digital products, and the Government of the Russian Federation, which monitors the implementation of the Digital Technology Federal Project forming part of the Digital Economy National Programme. All organisations managed by ROSATOM contribute to the digitisation of the nuclear industry.

Digitisation supports the achievement of ROSATOM's strategic goals and is a driver of ROSATOM's business efficiency. In 2022, the Digitisation Unit took active steps to develop a new ROSATOM 2030 Digital Vision following an update to ROSATOM's 2030 Vision. In accordance with the updated ROSATOM 2030 Digital Vision, the UDS is scheduled to be updated in 2023; it will incorporate the requirements of federal executive authorities.

The ROSATOM 2030 Digital Vision prioritises the achievement of the following digitisation goals in the industry by 2030:

- Accomplishing 100% of tasks set by the government;
- ROSATOM as a global technological leader;
- A 10-fold increase in digital revenue;
- Digital technologies/solutions developed by ROSATOM to be applied in 30 countries worldwide;
- 100% of products to be supplied by ROSATOM's businesses with a high level of digital maturity;
- 100% quality of digital services;
- The share of routine operations to be reduced to 0%;
- The share of people using or adopting digital technologies in their work to reach 100%;
- 5% share in the Corporation's EBITDA.

In 2023, extensive methodological activities and expert work will be initiated in order to provide a regulatory, methodological and scientific framework for digitisation in the industry and support the achievement of the goals set in the ROSATOM 2030 Digital Vision and the UDS.

In addition, in 2023, the Corporation plans to launch a dedicated internal communication campaign in order to communicate the goals set in the ROSATOM 2030 Digital Vision to every employee in ROSATOM's Divisions and organisations in line with their specialisation and to increase their engagement in the implementation of the 2030 Digital Vision.

Economic benefits

Digitisation is one of the most important drivers of ROSATOM's business efficiency. The Corporation is actively developing an approach based on a comprehensive assessment of effectiveness of IT projects in the nuclear industry.

In 2022, the uniform methodological framework for calculating benefits from the implementation of IT projects was updated; a list of mandatory projects was compiled, and ROSATOM's portfolio of IT projects was revised. In 2023, the Corporation plans to continue to provide training in project impact assessment for managers, to continue the audit of IT projects with a focus on evaluating their effectiveness and to implement large-scale IT projects for the benefit of government customers, large businesses and the independent IT market.

To unlock the significant potential of digitisation as a driver of the Corporation's business efficiency, ROSATOM will develop an approach to increasing the level of digital maturity¹ of existing processes in its organisations which involves applying digital tools in the manufacture of all core products in the industry.

Strategic partnership with AT Consulting

On 5 March 2022, LLC Rusatom Digital Solutions (a company of ROSATOM) and JSC AT Group (the holding company of AT Consulting Group) announced the establishment of a strategic partnership to address digitisation tasks. The alliance aims to pool the competences of the two companies in order to develop competitive digital products and solutions both for domestic customers, including government agencies, and for the international market.

During the first year of the Corporation's strategic partnership with JSC AT Group, all key growth targets set for the digital business were achieved. By working together, the companies achieved a number of extra synergies. The Corporation became a major player on the system integration market as an IT company and was offered an opportunity to participate in breakthrough government and intergovernmental initiatives thanks to having a professional IT integrator in its team, while JSC AT Group enhanced its industrial practice by participating in joint projects with ROSATOM.

Digital hierarchy

In 2022, the digital hierarchy was in place in 20 Divisions and 69 key organisations. To maintain a high professional level of chief digital officers (CDOs) managing digitisation initiatives in the Divisions and key organisations, a pilot assessment of their professional and technical competences was carried out. Based on its results, in 2023, the Corporation plans to develop a personalised list of training courses for each CDO who has undergone the assessment.

Digitisation programmes in the Divisions

Digitisation programmes in the Divisions are a key tool for the decomposition of the goals of the Uniform Digital Strategy. In 2022, the Corporation approved a methodological framework for developing and updating digitisation programmes in the Divisions, which currently underpins the implementation of programmes in 18 of ROSATOM's Divisions.

1. Digital maturity assessment forms part of the monitoring of progress in digitisation in organisations within ROSATOM's scope of consolidation as part of the industry-wide Digitisation function.



1.9.2. Participation in digitisation in Russia

Digital Economy

ROSATOM actively participates in the implementation of the Digital Economy National Programme. ROSATOM is a founder of the Autonomous Non-Profit Organisation Digital Economy, which is involved in managing the implementation of the Digital Economy National Programme¹. The Corporation performs the functions of a competence centre for the Digital Technology Federal Project forming part of the Digital Economy National Programme² and is a contractor responsible for individual deliverables under the Digital Technology Federal Project. The Corporation has also been assigned responsibility under letters of intent signed with the Government of the Russian Federation for the development of individual high-technology areas, including New Industrial Software (previously New Production Technologies).

In addition, ROSATOM's representatives are members of working groups on federal projects forming part of the Digital Economy National Programme under the Autonomous Non-Profit Organisation Digital Economy. ROSATOM and its organisations actively participate in initiatives launched by the Government of the Russian Federation to replace foreign software in key sectors of the Russian economy in order to achieve technological sovereignty.

Participation in the implementation of systemic measures to ensure the technological independence of the Russian economy

In 2022, ROSATOM and its organisations actively participated in the implementation of Instructions No. MM-P10-10127 of the Prime Minister of the Russian Federation Mikhail Mishustin dated 16 June 2022. This involved initiating a set of large-scale systemic measures at the federal level in order to replace foreign solutions and software used in the industry with Russian analogues in prioritised areas with financial assistance from the government. The measures were implemented in cooperation with major customers in the industry and independent Russian developers.

In order to align software supply and demand in the industries, the Government of the Russian Federation established industrial competence centres responsible for replacing imported digital products and solutions, including hardware and software systems, used in key sectors of the economy (hereinafter referred to as ICCs), as well as competence centres responsible for developing Russian system-wide and applied software in order to replace foreign analogues that are currently in use (hereinafter referred to as DCCs) involving leading Russian companies.

Nuclear organisations actively participated in the work of 23 ICCs and DCCs.

In addition, ROSATOM's Director General Alexey Likhachev headed the ICC for General Mechanical Engineering of the Industry Committee on Mechanical Engineering under the Russian Ministry of Industry and Trade.

As a result of initiatives implemented by ROSATOM and its organisations, 13 projects were submitted as part of the work of eight ICCs and were granted the status of particularly significant, including in terms of future government support. IT solutions to be developed and implemented as part of these projects are scalable across entire industries and are critical for ensuring the technological sovereignty of Russian enterprises.

ROSATOM as the competence centre for the Digital Technology Federal Project participated in updating regulatory documents of the Government of the Russian Federation defining the procedure for providing financial assistance from the government for projects focused on developing and implementing Russian IT solutions.

1. The relevant regulations were approved by Decree No. 234 of the Government of the Russian Federation dated 2 March 2019 on the System for Managing the Implementation of the National Programme 'Digital Economy of the Russian Federation'.

2. Pursuant to Decree No. 234 of the Government of the Russian Federation dated 2 March 2019.

In 2023, ROSATOM plans to actively participate in the implementation of projects focused on the development and implementation of IT solutions by the Corporation's enterprises as part of large-scale programmes implemented by the Government of the Russian Federation in order to replace imported solutions; it also plans to continue working to improve laws and regulations on government support measures.

New industrial software

In order to provide a single platform for cooperation between industrial software developers/integrators, industrial enterprises adopting industrial software, as well as software testing centres and the expert community, in March 2022, ROSATOM jointly with the Russian Ministry of Digital Development, Communications and Mass Media and the ICT Competence Centre established a Competence Centre for New Production Technologies (hereinafter referred to as CC NPT) as a standalone division of the ICT Competence Centre.

Based on projects submitted by 16 industry committees and 33 associated industrial competence centres, the road map for the development of a separate high-technology area, New Industrial Software¹, was updated. On 29 December 2022, an updated letter of intent was signed with the Government of the Russian Federation in order to develop the New Industrial Software high-technology area.

The road map for New Industrial Software is to be implemented in 2023; this includes securing support for the relevant projects through the Russian Information Technology Development Foundation (RITDF), expanding the list of particularly significant projects run by ICCs and subsequently updating the road map.

1.9.3. End-to-end digital technologies and data management

The end-to-end digital technology development and data management (EDT&DM) programme is a key part of ROSATOM's Uniform Digital Strategy as it provides technological capabilities for the implementation of other prioritised initiatives.

Since 2021, the Corporation has been taking steps to transform the End-to-End Digital Technologies and Data Management subsidiary programme into an investment programme. As part of these efforts, in 2022, a new area, the Lean Smart Plant, was included in the programme; an inventory of the programme's components was compiled; projects categorised as 'mandatory' were approved; investment indicators of the programme until 2030 were updated.



**PROJECTS IMPLEMENTED
IN THE SPHERE OF END-TO-END
DIGITAL TECHNOLOGIES
AND DATA MANAGEMENT**

1. Approved under the resolution of the Government of the Russian Federation on 14 December 2022.

As part of the programme, in 2022:

- The Corporation recorded the first documented direct quantifiable benefits from the programme’s components since its launch totalling RUB 105.88 million;
- 12 digital RPS benchmarks (lean smart) were developed;
- As part of the development of laboratories of the International Research Centre for Advanced Nuclear Technologies, as well as a joint laboratory at the Obninsk Institute for Nuclear Power Engineering (a branch of NRNU MEPhI), educational programmes including activities focused on working with digital solutions were developed and implemented at Far Eastern Federal University;
- The number of organisations in the industry that apply technologies/sub-technologies included in the EDT list in their operations reached 50 (or 4% of the total number of organisations in the industry for which the application of included in the EDT list is feasible);
- The number of organisations that have developed and are implementing a road map for achieving the target status of a ‘digital’ enterprise in terms of EDTs that they apply reached 51 (or 42% of the total number of organisations in the industry for which the application of technologies/sub-technologies included in the EDT list is feasible);
- Five projects focused on rolling out the successful components of the EDT&DM programme were included in the programme;
- Intellectual property rights over a prototype text mining solution developed jointly with JSC RASU based on natural language processing technologies were registered, and plans for its commercialisation were formulated.

The level of digitisation of an enterprise directly contributes to an increase in its margins and profit, which has necessitated the development of a universal methodology for determining whether both individual businesses and the industry as a whole have made sufficient progress in digitisation. In 2022, a methodology for assessing the level of digitisation was proposed; it is based on a detailed assessment of the possibility of digitisation of processes involved in the manufacture of core products in the industry. Plans for 2023 include providing methodological support for the development of the programme in the industry, including the approval of local regulations on the methodology for calculating indicators for the monitoring of progress in increasing the level of digital maturity of processes and products in the industry.

In addition, in 2023, the Corporation plans to develop local regulations on data management in the industry, create 15 digital RPS benchmarks, achieve an increase in direct quantifiable benefits by at least 60%, and implement pilot projects in order to test the readiness of technological solutions and assess potential benefits from their implementation in nuclear organisations in the future.

1.9.4. Digital products

LLC Rusatom Digital Solutions and LLC Security Code have established a strategic partnership to develop Russian software and hardware solutions in the sphere of information security. The alliance aims to pool the capabilities and competences of the parties in order to accelerate the development of Russian information security products and enhance the country’s technological sovereignty in this area.

The participants will develop synergies between their solutions and products in order to scale Russian sovereign software and hardware solutions both in Russia and abroad.

ROSATOM has updated its approach to building its portfolio of digital products; the new approach takes into account not only existing digital developments in the industry and unique knowledge of end-to-end processes but also market objectives and needs and is relevant to the prioritised sectors of the Russian economy.

The digital portfolio includes a variety of custom tools, products and services for the development of comprehensive solutions, including opportunities for establishing consortiums and partnerships and engaging third-party developers.

The development of ROSATOM’s digital product portfolio is focused on the following key areas: mathematical modelling; enterprise and production management; digital infrastructure; design and construction; information security and digital physical security.

Mathematical modelling

In 2022, the fifth stage of productisation of the Logos digital product was completed: the functionality of basic software modules (Logos Aero-Hydro, Logos Thermo, Logos Strength and Logos Platform) was expanded. The latest stages in the development of new software solutions, Logos EMR and Logos Atom, were completed.

An international version of the Logos product was developed and presented at the ATOMEXPO 2022 International Forum. It is expected that Logos will soon be launched on the global engineering software market.

Financial targets for the commercialisation of Logos in the industry and on the Russian market have been met.

On instruction from the Prime Minister of the Russian Federation Mikhail Mishustin, a number of industry-wide implementation projects have been developed in the established industrial competence centres; these are focused on the Logos product and other software solutions developed by the Consortium of Russian Developers of CAD/CAE Systems. Four of them have been approved by the Presidium of the Government Commission of the Russian Federation on Digital Development and the Use of Information Technology to Improve the Quality of Life and the Business Environment.

The first National Student Competition in Mathematical Modelling was held in 2022. More than 300 students from 45 Russian universities participated in this event.

A strategic conference on mathematical modelling and engineering software was held in December 2022. The conference has become one of the largest top-level meetings of players in the Russian industrial software market: it was attended by more than 300 developers and users of industrial software across a wide range of industries, including the aerospace, nuclear, automotive and transportation industries, shipbuilding, engine manufacturing, mechanical engineering, the fuel and energy sector, as well as science and academia.

Enterprise and production management

The Corporation’s updated digital product portfolio 4.0 includes the following products:

- The Atom Mind industrial predictive analytics system;
- Data analytics products: Almaz ETL and Almaz Monitoring.

The Atom.RITA, Atom Mind and My Voice digital products have been included in the Register of Russian Software compiled by the Ministry of Digital Development, Communications and Mass Media of the Russian Federation.

In November 2022, the Atom.RITA product was launched on the market. This is a platform designed for developing and managing software robots that enable business process automation by reproducing user actions in web applications and software programs installed on workstations.

In September 2022, a contract for the supply of the Dedal-Scout digital product was concluded with a Russian company.

Digital infrastructure

As part of a programme to develop a geographically distributed disaster-resilient network of data centres of ROSATOM, the Corporation operates and continues to develop the data centres that it has built/ acquired: the Kalininsky Data Centre at Kalinin NPP, the Xelent Data Centre in Saint Petersburg and the StoreData Data Centre in Moscow. In 2022, the construction of the first stage of the Innopolis Data Centre was started in Innopolis (Republic of Tatarstan), and a decision was made to implement a project to build a modular data centre, Arktika, at Kola NPP.

Plans for 2023 for this area include:

- Commissioning the first stage of the Innopolis Data Centre;
- Starting design work for the second stage of the Xelent Data Centre;
- Acquiring a data centre in Moscow with a capacity of up to 4,000 rack spaces;
- Completing the design of the Arktika Modular Data Centre at Kola NPP.

JSC TVEL has produced telecommunications equipment and has developed software for the first switch models, which has been included in the Register of Russian Software. In 2023, the equipment is scheduled to be included in the register of telecommunications equipment of Russian origin.

The Atom.Port configuration management system has been included in the Unified Register of Russian Computer Software and Databases; it is a system for the automated migration and management of mixed (hybrid) workstation infrastructure based on operating systems of the GNU/Linux and Microsoft Windows families.

Design and construction. Multi-D digital products

Multi-D Docs & Resources (MDDR) is electronic document management and resource planning software that does not rely on imported technology.

A strategy for the development of JSC ASE’s digital product and its sales on the foreign market has been approved; the product has been launched on the market.

Products forming part of the Multi-D product line (Multi-D Platform and Multi-D Project) have been included in the Unified Register of Russian Computer Software and Databases.

The Multi-D ESB product has been launched on the market; it is an enterprise service bus facilitating centralised and standardised event-driven communication between various modules of the Multi-D Platform and external systems.

The Multi-D Platform product development team has been transferred from JSC ASE to Private Institution Cifrum in order to continue to develop this product and associated business modules taking into account market needs outside the industry.

Plans for 2023 for this area include:

- Approving and launching a revenue-generating project focused on the Multi-D Platform product;
- Rolling out release 3.0 and launching the product on the market;
- Concluding partner agreements with developer companies on the use of the Multi-D Platform during custom development of information systems;
- Formulating and approving a strategy for BIM product development based on the Multi-D Platform.

Plans for 2023

In 2023, the Corporation will continue to develop its digital portfolio.

The priority is to develop the commercial potential of the digital product portfolio. This includes:

- Developing and implementing integrated digital solutions and providing digital services;
- Continuing to promote the customer-centric approach to the development of the digital portfolio to supplement the existing methodology: products and solutions in the digital portfolio will be aimed at achieving business objectives of customers and will be aligned with market trends;
- Strengthening ROSATOM’s positions in promising product areas through strategic partnerships and M&As.



1.10. RESEARCH AND INNOVATIONS

Key results in 2022

- ROSATOM updated its Innovative Development and Technological Modernisation Programme until 2030.
- The Digital Science IT project won an award in the Corporate Research Management System of the Year category at CNews FORUM 2022.
- 37 integrated technological projects and 143 R&D initiatives forming part of ROSATOM’s Consolidated Industry-Wide Plan of R&D Topics were underway.
- The number of international applications filed and patents obtained in the reporting year totalled 244.

1.10.1. Implementation of ROSATOM’s Innovative Development and Technological Modernisation Programme

Pursuant to a resolution of the Government Commission for Economic Modernisation and Innovative Development of Russia (minutes No. 24 dated 14 July 2022), in 2022, ROSATOM updated its Innovative Development and Technological Modernisation Programme until 2030 (the IDP)¹.

As part of the update, the IDP was expanded to include projects supporting the implementation of national programmes and projects, initiatives focused on hydrogen energy, development of the Russian Arctic, etc. As part of the exercise of its regulatory powers, in 2021 and 2022, ROSATOM launched and supported the adoption of critical legislative initiatives aimed at addressing prioritised strategic tasks and promoting the development of various areas of business of the Corporation and its organisations, namely:

- Radioactive waste management;
- Expansion of shipping along the Northern Sea Route;
- Supervision and control;
- Management of hazard class 1 and 2 waste;
- Sustainable transition to clean energy, development of low-carbon hydrogen energy and state-of-the-art equipment for the energy industry, and addressing the strategic task of reducing the carbon footprint.

In order to develop and apply various approaches and techniques for qualitative and quantitative analysis of outcomes of innovation activities of nuclear organisations and use a proper evidence base for reviewing and assessing innovations and selecting the most effective innovation tools, in 2022, ROSATOM approved the Uniform Industry-Wide Methodological Guidelines for Rating Innovation Activities and Rewarding ROSATOM’s Organisations Based on the Ratings. In addition to promoting innovation activities carried out by ROSATOM’s organisations, identifying areas for improvement and enabling rapid development of innovation processes in the organisations, innovation ratings assigned to nuclear organisations will play an important role in informing management decisions.

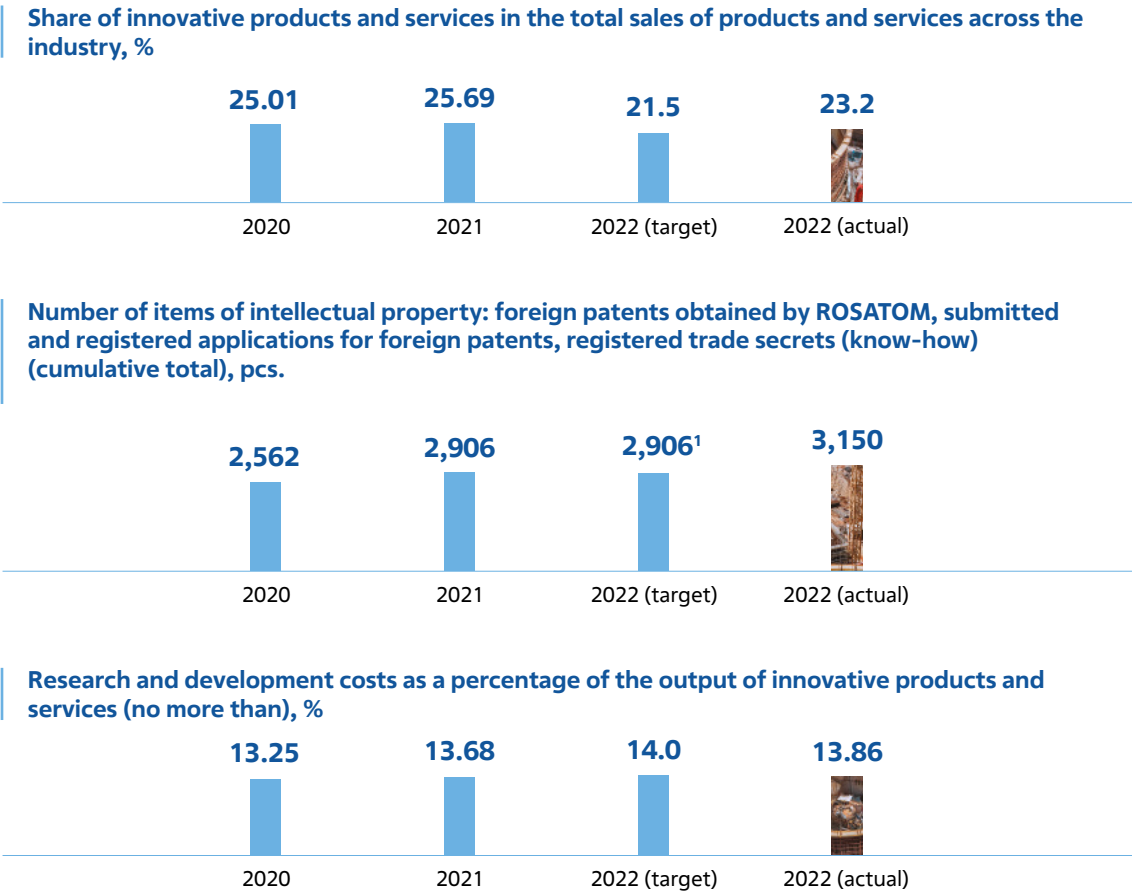
1. Minutes No. 24 of the meeting of ROSATOM’s Management Board dated 14 July 2022.

On 1 and 2 December 2022, the Corporation held an industry-wide conference titled ‘Innovation Management in ROSATOM’ organised jointly with the Rosatom Technical Academy. The conference was focused on approaches to developing the innovation potential in the nuclear industry and practical tools for enhancing R&D management.

In 2022, ROSATOM made significant progress in developing and promoting the innovation ecosystem (including a digital environment). The Digital Science IT project won an award in the Corporate Research Management System of the Year category at CNews FORUM 2022. The Innovation Management industry-wide function was updated. The Programme to Promote R&D and Innovation was successfully implemented.

37 integrated technological projects supporting R&D and technological development in strategic areas of national importance and prioritised industry-specific areas, digitisation of the economy and modernisation of existing technologies were being implemented in 2022 as part of the IDP. 21 ‘process’ projects supported effective R&D, technology and innovation management.

Performance indicators in the sphere of innovation between 2020 and 2022



1. In accordance with ROSATOM’s updated Innovative Development and Technological Modernisation Programme until 2030 (for the civilian sector), taking into account provisional patenting rules adopted by ROSATOM.

1.10.2. Comprehensive Programme ‘Development of Technical Capabilities, Technology and Scientific Research in the Use of Nuclear Energy in the Russian Federation until 2024’

In 2022, ROSATOM continued to implement the Comprehensive Programme ‘Development of Technical Capabilities, Technology and Scientific Research in the Use of Nuclear Energy in the Russian Federation until 2024’ (CP DTTS). CP DTTS deliverables, targets and milestones for 2022 have been achieved in full.

All results produced in 2022 as part of the Comprehensive Programme help the Russian Federation to achieve technological leadership in the use of nuclear energy and contribute to the development of other industries.

Implementation of Federal Project U1 ‘New Nuclear Power Industry, Including Small Nuclear Reactors for Remote Areas’ included in the CP DTTS

In 2022, a state environmental expert review was carried out for the placement of a small NPP based on a RITM-200N reactor; supporting materials for the licence for the placement of the NPP were prepared, and the engineering design was developed for the RITM-200N reactor unit.

1.10.3. Proryv (Breakthrough) Project aimed at closing the nuclear fuel cycle

In addition, as part of Federal Project U1 ‘New Nuclear Power Industry, Including Small Nuclear Reactors for Remote Areas’ included in the CP DTTS, ROSATOM is implementing the Proryv (Breakthrough) Project, which is aimed at developing fast neutron reactors and closing the nuclear fuel cycle. It 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 2022, construction and installation work was completed at utility facilities forming part of a plant that will produce new-generation fuel, namely dense mixed uranium/plutonium fuel for fast neutron reactors.

The first stage of a training and information centre forming part of the Pilot and Demonstration Energy Facility (PDEF) was commissioned as part of the Proryv Project.

As part of the construction of the world’s first Generation IV power unit with the inherently safe BREST-OD-300 fast reactor, the construction of a unique test bench for the reactor coolant pump (RCP) of the BREST-OD-300 reactor was completed at the site of JSC SCP. The construction of the test bench is a mandatory requirement for the validation of the innovative BREST-OD-300 lead-cooled fast neutron reactor unit. The actual head and flow characteristics of the RCP of the reactor unit can only be measured on a specialised test bench.

A prototype shielded inert glovebox was manufactured and assembled at the site of JSC SCP. This glovebox is a unique experimental facility designed for the validation of technologies for manufacturing and operating large-size sealed inert-atmosphere equipment and for the testing of pilot SNF pyroprocessing equipment.



93% OF THE BN-800 REACTOR CORE AT A POWER UNIT OF BELOYARSK NPP WAS LOADED WITH MOX FUEL

Field simulation tests of a mock-up of transportation packaging for spent fuel assemblies from the BREST-OD-300 reactor were carried out to simulate external impacts.

93% of the BN-800 reactor core at a power unit of Beloyarsk NPP was loaded with MOX fuel.

Implementation of the Federal Project ‘Construction of Modern Experimental Test Facilities for the Development of Technologies for a Two-Component Nuclear Power Industry Based on a Closed Nuclear Fuel Cycle’

In 2022, the construction of two 2,000 m³ water tanks for the MBIR multipurpose fast neutron research reactor (the MBIR nuclear research facility) was completed. The construction of a drainage pumping station for the MBIR nuclear research facility was completed. The engineering design was developed for reverse steam generator modules.

On 22 April 2022, the MBIR vessel was delivered to the site in Dimitrovgrad.

Implementation of the Federal Project ‘Development of Controlled Thermonuclear Fusion Technologies and Innovative Plasma Technologies’

In 2022, design solutions were developed and work was started on the following:

- The technical upgrade of a pilot superconductor production site;
- The renovation of buildings 124 and 125, including the development and installation of test benches for electric propulsion engines and for a powerful neutron source (stages 1 and 2);
- The renovation of the TSP thermonuclear facility (stage 1).

Modules of electric propulsion engines for future-generation spacecraft with a maximum power of 250 kW were developed; they are based on clusters of new-generation Hall-effect and ion thrusters.

Key components of a mock-up of a diode-pumped laser fusion driver module that is unique in the world were developed; a mock-up of a diode emitter was produced and tested.

A set of R&D activities was carried out in order to produce a preliminary design of a tokamak with reactor technologies (TRT) in 2024; it will serve as a full-scale prototype of a future nuclear fusion reactor/neutron source.

Implementation of the Federal Project ‘Development of New Materials and Technologies for Advanced Energy Systems’

In 2022, a preliminary design was developed for a hardware and software platform for managing additive manufacturing equipment used for the production of parts from ceramic and polymer composite materials.

A pilot batch of the first Russian-made ultra-high-strength carbon fibre was produced using industrial equipment.

Two 3D printers for the production of parts from ceramic and polymer composite materials were developed and produced.

The first Russian three-axis scanner that is unique in the world was developed and produced. It helps to control temperature and modulate the properties of materials during crystallisation as part of the selective laser melting process, which makes it possible to manage the structure of materials during 3D printing.

Implementation of the Federal Project ‘Design and Construction of Reference Power Units of Nuclear Power Plants’

In 2022, the reactor vessel was moved into final position at power unit No. 1 of Kursk NPP-2.

Concreting of the floor slab for the reactor coolant pump was completed at power unit No. 2 of Kursk NPP-2.

Preparation for the commissioning of Kursk NPP-2, which comprises two power units with VVER-TOI reactors, was 37.48% complete.

1.10.4. International projects

In 2022, ROSATOM continued to participate in the development of unique ‘mega science’ research facilities: the International Thermonuclear Experimental Reactor (ITER) and the Facility for Antiproton and Ion Research in Europe (FAIR).

ITER (International Thermonuclear Experimental Reactor) project

The research and engineering megaproject to build the International Thermonuclear Experimental Reactor (ITER) is the key technological platform for the fusion power industry of the future.

In 2022, work was performed in accordance with the current detailed ITER construction schedule; equipment manufactured as part of Russia’s commitments was delivered to the ITER Organisation, including four gyrotron systems for plasma heating and a 200-tonne poloidal field coil. As at year-end 2022, a total offset was received amounting to 49.22% of Russia’s total in-kind commitments.

In-cash commitments to the ITER Organisation for 2022 were met.

Russian representatives participate in all events and activities of the ITER Organisation. More than 60 Russian specialists are members of the ITER Organisation and work on the project.

Project to establish the Facility for Antiproton and Ion Research in Europe (FAIR)

In 2022, the Russian delegation participated in all meetings of the FAIR Council and the Administrative and Finance Committee. However, due to the current geopolitical situation, Germany has unilaterally suspended R&D cooperation with Russia. On 22 September 2022, European delegates to the FAIR Council voted to revoke all resolutions assigning equipment manufacture to Russian suppliers. Pursuant to this resolution, the FAIR Management Board notified Russian suppliers of the termination of contracts concluded earlier. In these circumstances, in 2022, Russia made no contribution towards the construction of FAIR.

International Research Centre Based on the MBIR Multipurpose Fast Neutron Research Reactor (IRC MBIR)

As part of Federal Project U2 ‘Construction of Modern Experimental Test Facilities for the Development of Technologies for a Two-Component Nuclear Power Industry Based on a Closed Nuclear Fuel Cycle’ included in the CP DTTS, the construction of the MBIR multipurpose fast neutron research reactor is underway at the site in Dimitrovgrad. Due to the technologies used in the project and close cooperation between researchers and construction personnel, MBIR construction is ahead of schedule.

Simultaneously, the International Research Centre Based on MBIR (IRC MBIR) is being developed. Russian and foreign partners are granted access to the MBIR reactor based on a legal framework that is unique for the Russian market and research projects, namely the IRC MBIR Consortium Agreement. This approach enables the flexible use of reactor capabilities. The pooling of research capabilities of different countries as part of a multilateral research programme should provide a foundation for promoting fast reactor technology on the global market, with Russia as an undisputed technological leader in this area.

In June 2022, the IRC MBIR Advisory Board (the IRC MBIR body responsible for scientific research) held a meeting. More than 80 scientists, experts and executives from more than 30 leading research centres in Russia and friendly countries, as well as international organisations such as the IAEA and the Joint Institute for Nuclear Research (JINR), took part in the event in person and online.

Partners of the Centre include more than 20 foreign organisations; cooperation arrangements with some of them have already been put into practice. For instance, as part of the 12th ATOMEXPO 2022 International Forum in Sochi in November 2022, a legally binding document (a Term Sheet) was signed, establishing the procedure whereby a member from a CIS country joined the Consortium as a key member.

In 2022, MBIR was represented at the Fourth Russian-Chinese Energy Business Forum (held on the sidelines of the EXPO 2020 Forum in the UAE), the European Research Reactor Conference, the ATOMEXPO 2022 Forum and on other well-established platforms. In addition, an active dialogue is maintained with partners from the CIS and BRICS countries, the Middle East and Latin America on joining the International Research Centre Based on the MBIR Reactor.

Participation in the Generation IV International Forum (GIF)

By year-end 2022, 14 countries and organisations had signed the Charter of the Generation IV International Forum (GIF) and were official GIF members: Australia, Argentina, Brazil, the UK, Euratom, Canada, China, the Republic of Korea, the Russian Federation, the US, France, Switzerland, South Africa and Japan.

In 2022, GIF continued to operate in a challenging environment, given both the COVID-19 pandemic and the current global political situation. Russian nominated experts participated in all scheduled GIF events (more than 30 events) via video conferencing.

In 2022, Russian nominated experts participated in GIF events and meetings, including the work of its governing bodies, Working Groups and thematic activities focused on SFR (sodium-cooled fast reactors), SCWR (supercritical-water-cooled reactors), LFR (lead-cooled fast reactors), MSR (molten salt reactor systems) and VHTR (very-high-temperature gas-cooled reactors).

Russian representatives actively participated in a new GIF Task Force on Non-Electric Applications of Nuclear Heat.

Significant progress was made on the transition of LFR and MSR development from the stage of information exchange under a Memorandum of Understanding to the sharing of R&D outcomes under a System Arrangement, with Russian experts actively participating in the development of the LFR and MSR System Research Plans.

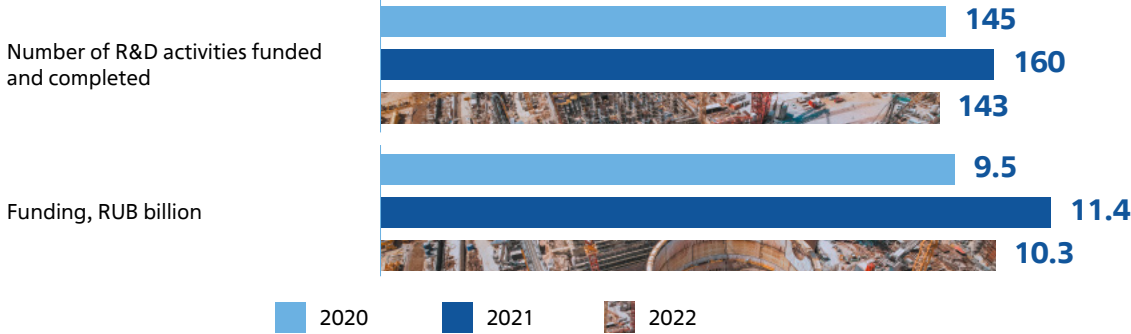
1.10.5. Plan of R&D Topics of ROSATOM

The implementation of the Consolidated Industry-Wide Plan of R&D Topics (CIPT) is aimed at promoting scientific and technological development in areas prioritised by ROSATOM, including VVER technology, small-scale reactors, new materials, hydrogen energy, thermonuclear fusion, superconductivity, nuclear medicine, etc.

The R&D Plan builds on ROSATOM’s Business Strategy until 2030 and is aligned with the list of promising business areas of the holding companies of ROSATOM’s Divisions/incubated businesses as part of prioritised R&D areas and industry-wide and national research and technology programmes, taking into account the outperformance of the product/technology being developed by ROSATOM over existing analogues in terms of their technical characteristics, as well as the findings of benchmarking, patent search and technology readiness assessment conducted by ROSATOM and the commitment to accelerating research and development.

Every year, despite external challenges, ROSATOM maintains the amount of its own funds allocated for R&D focused on prioritised areas of scientific and technological development as part of the CIPT at a high level; this provides opportunities for the development of promising solutions and their subsequent practical application.

Amount of R&D funding provided by ROSATOM



1.10.6. Cooperation on scientific research with research institutions and universities

In order to leverage additional research and technical capabilities for developing both traditional and new business areas, ROSATOM continues to engage with its key partners: universities, organisations of the Russian Academy of Sciences, other third-party research institutions, small and medium-sized businesses.

Cooperation in the sphere of research and education takes various forms: research conducted under contracts, joint science and innovation projects, participation in scientific and technical expert reviews, joint research workshops, conferences and educational programmes.

Universities and research institutions actively participate in the implementation of ROSATOM’s programmes such as the Comprehensive Programme ‘Development of Technical Capabilities, Technology and Scientific Research in the Use of Nuclear Energy in the Russian Federation until 2030’, the Consolidated Industry-Wide Plan of R&D Topics, technological programmes aimed at developing new products and businesses, etc.

In order to promote cooperation, ROSATOM actively uses tools for cooperation between industry, science and education provided as part of the Science and Education National Programmes: world-class research and education centres, innovative science and technology centres, competence centres of the National Technology Initiative, the Priority 2030 academic leadership programme, etc.

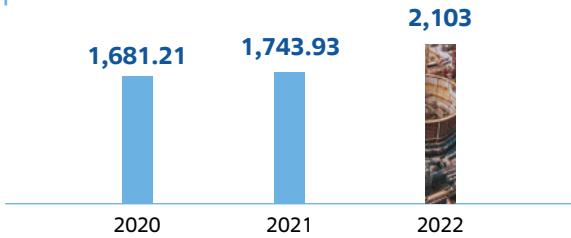
As part of a government programme titled ‘Scientific and Technological Development of the Russian Federation’, in 2022, an initiative was launched to establish advanced engineering schools at leading Russian universities. The aim of the project is to provide highly productive export-oriented sectors of the Russian economy with highly skilled specialists in order to achieve technological self-sufficiency and develop state-of-the-art high-technology products in partnership with Russian high-technology companies. ROSATOM’s organisations (JSC SCP, JSC ETC GET, JSC ASE, JSC Afrikantov OKBM, JSC TVEL, JSC CDBMB, JSC RME Centrotech, JSC Greenatom, etc.) actively contributed to the establishment of Advanced Engineering Schools at Tomsk Polytechnic University, National University of Science and Technology MISIS, Alekseev Nizhny Novgorod State Technical University, Peter the Great St. Petersburg Polytechnic University and Lobachevsky National Research State University of Nizhny Novgorod. Advanced Engineering Schools supported by organisations in the industry specialise in materials science, additive manufacturing and end-to-end technologies, smart energy systems, nuclear engineering and high-energy-density systems, and digital engineering.

In the reporting year, ROSATOM continued to implement the Greater Sarov project focused on developing the National Centre for Physics and Mathematics (NCPM).

The project to establish the NCPM in Sarov is being implemented by ROSATOM jointly with the Russian Academy of Sciences, the National Research Centre Kurchatov Institute, Lomonosov Moscow State University, the Joint Institute for Nuclear Research (an international intergovernmental organisation), etc. As part of research cooperation, 2,193 researchers from 55 research and educational institutions took part in the NCPM Research Programme in 2022. In 2022, the NCPM hosted seven science schools, workshops and conferences, including three schools for young researchers and specialists focused on various tracks of the NCPM Research Programme, as well as 42 events involving various stakeholders of the Programme.

In 2022, more than 30 universities were involved in ROSATOM's research and innovation projects. In 2022, the volume of orders for R&D performed by universities totalled RUB 2.1 billion. Key participants of research and innovation projects include NRNU MEPhI, National University of Science and Technology MISIS, Alekseev Nizhny Novgorod State Technical University, Lobachevsky National Research State University of Nizhny Novgorod, Peter the Great St. Petersburg Polytechnic University, Tomsk Polytechnic University, Bauman Moscow Technical University, Moscow Power Engineering Institute, the Ural Federal University, Moscow State University of Civil Engineering and Lomonosov Moscow State University.

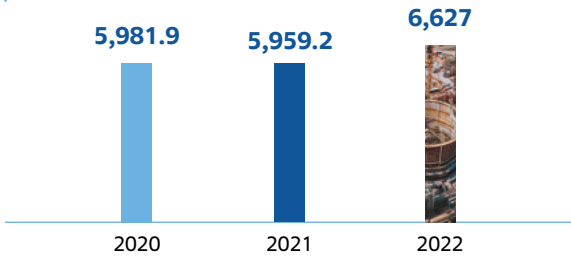
Funding of R&D projects carried out by universities at the request of ROSATOM and its organisations between 2020 and 2022, RUB million



In 2022, the volume of orders for R&D performed by research institutions outside the industry totalled RUB 6.6 billion. More than 50 third-party research institutions were involved in ROSATOM's R&D projects, including the National Research Centre Kurchatov Institute, the Nuclear Safety Institute of the Russian Academy of Sciences (IBRAE RAN), the Joint Institute for Nuclear Research, the Joint Institute for High Temperatures of the Russian Academy of Sciences, the Institute of Problems of Chemical Physics of the Russian Academy of Sciences, the Ioffe Institute of the Russian Academy of Sciences, the Budker Institute of Nuclear Physics of the Siberian Branch of the Russian Academy of Sciences and the Institute of Applied Physics of the Russian Academy of Sciences.

Under the cooperation agreement between the Corporation and the Russian Foundation for Basic Research (RFBR), the joint competition for the best interdisciplinary basic research projects on the interaction of electromagnetic radiation with matter as a basis for new techniques for material modification and development of materials operating under extreme conditions continued to be held in 2022. The objective of the competition is to support experimental and theoretical research aimed at obtaining basic scientific knowledge that can provide the foundation for tackling practical tasks facing the Corporation. Following the competition, projects focused on the relevant topics received funding totalling RUB 200 million.

Funding of R&D projects carried out by research institutions at the request of ROSATOM, RUB million



In 2022, ROSATOM participated in the Technological Breakthrough Award organised by the Platform for National Technology Initiative, the Agency for Strategic Initiatives (ASI), the Foundation for National Technology Initiative's Projects Support and University 2035. The Technological Breakthrough Award is presented to researchers, product developers and project team leaders for an important contribution to developing Russian technology businesses and for major achievements in the country's technological development. Five of ROSATOM's projects (projects run by JSC TVEL, JSC ZiO-Podolsk, JSC Rosenergoatom, JSC Smart City Digital Platforms and Solutions and JSC VNIIAES) won awards in the Technological Breakthrough in Nuclear Power and Industry category.

1.10.7. Knowledge management system

In order to establish uniform knowledge management principles and approaches of ROSATOM and its organisations, a Uniform Industry-Wide Knowledge Management Policy has been approved by Order No. 1/1361-P of ROSATOM dated 17 October 2022. The aim of ROSATOM and its organisation in the sphere of knowledge management is to create an environment for transforming corporate knowledge into a strategic resource that will enable them to make their products and services more competitive and achieve technological leadership; this involves:

- Enhancing the commercial appeal of ROSATOM and its organisations on the Russian and foreign markets by accumulating and leveraging knowledge and experience in order to gain a competitive advantage;
- Improving the operational and cost efficiency of ROSATOM and its organisations by efficiently using knowledge and intellectual capital;
- Making business processes in ROSATOM and its organisations more efficient and agile and accelerating their development by leveraging knowledge.

Key elements of the knowledge management system include scientific and technical evaluation and the development of expert communities, which help to accelerate the circulation of knowledge in the industry and support the development of a system of in-house consultancies covering both general matters related to scientific, technical and technology evaluation of a given focus area and specialised matters, such as patent examination, technical and economic reviews, etc.

In order to enhance the role of industry expertise in the sphere of research, technology and innovation, in 2022, steps were taken to develop the Single Industry Expertise Centre and expand the scope of its activities; the Centre was directly involved in organising expert reviews, monitoring and developing expertise, and developing the expert network (a network of experts and expert organisations).

In 2022, in the Automated Expert Database information system (AED IS), which forms part of the Digital Science system of services:

- Existing data were verified and updated and new data were entered on 150 experts;
- Data on 490 expert reviews carried out as part of the CP DTTS in 2021 were entered in the Expert Review Collection section;
- The integration of the AED IS with the information system of the Common Information Space of the CP DTTS was initiated.

Knowledge management in ROSATOM's organisations supports the implementation and improvement of a system for preserving critical knowledge.

In order to preserve and visualise knowledge, abilities, skills and personal professional experience of experts involved in the Proryv Project, a scientific and technical competence mapping survey was carried out in 2022, which made it possible to:

- Visualise the components of intellectual capital of the project;
- Incorporate not only explicit but also implicit critical knowledge accumulated by experts while performing their professional tasks into training programmes for specialists in the nuclear industry;
- Plan HR management processes pertaining to recruitment, training, competence maintenance and professional development of specialists.

54 experts from responsibility centres of the project took part in the survey. The mapping included identifying the functions of the responsibility centres that are of key importance for accomplishing the project objectives.

On 1 November 2022, the CNews Conferences Business Communications Agency and CNews Analytics with support from the Ministry of Digital Development, Communications and Mass Media of the Russian Federation held the 15th annual event titled ‘CNews FORUM 2022: Information Technology of Tomorrow’, which involved a discussion of key topical issues related to information and communications technology, innovative technologies, and approaches to the implementation of IT projects. The forum was attended by representatives of federal executive authorities, businesses, government agencies and major IT companies, as well as independent experts and analysts. The programme of the forum included the 12th Annual CNews AWARDS, where ROSATOM’s IT project titled ‘Digital Science System of Digital Services’ won an award in the Corporate Research Management System of the Year category.

In 2022, ROSATOM continued to maintain and populate its electronic library of R&D information (hereinafter referred to as the R&D e-library). The collection of scientific and technical documentation digitised by the Private Enterprise Central Archive of the Nuclear Industry, which comprises R&D materials under 122 government contracts and three agreements for 2014 and 2015, was processed. Metadata on 2,724 documents classified using three classification systems of the R&D e-library were entered in the local collection of R&D reports.

1.10.8. Intellectual property management

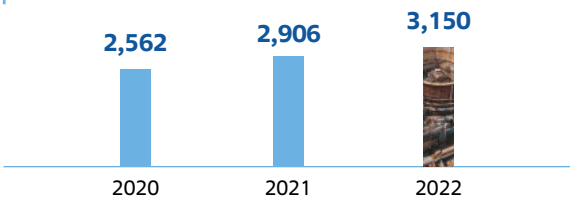
In 2022, protection of the industry’s key products and technologies abroad remained the main priority of the intellectual property management system.

The number of international applications filed and foreign patents received in 2022 totalled 244.

The following results were achieved in the reporting year:

- As part of its efforts to improve the methodological and regulatory framework for intellectual property management at all stages of its life cycle, ROSATOM approved provisional rules and ensured optimal legal protection of intellectual property created by ROSATOM and its organisations;
- Arrangements for the management of intangible assets and tangible R&D results as part of projects included in the CP DTTS were approved for pilot testing;
- ROSATOM started to form intellectual property portfolios for federal projects included in the CP DTTS on a systematic basis;

Number of items of intellectual property¹



1. Changes in the number of foreign patents obtained by ROSATOM, applications submitted and registered under the established procedure, registered trade secrets (know-how) reflecting the commercialisation and expansion of the scope of application of research findings in the nuclear industry between 2020 and 2022 (as a cumulative total).

- A digital model was developed and uniform industry-wide methodological guidelines were drafted for assessing the initial value of intellectual property created under government contracts for research and development;
- Eight workshops on intellectual property were held.

1.10.9. Long-term priorities in the sphere of scientific development

Innovative development priorities in the nuclear industry are informed by prioritised areas approved by ROSATOM’s Strategic Council and formalised in the Government Programme ‘Development of the Nuclear Power and Industry Complex’, the CP DTTS and other government programmes of the Russian Federation involving ROSATOM.

Key priorities in the sphere of scientific development in the nuclear industry include the following:

- Transitioning to a new technological platform for the development of the nuclear power industry by building on a two-component structure based on fast and thermal-neutron reactors and a CNFC;
- Designing and developing modern experimental test facilities in order to develop technologies for the two-component nuclear power industry based on the CNFC;
- Developing the required range of small nuclear power plants of sufficient capacity for various applications, including heat and power supply to remote regions, high-potential heat generation and hydrogen production for industry, and seawater desalination;
- Conducting research and development focused on controlled thermonuclear fusion technologies (including laser-induced fusion and applied laser technologies), innovative plasma technologies, new materials and technologies for advanced energy systems, and high-temperature superconductivity technologies;
- Building infrastructure for hydrogen-based nuclear technologies for environmentally friendly hydrogen production in order to enable its widespread use as a product, as a source of energy, an energy storage medium and a component of industrial technology;
- Building state-of-the-art infrastructure for high-technology treatment of socially significant diseases; promoting comprehensive development of radiotherapy and nuclear medicine; developing and introducing new diagnostic and therapy methods;
- Developing a system for managing unique technological capabilities of ROSATOM’s organisations and expanding their links with the capabilities of Russian research and educational institutions;
- Performing a market and technology analysis and competitive analysis in order to identify promising areas for the innovative development of the nuclear industry;
- Upgrading existing technologies, including in order to increase the output of innovative products and reduce their cost and the lead time;
- Participating in building state-of-the-art research and development and innovation infrastructure, including participation in the formation and development of a network of unique ‘mega science’ research facilities, the establishment of world-class research and educational centres, etc.;
- Establishing a competitive digital company with a strong presence on the Russian and global markets;
- Participating in the Science National Project, including expanding cooperation with universities and research institutions on R&D and the manufacture of innovative products using unique test facilities;

- Developing personnel training and professional development mechanisms in ROSATOM’s organisations; expanding the motivation system for encouraging innovation and the study and sharing of best practices;
- Developing leadership skills and managerial competences, including for career planning and executive succession planning purposes;
- Improving the performance of collective expert and advisory bodies, etc.

1.10.10. Research Division: performance in 2022

Key results in 2022

- Revenue from new products of JSC Science and Innovations makes up about 50% of total revenue.
- Over five years, revenue from new products of JSC Science and Innovations increased six-fold.

JSC Science and Innovations (the holding company of the Research Division) is the key nuclear organisation responsible for scientific research.

Three units focused on specific disciplines have been set up within JSC Science and Innovations: the Physics and Energy Unit, the Electrophysics Unit, and the Chemical Technology Unit; an Industry-Wide Competence Centre for Intellectual Property Management (an IP operator) has been established.

An important area of operations for JSC Science and Innovations is the development and commercialisation of the Division’s technological competences, the search for and structuring of technologies and their subsequent sale on the domestic and foreign markets.

Twelve companies within the Research Division are directly involved in R&D and innovation activities.

In 2022, institutes forming part of ROSATOM’s Research Division met all key targets set for three federal projects included in the comprehensive programme titled ‘Development of Technical Capabilities, Technology and Scientific Research in the Use of Nuclear Energy in the Russian Federation until 2024’ (CP DTTS).



SHARE OF REVENUE FROM
NEW PRODUCTS OF JSC
SCIENCE AND INNOVATIONS
IN TOTAL REVENUE

As part of the **second federal project** included in the CP DTTS (U2 ‘Construction of Experimental Test Facilities for the Development of Technologies for a Two-Component Nuclear Power Industry Based on the Closed Nuclear Fuel Cycle’), all R&D activities were completed under government contracts concluded with institutes forming part of ROSATOM’s Research Division for research and safety analysis of the MBIR research reactor, the validation of service life extension of the BOR-60 reactor and the validation of innovative radiochemical techniques.

As part of the **third federal project** included in the CP DTTS (U3 ‘Development of Controlled Thermonuclear Fusion Technologies and Innovative Plasma Technologies’), an in-vessel component for first-wall protection and a lithium limiter designed for use in experiments on the Russian T-15MD tokamak (a research fusion reactor built by the National Research Centre Kurchatov Institute), which can operate in steady-state mode with forced cooling and external liquid lithium supply, were developed and produced. Experiments were conducted on the T-11M small tokamak to study the impact of lithium dust injection on plasma parameters. All these devices are necessary and important for protecting the first wall of a tokamak against a high-energy particle flux and operating the T-15MD tokamak in a mode with the highest parameters. Apart from the research reactor at the National Research Centre Kurchatov Institute, the new protection technology will also be applied at the tokamak with reactor technology (TRT), which is being developed as a full-scale prototype of the future nuclear fusion reactor and will enable researchers to take a step closer to successfully conducting experiments in clean and safe energy generation and building a fusion demonstration reactor.

Technical specifications and design documentation were developed and a permit was obtained for the renovation of the TSP thermonuclear test facility with a total area of 88,500 m²; it is necessary for building the power supply infrastructure of the TRT, which will serve as a full-scale prototype of the future nuclear fusion reactor. Construction and installation work was started.

As part of R&D focused on the development of compact high-intensity neutron sources, specialists designed and built a laboratory prototype of a plasma accelerator for a neutron source based on plasmoid collisions. A diagnostic facility was built for measuring plasma parameters and neutron yield; experimental research was conducted to determine the parameters of the laboratory prototype of a plasma accelerator and its power unit. In 2022, pulsed power sources were designed and produced for a system for working gas pre-ionisation in the plasma accelerator; experiments were carried out with neutron detectors. These devices and experimental findings will provide a basis for a compact high-intensity neutron source designed for the testing of components of fusion reactors.

As part of the development of a prototype for a plasma jet engine, in 2022, a plasma accelerator with a system for working medium pre-ionisation was built; experiments were carried out to examine its energy balance with a high specific impulse, and methods were developed for extending the service life of its electrodes. Following the completion of the work in 2024, an engine prototype will be built with improved thrust and specific impulse outperforming alternative solutions in terms of jet power (300 kW), thrust (6 N) and specific impulse (100 km/s).

Working designs were produced for key systems and components of a mock-up of a laser fusion driver module; vacuum spatial filters were developed and examined, and a mock-up of a diode emitter, a cryogenic fan with a flow channel and active components were produced. This work will result in the development of a unique research facility that will make it possible to study physical processes and phenomena that occur during diode pumping and cryogenic cooling of the active medium, model, study and test complex laser systems, and test laser subsystems and circuits in a wide range of operation. Scientific research in this area will help to develop world-class repetitively pulsed laser devices with a high average emission power.

Research focused on laser surface modification of metallic materials was completed. This included developing a laser shock hardening process, which eliminates internal stresses in metal samples, increases their fatigue resistance and durability without the need for subsequent machining. This enhances the strength performance of structural steel used in gas turbine components, with surface hardness increasing by a factor of 3.5 and surface roughness decreasing by 25%. A pulsed plasma jet device was developed for the treatment of complex-shaped parts.

As part of the **fourth federal project included in the CP DTTS (U4 ‘Development of New Materials and Technologies for Advanced Energy Systems’)**, research is focused on three areas: the development of new materials and technologies for existing and advanced power generation units; the synthesis of superheavy elements and the study of properties of matter under extreme conditions (MEC); the development of a molten salt research reactor (MSRR).

More specifically, in 2022, specialists from ROSATOM’s Research Division developed an accelerated testing method that makes it possible to shorten the development cycle of new materials three- or four-fold. Its efficiency has been demonstrated during the development of fuel elements made from deoxidised carbon fibre based on silicon carbide, and during the development of structural fuel materials for BR, BN and BREST reactors. Specialists from the Division also developed a technology and produced a pilot batch of blanks from a new type of high-strength austenitic steel. This steel will be widely used in the construction of small nuclear power plants. The project team produced stepped forgings of reactor vessels for water-cooled water-moderated reactors (VVER-SKD and VVER-S) from new high-strength lightweight materials. The key structural material was also selected and the selection was validated for the former, and industrial welding of vessel components of the latter unit was carried out. In addition, in 2022, two 3D printers were developed and produced that can be used to manufacture products from ceramic materials (using the FDM/LDM and SLA techniques) and polymer materials (using the FDM technique). This method significantly reduces the lead time for the required parts and helps to optimise production costs. JSC LUCH Research and Production Association, Research and Development Institute (Podolsk, Moscow Region) produced a single-crystal blank for a turbine disc that is 130 mm in diameter and 50 mm high from a refractory superalloy using the electron-beam additive process. The first Russian three-axis scanner that is unique in the world was produced. It helps to control temperature and modulate the properties of materials during crystallisation as part of the selective laser melting process, which makes it possible to manage the structure of materials during 3D printing.

Research on MEC carried out in 2022 involved building a test bench to study metal corrosion from simultaneous exposure to humid air and ionising radiation, reducing the required duration of experiments several thousand-fold. ROSATOM’s specialists developed technology for introducing catalytic particles into a reactive medium, restoring the catalytic activity of activated particles, and producing passive catalytic recombiners for flameless hydrogen combustion. As part of a project to build a facility for the synthesis of new superheavy elements, radiochemical techniques were developed for producing isotopes of transplutonium elements to be used as target materials for the synthesis of new elements in the periodic table; these include a technique for remote production of cadmium-screened test targets containing heavy curium isotopes in gram amounts. By 2030, this work will enable the Joint Institute for Nuclear Research (JINR, Dubna, Moscow Region) to carry out experiments in the synthesis of new elements, which will make Russia a leader in this area.

As part of MSRR development, in 2022, one of the key stages, namely preliminary design, was completed. The first stage of the facility is to be built at the Mining and Chemical Plant (Krasnoyarsk Territory) by 2030. The new facility will become an experimental site for the testing of a technology for the incineration of long-lived radioactive waste.

As part of this federal project, by the end of 2024, the team expects to produce at least 11 new materials with higher strength and corrosion resistance and improved radiation properties for the same service life, as well as six samples of new equipment. By the end of 2030, the Division will start to manufacture products from basic materials on an industrial scale, which will enable it to design advanced energy systems using them.

International projects

In 2022, the Division fulfilled all its obligations to foreign customers under existing contracts carried out jointly with organisations in Europe, the US, Latin America and Asia and aimed at developing high-technology sectors, such as fusion power, improving the safety of nuclear technology, developing and improving new types of nuclear fuel and new materials.

In addition, contracts were concluded with new partners from China, India and Thailand for the supply of products manufactured by enterprises within the Research Division and for the provision of services and conducting high-technology experiments using Russian research facilities.

At the ATOMEXPO 2022 International Forum in November 2022, a research cooperation agreement was signed with the Institute of Nuclear Physics of the Academy of Sciences of the Republic of Uzbekistan. Under the agreement, the parties will jointly implement projects and conduct R&D in the field of radiation materials science and astrophysics and will cooperate in order to develop technologies for the production of radionuclides for nuclear medicine.

In 2022, foreign revenue increased by 11% compared to 2021, while the volume of the portfolio of overseas orders exceeded projections by 12%. Overall, over the past five years, revenue from new products of the Research Division has increased six-fold, accounting for around 50% of total revenue.

Cooperation on scientific research with research institutions and universities

In 2022, ROSATOM’s organisations became partners of seven advanced engineering schools established at various universities. More specifically, the Research Division supported the Advanced Engineering School ‘Materials Science, Additive Manufacturing and End-to-End Technologies’ of NUST MISIS. The School focuses on four breakthrough areas of science and education based on digital materials science: materials and technologies for the production of critical equipment, including nuclear engineering; digital technology, including additive manufacturing; digital materials science; precision casting; biomedical engineering and biofabrication. This cooperation will make it possible to train highly skilled specialists with a new mentality who have competences in the sphere of both digital materials science and data analytics and integrated project management and are able to accomplish tasks related to providing new materials for projects in the nuclear, aerospace and metals industries.

Intellectual property management

The Division continued to take steps to ensure legal protection of intellectual property of ROSATOM and its organisations in Russia and abroad. In 2022, specialists at the Industry-Wide Competence Centre for Intellectual Property Management (the IP operator) filed 52 foreign patent applications. Based on applications filed in previous years, 16 Russian and 153 foreign patents were obtained in 2022. Principal patented areas include key components and technologies for VVER reactors, radiopharmaceuticals based on medical isotopes, additive manufacturing technologies, and fuel assemblies for nuclear reactors for NPPs.



In addition, employees of the IP operator filed 13 Russian applications for inventions and utility models and six applications for state registration of computer software and databases as part of projects included in the Consolidated Industry-Wide Plan of R&D Topics (CIPT).

Overall, in 2022, the Division’s specialists registered the rights over 624 items of intellectual property.

Development of technologies supporting the technological sovereignty of the Russian Federation

Institutes forming part of ROSATOM’s Research Division consistently develop technologies and new products to ensure the country’s technological sovereignty by developing and implementing solutions that do not rely on imported technology.

JSC Research Institute of Nuclear Materials (INM, Zarechny, Sverdlovsk Region) carried out reactor tests of fuel for a new type of high-temperature gas-cooled reactors (HTGRs) and the initial stage of comprehensive pre-irradiation and post-irradiation examination of micro-fuel elements, fuel compacts and matrix graphite. This research has helped to optimise the fuel fabrication technology for HTGRs.

Based on applications filed in 2022 for this type of research, in 2022, JSC INM obtained two Russian patents. Reactors of this type are intended to be used for more efficient hydrogen production.

At the request of TEPCO (Tokyo Electric Power Company, Japan), researchers at JSC INM validated the safety of storage of sorption columns used for the treatment of water contaminated with caesium-137, strontium-90 and tritium radionuclides (the water was used to cool damaged reactors at the Fukushima Daiichi NPP in March 2011).

Plans for 2023:

- To implement federal projects forming part of the CP DTTS;
- To implement research and technology projects as part of the Consolidated Industry-Wide Plan of R&D Topics: the Proryv (Breakthrough) Project (closing the nuclear fuel cycle based on fast neutron reactors); development of the modern nuclear power industry based on VVER reactors, small NPPs, SNF processing and multiple recycling of nuclear materials; projects focused on hydrogen energy, creating new and improving existing materials, nuclear medicine, superconductivity, laser, nuclear fusion and plasma technologies;
- To strengthen partnerships with business divisions and product integrators in the industry;
- To expand the product line, introduce new technologies, and commercialise research results supporting sustainable development of the Division and the nuclear industry as a whole.

1.11. PERFORMANCE OF DIVISIONS

1.11.1. Mining Division

Key results in 2022

- Revenue under RAS increased by RUB 1.5 billion (RUB 24.7 billion in 2022).
- The development of the Kolichkanskiye deposit in Buryatia began ahead of schedule.
- The first ore was recovered from deep areas of the Yubileynoye deposit.
- Positive opinions were obtained from FAI Glavgosexpertiza of Russia for the project to develop the Khokhlovskoye uranium deposit (JSC Dalur) and design documentation for the development of the Dybrynskoye deposit (JSC Khiadga), as well as for the construction of a mining and processing plant and port facilities at the Pavlovskoye lead and zinc deposit.
- The first stage of the Tugansk Ore Mining and Processing Enterprise specialising in the processing of ilmenite-zircon sands in the Tomsk Region was put into operation.

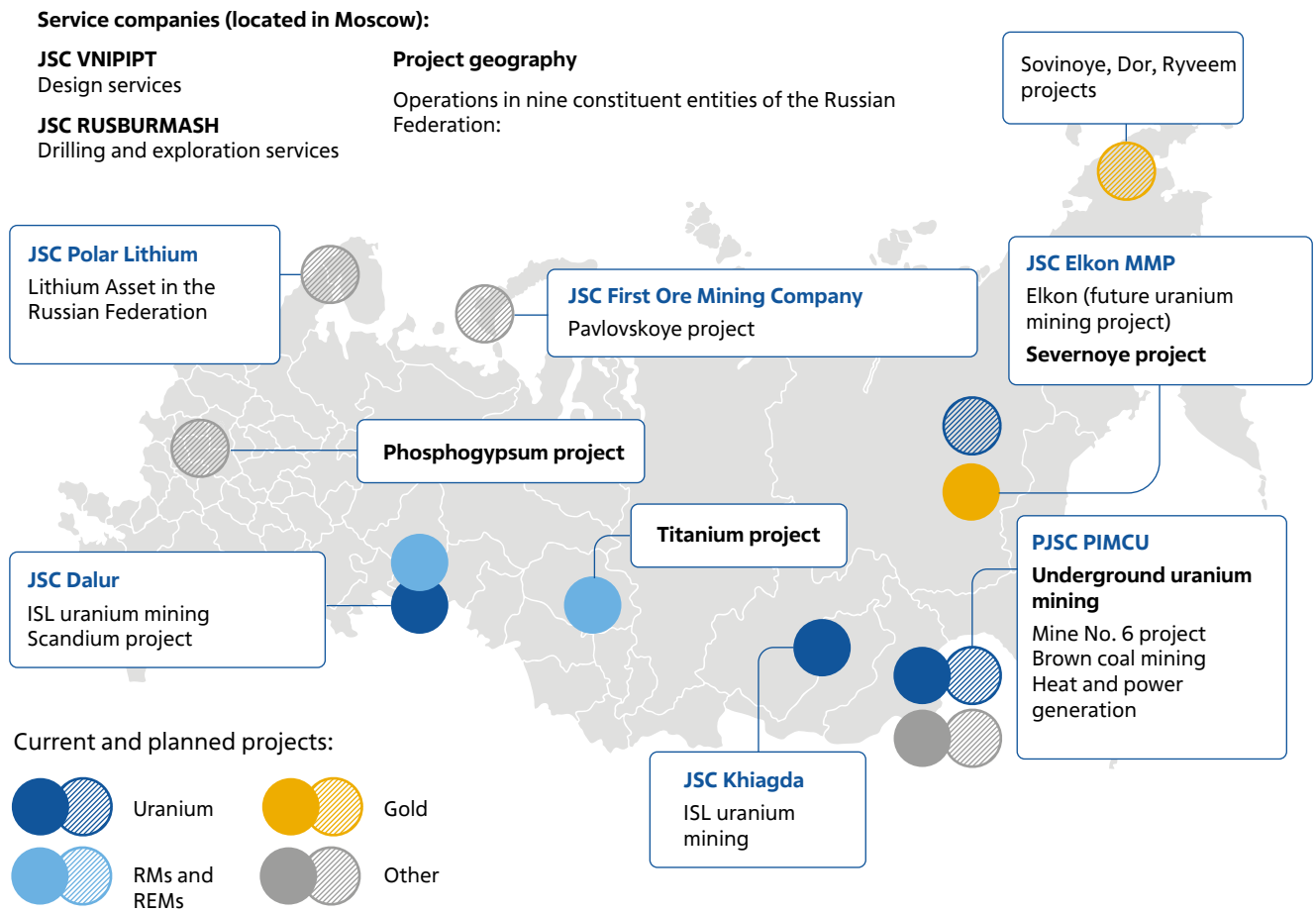
The Mining Division of ROSATOM (its holding company is JSC Atomredmetzoloto) ranks among the world’s largest natural uranium producers.

The Division manages Russian uranium mining assets in the Zabaykalsky Territory (PJSC PIMCU), the Republic of Buryatia (JSC Khiadga) and the Kurgan Region (JSC Dalur).

In addition to uranium mining, the Division is actively developing non-uranium businesses, including scandium mining as a by-product (JSC Dalur), brown coal mining (PJSC PIMCU), gold mining (JSC Elkon MMP), the mining and processing of ilmenite-zircon sands (JSC Tugansk Ore Mining and Processing Enterprise), the development of lithium production at the Kolmozerskoye lithium deposit (LLC Polar Lithium), the design of an integrated production facility at the Pavlovskoye lead and zinc deposit, etc.

The Division has unique uranium mining capabilities; its enterprises perform a full range of operations, from geological exploration, design and pilot operation to the decommissioning of production facilities and land rehabilitation.

Map of assets of the Mining Division



Key operating results

In 2022, the enterprises of the Mining Division produced 2,508 tonnes of uranium, which is 8% above the target.

PJSC PIMCU:

- The enterprise continued to develop the existing mines: the Yuzhny site of the Yubileynoye deposit of Mine No. 8 was developed;
- Two new high-performance ARAMINE diesel load-haul-dump (LHD) machines and two new drilling rigs were purchased;
- The programme for the third stage of renovation of the Sredneye tailings dump was completed.

Mine No. 6:

- Demothballing of facilities at Mine No. 6 was started; more than 2 million m³ of water was pumped out; work is underway to achieve the design targets for the quality of treated mine water;
- Construction of exploration and development shaft 19-RESh and the hoist building was started;
- The project focused on the technical upgrade of shaft 20V was submitted for industry expert review.

JSC Dalur:

- The construction of phase one facilities was completed at the pilot site of the Dobrovolnoye deposit;
- A positive opinion was obtained from FAI Glavgosexpertiza of Russia for the project to develop the Khokhlovskoye uranium deposit;
- The construction of stage one start-up facilities for the development of the Eastern ore body of the Khokhlovskoye deposit was completed; the ‘digital’ uranium mining technology (Smart ISL Mine) was rolled out across the entire ore body.

JSC Khiagda:

- The construction of stage one mining units was completed at the Kolichkanskye deposit (units KI1.2-1.10);
- The development of the Dybrynskoye deposit was started; the construction of phase one infrastructure facilities was completed;
- The construction of field facilities was completed at the Vershinnoye deposit.

JSC RUSBURMASH:

- The enterprise continued to enhance construction capabilities at the construction sites of JSC Dalur and JSC Khiagda;
- As part of the fulfilment an industry-wide RPS order, the amount of time required to prepare for the mining of ore bodies at uranium deposits was reduced three-fold;
- The fleet of drilling rigs for the construction of process wells in ISL enterprises was expanded, including as part of import substitution.

JSC VNIPIPT:

- The enterprise received the status of the 2022 BIM Leader;
- A positive opinion was obtained from FAI Glavgosexpertiza of Russia for the Pavlovskoye project, which makes it possible to begin the expansion of Russia’s footprint in the Arctic.



Contribution to the technological sovereignty of the Russian Federation

The development of production of rare and rare-earth metals (hereinafter referred to as RMs and REMs) is of critical importance for meeting the needs of high-technology industries in the Russian Federation. The key priority for the development of the industry is to replace imports, develop technologies and establish integrated production operations based on its own mineral resource base. To achieve this, a road map for the development of the Technology for New Materials and Substances high-technology area has been drafted, which includes a separate product area, Rare and Rare-Earth Metals. In accordance with the road map, it is intended that the share of imported products in total consumption in the Russian Federation will be reduced to zero by 2030.

In order to achieve the goals of developing the RM and REM product area, supplying resources for the production of flagship products and addressing gaps in the process chains for the manufacture of products based on titanium, zirconium, REM oxides, lithium and scandium, the Division is implementing the following projects:

- Lithium Asset in the Russian Federation: the development of lithium carbonate/hydroxide production at the Kolmozerskoye lithium deposit in the Murmansk Region;
- Phosphogypsum: the establishment of a facility for the production of REMs and gypsum products from phosphogypsum, including individual REM oxides;
- Titanium: the establishment of a mining and processing plant for the processing of ilmenite-zircon sands from the Tuganskoye deposit in the Tomsk Region to produce titanium and zircon concentrates;
- Scandium: the establishment of a facility for the production of scandium oxide and aluminium-scandium alloy as by-products at the industrial site of JSC Dalur.

Plans for 2023

The main objective of the Division in 2023 is to ensure that the uranium production programme is 100% fulfilled.

The Division will continue to expand the use of in-situ leaching, which is the most effective and environmentally safe mining technique. Plans include completing the construction of pilot site facilities at the Dobrovolnoye deposit. The Division will continue the construction of facilities at the Khokhlovskoye deposit and begin to design facilities for the Verkhne-Uksyanskoye deposit (JSC Dalur). The Division also plans to start uranium mining at the Dybrynskoye deposit (JSC Khiagda).

As part of construction at Mine No. 6 of PJSC PIMCU, the Division plans to reach the design capacity and meet the quality target for the pumping out of mine water, and start the construction of facilities at site 20V.

As the Krasnokamensk CHPP has become a subsidiary of the Mining Division, ensuring the reliable and safe operation of energy facilities will become one of the top priorities of PJSC PIMCU.

The preparation of a pre-feasibility study for the development of the Elkon Mining and Processing Plant is scheduled for 2023.

As part of new business development, in 2023, the Division plans to move to the industrial stage of development of the Severnoye deposit, which will result in a significant increase in gold production. Reserves are expected to be confirmed and entered in the register by the State Reserves Commission.

An important milestone in the development of the rare and rare-earth metals business in 2023 will be participation in the auction for mineral rights over the Kolmozerskoye deposit in the Murmansk Region. In 2022, the deposit formed part of the unallocated fund of the Ministry of Natural Resources and Environment of the Russian Federation. The development of this deposit will provide the Russian Federation with its own source of lithium feedstock. While there are three operating enterprises processing lithium feedstock, Russia does not have its own operating lithium mines and imports all lithium feedstock.

The Mining Division is the successor to the world's largest network of raw materials enterprises in the nuclear industry created in the Soviet Union. During its recent history, ARMZ has not only retained the status of a world-class uranium mining enterprise, but has also laid the foundation for the development of a new high-technology industry in Russia, namely the production of rare and rare-earth metals. The current focus of ARMZ on the production of scandium, titanium and zirconium is only the first step in a long journey towards ensuring the self-sufficiency of the Russian Federation in raw materials and technologies. JSC Atomredmetzoloto is aware of the importance and complexity of the tasks facing it and is actively working to improve the quality of its own resource base and increase the efficiency of production processes.

An important step towards developing an in-house technological solution for producing individual REM oxides will be the validation of design performance of a pilot REM separation plant and of the quality of the finished product as part of the Phosphogypsum project in 2023. The next stage will involve the development of a semi-industrial plant to ramp up REM production.

Production ramp-up to target capacity in the Tugansk Ore Mining and Processing Enterprise in 2023 will provide Russian producers with a domestic source of titanium and zirconium and will make it possible to validate design performance.

The implementation of new projects in the mining industry and related sectors will drive the growth of the Division's business and enhance its long-term social and financial sustainability.

For details, see 'Performance of the Mining Division in 2022'.

1.11.2. Fuel Division

Key results in 2022

- The Division's consolidated revenue totalled RUB 271 billion (up by 14.9% compared to 2021).
- Fuel for the CFR-600 reactor (China), which is under construction, was manufactured and shipped.
- Delivery of components for the BREST-OD-300 reactor vessel in Seversk was started.
- A contract was signed for the supply of modified fuel for the VVR-SM research reactor (Uzbekistan).
- The construction of a lithium-ion battery factory was started in the Kaliningrad Region.
- ROSATOM's second Additive Manufacturing Centre was opened.

ROSATOM's TVEL Fuel Company (hereinafter referred to as TVEL Fuel Company or the Company) is one of the world's largest producers of nuclear fuel. The Company is a monopoly supplier of nuclear fuel for all Russian NPPs, marine and research reactors in Russia. Fuel produced by the Company is used at NPPs in 15 countries, meaning that one in every six power reactors worldwide runs on this fuel. The Division comprises enterprises specialising in gas centrifuge production, uranium enrichment and nuclear fuel fabrication, as well as research and design organisations.

The Division is actively developing new businesses: metals production and energy storage systems, the chemical industry and 3D printing technologies. TVEL Fuel Company comprises industry integrators specialising in the decommissioning of facilities posing nuclear and radiation hazards, as well as in additive manufacturing and energy storage systems.

The Division is the main supplier of fuel for Russian-design VVER reactors abroad and has the necessary capabilities for the fabrication of nuclear fuel for PWR and BWR reactors and its components from reprocessed uranium (in cooperation with Framatome), as well as fuel pellets for BWR and PHWR reactors. TVEL Fuel Company has developed and started to supply PWR fuel assemblies designed in-house, TVS-Kvadrat. The Division has globally unique capabilities for the production of fuel for fast neutron reactors: uranium fuel for the BN-600 and CFR-600 reactors and MOX fuel for the BN-800 reactor. In addition, pilot fuel assemblies with mixed nitride uranium-plutonium (MNUP) fuel, which is being developed by the Division for the innovative BREST-OD-300 reactor, are currently being tested in the BN-600 reactor (Beloyarsk NPP). The Division's enterprises also fabricate nuclear fuel and its components for Russian- and foreign-design research reactors around the world.



With enterprises located in 10 regions of the Russian Federation, the Division is able to effectively cooperate and collaborate with its partners on a wide range of issues and business areas. The social environment in the Division's regions of operation is influenced by the fact that some of its production facilities are based in closed administrative and territorial formations (CATFs): Seversk, Novouralsk and Zelenogorsk, and in the single-industry town of Glazov. These enterprises play a central role in the local economy and are major taxpayers.

Key operating results

Fuel for start-up core loading and for the first reloading of CFR-600, the first high-power fast neutron reactor currently under construction in China, was manufactured and shipped to the customer.

An engineering project aimed at introducing more advanced nuclear fuel, TVS-2M, was implemented at power unit No. 1 of Kudankulam NPP (VVER-1000).

The delivery of vessel components for the innovative BREST-OD-300 reactor to the power unit construction site was started: the support plate for the unique reactor was delivered to Seversk.

The programme of reactor tests for new materials for accident tolerant fuel (ATF) was expanded. The technology for the production of fuel pellets from uranium disilicide was developed; reactor tests of new VVER- and PWR-sized fuel elements with uranium silicide fuel were started.

The construction of a lithium-ion battery factory was started in the Kaliningrad Region. The first Russian 'gigafactory' with a capacity of 4 GWh per year will meet the demand of Russian electric vehicle producers for lithium-ion traction batteries; it will also supply stationary energy storage systems for the power grid.

LLC T-COM launched a workshop for the SKD assembly of telecommunications equipment at the site of the Moscow Polymetal Plant. The production of more than 70 models of managed switches was set up; the switches can be used for building or upgrading any segment of telecommunication networks.

Contribution to the technological sovereignty of the Russian Federation

The Division's enterprises contribute to the technological sovereignty of the Russian Federation in a number of areas, including metals production, special chemicals, energy storage systems, additive manufacturing, hydrogen energy, etc.

Metals production

- The range of titanium products for shipbuilding and the aircraft industry has been expanded;
- The first batch of bioceramic dental implants has been delivered in order to register the medical product and launch it on the Russian market;
- Serial batches of medical titanium bars and wire have been shipped to key domestic manufacturers of medical implantable products. These bars have been used to produce implants for osteosynthesis, maxillofacial surgery and products for the arthroplasty of large human joints;
- A new high-performance design of calcium injection wire has undergone industrial tests; the wire is supplied in batches to Russian metals enterprises;

- The production of a new range of injection wire for the iron and steel industry based on ferrotitanium for steel microalloying has been set up;
- Process parameters have been tested for the machining of rare-earth magnets and the application of a multilayer protective coating on them; a pilot batch has been manufactured, and samples of finished products have been sent for the required examination and testing. Permanent rare-earth magnets are used primarily in wind power generation and electric vehicles.

Special chemicals

In 2022, the first shipments of samples of battery-grade lithium hydroxide produced by JSC Angarsk Electrolysis Chemical Plant were initiated. The pilot plant for the manufacture of this product was launched in 2021. In the future, the Company plans to expand its sales footprint; work is underway to set up large-scale production.

Energy storage systems

In October 2022, the construction of Russia's first 'gigafactory' designed using state-of-the-art technologies was started in the Kaliningrad Region. The enterprise will start manufacturing world-class products, namely lithium-ion batteries (cells) and assemble them into battery modules. This will be the country's largest factory of this type; it will meet the demand of Russian electric vehicle producers for lithium-ion traction batteries and will also produce stationary energy storage systems for the power grid and for industrial enterprises. The first stage of the 'gigafactory' will have a capacity of 4 GWh per year, supplying lithium-ion batteries for up to 50,000 EVs. If demand for the products is confirmed, the second and third stages of the factory may be commissioned.

In December 2022, a new assembly facility for lithium-ion energy storage systems was opened at the site of the Moscow Polymetal Plant (JSC MZP). The first samples assembled at the site were traction batteries for trolleybuses with an extended off-wire range designed to be used on intra-city routes in Saint Petersburg.

JSC MZP has set up mass production of batteries for electric vehicles and stationary energy storage systems. The capacity of the new production facility is 10 times higher than that of the pilot production site established in 2021. The annual output will total up to 150 MWh of batteries for stationary systems (the total capacity of manufactured devices) or about 2,000 traction batteries for electric vehicles.

Additive manufacturing

The first commercial delivery of an industrial 3D printer using the selective laser melting technology was made.

A pilot sample of a DMD printer based on two industrial robots and a positioner was put into operation; the relevant technology was developed, and a fragment of a partition for an in-vessel device of a VVER-TOI reactor was produced.

An integrated process chain for the printing of products involving heat treatment in a vacuum kiln, post-processing and 3D scanning was set up in Moscow.

Parts for the aircraft industry were printed from superalloys.

An automated additive manufacturing facility for repairs and production (MARPAK) was designed.

Digital products

The Division is working to fulfil the national task of replacing imported software and equipment for the Russian industry by supplying digital products to the market, as well as by making nuclear industry digitisation expertise available to manufacturing companies. The Division is developing four product areas: digital engineering, predictive analytics, robotisation and automation in enterprises, and telecommunications equipment.

In 2022, two digital products developed in the Division were included in the Unified Register of Russian Computer Software and Databases:

- The AtomMind information system for predicting product quality and the state of equipment: this is an industry digitisation platform that enables efficient equipment maintenance and repairs and product quality assurance using predictive analytics tools;
- Atombot.Procurement: the first digital product for procurement automation based on artificial intelligence and the use of software robots, which significantly increases the efficiency of procurement documentation management.

LLCT-COM (a company of the Division) has launched a workshop for the SKD assembly of telecommunications equipment at the site of JSC MZP. The production of more than 70 models of managed switches has been set up; the switches can be used for building or upgrading any segment of telecommunication networks. The company produces equipment using Russian software which is included in the register of domestic software. Key consumers are industrial, energy, telecommunications and nuclear industry enterprises, as well as research institutes, educational and healthcare institutions, etc.

In less than a year, the partner network of LLC T-COM has grown to 140 companies.

Customers for the Division’s digital products are the largest players in the mechanical engineering, energy, metals, oil and gas, mining and other industries.

Plans for 2023

Nuclear fuel cycle:

- To manufacture and supply fuel for the initial loading of the first power units of Akkuyu NPP (Turkey) and Rooppur NPP (Bangladesh);
- To complete the first cycle and start the second cycle of pilot operation of accident tolerant fuel (ATF) at Rostov NPP;
- To manufacture experimental fifth-generation fuel assemblies (TVS-5) and deliver them to one of the Russian NPPs;
- To build an industrial plant for applying chromium coatings on zirconium alloy cladding of fuel elements at JSC Chepetsk Mechanical Plant;
- To develop optimised cores for the RITM-200M reactor used at floating power units;
- To manufacture MOX fuel assemblies containing minor actinides for the BN-800 reactor.

Additive manufacturing:

- To launch mass-produced 3D printers using metal powder compositions and wire materials on the market;

- To start batch production of stainless steel powders, superalloys and titanium alloys, and to continue to expand the network of additive manufacturing centres.

Energy storage systems:

- To open a new assembly site for the production of energy storage systems in the Technopolis park.

Digital products:

- To launch the AtomReverse product on the market. This is a digital service that combines engineering solutions for replicating and optimising equipment and its components. The product is intended for a wide range of Russian industrial enterprises from various sectors that operate sophisticated imported equipment and have encountered difficulties in upgrading, repairing and maintaining it.

Metals production:

- To expand calcium injection wire production capacities;
- To launch implantable products for osteosynthesis, prosthetic implants for the arthroplasty of large human joints and high-technology surgical instruments on the Russian market;
- To develop new types of conductor products based on copper-niobium and other alloys.

For details, see ‘Performance of the Fuel Division in 2022’.

1.11.3. Mechanical Engineering Division

Key results in 2022:

- Mechanical engineering products were delivered to 18 NPPs.
- Consolidated revenue reached RUB 115 billion.
- The Division’s share in the Russian power machine engineering industry increased to 43.2%.
- The RITM-200 reactor unit on the *Ural* nuclear icebreaker reached first criticality ahead of schedule.
- The Division supplied 85% of equipment for the first power unit of Akkuyu NPP (Turkey).

The Mechanical Engineering Division of ROSATOM (its holding company is JSC Atomenergomash) is one of the leading groups of mechanical engineering enterprises in Russia and the key supplier of main and auxiliary equipment for Russian-design NPPs under construction. The Mechanical Engineering Division forms part of ROSATOM and includes engineering and design centres, major power machine engineering enterprises and smelters, as well as research and materials science organisations. The Division’s enterprises have supplied mechanical engineering products to 52 NPPs in Russia, Europe and Asia.

The Division is actively developing new businesses focused on solutions for the manufacture and supply of equipment for the thermal power industry, shipbuilding, the oil and gas industry, and the special steel market. Extensive production and technological capabilities of the Division’s enterprises and expertise acquired over many years of improvement enable the Division to supply its customers with high-quality reliable equipment. JSC Atomenergomash has well-established manufacturing operations, which enables it to effectively participate in NPP construction projects and provide maintenance and upgrade services. Equipment produced by the Division is used at all Russian-design NPPs.

Technological advantages over competitors in the floating small NPP segment are underpinned by the availability of reference solutions for reactor units, marine solutions, production capacities and sustainable cooperation and are now fully leveraged in the construction of icebreakers and a whole family of floating power units (FPUs).

JSC Atomenergomash manufactures high-performance equipment for the Russian oil and gas industry. The Division's enterprises have a proven track record in the design and manufacture of equipment for the thermal power industry. As part of the Clean Country Federal Project, the Division has become the main producer of key process equipment for waste-to-energy plants.

Key operating results

JSC Atomenergomash has extensive capabilities for equipment manufacture and technologies for various sectors of the domestic industry. In addition to nuclear engineering, its enterprises contribute to ensuring reliable supplies of equipment for energy projects by providing national power machine engineering capabilities as they have smooth-running fully integrated production facilities for the manufacture of large-sized equipment for the gas, oil, chemical, metals and thermal power industries.

NPP turbine islands

The Division is developing its capabilities in the design of turbine islands with Arabelle turbines and the design of licensed equipment that forms part of the turbine islands; it adapts the documentation of foreign suppliers to align it with Russian standards and assists industry enterprises in organising the manufacture of licensed equipment.

The Division has adopted unique technologies for mechanical assembly of equipment for the turbine island with VVER-1200 water-cooled water-moderated power reactors for Akkuyu NPP (Turkey).

The following technologies have been developed and introduced as part of project implementation:

- Equipment manufacture for a low-speed steam turbine island for NPPs with VVER-1200 and VVER-TOI water-cooled water-moderated power reactors;
- Equipment manufacture for a high-speed steam turbine island for NPPs with VVER-1000 and VVER-1200 water-cooled water-moderated power reactors, including unique technologies for the drilling of deep holes in MSR¹, HPH² and LPH³ vessels and for the press-fitting of heat exchange tubes into them;
- Manufacture of MSRs with cross-fin tubes.

Technologies under development include:

- Equipment manufacture for the turbine island for the pilot BREST-OD-300 power reactor unit with a lead-cooled fast neutron reactor;
- Equipment manufacture for the BN-1200 unit with a sodium-cooled fast neutron reactor, including unique technologies for the press-fitting of heat exchange tubes into reactor vessels with a high-pressure liquid jet.

Overlay welding machine

The Division has made a calculation that has helped to validate the 'leak-before-break' (LBB) concept by eliminating the intermediate weld at the junction of the main coolant line (MCL) and the reactor

1. Moisture separator-reheater.
2. High-pressure heater.
3. Low-pressure heater.

coolant pump (RCP). The application of this approach in design and the selection of materials prevents the complete destruction of a component with a through-wall crack without a pre-existing stable leak, which can be detected before the crack becomes critical in terms of instability.

The spherical body of the RCP, is to be made from metal with internal weld overlay cladding. The switch to a new metal for the RCP body has been necessitated by the introduction of requirements for the application of the LBB concept in Russian and international scientific and technical documentation. Certification tests of steel have shown that its properties are highly stable: its impact strength and mechanical characteristics do not change significantly after prolonged exposure and meet the relevant requirements.

For the weld cladding of the inner spherical surface of the RCP sphere body, an overlay welding machine was purchased and was put into pilot operation in the Division's enterprises at the end of 2022.

New pump type (RCP-1753)

An enterprise of JSC Atomenergomash has successfully completed life tests (with a total duration of 5,000 hours) of the prototype of a new type of pump unit, RCP-1753, developed using cutting-edge technologies. Its main feature is the water lubrication system for all pump and electric motor components, which eliminates the use of oil in the reactor compartment, thus significantly improving the fire safety of the reactor unit and the NPP as a whole. The purpose of the life tests was to confirm the reliability of the RCP-1753 pump during continuous operation and to verify the possibility of its shutdown for 72 hours under conditions that fully simulate an emergency loss of power at an NPP power unit.

This design has a number of advantages and improved characteristics compared to previous types of pump units, especially in terms of reliability and efficiency, and is unique in the world.

Gas and petrochemical industry

In the reporting period, Europe's first and the world's third test bench for critical liquefied natural gas equipment was put into operation.

The development of a line of LNG pumps was initiated; in addition, a project was launched to develop and manufacture LNG loading arms and spiral heat exchangers for LNG production using mixed refrigerants.

The development of equipment for the domestically developed Arctic Cascade 2 natural gas liquefaction process was started.



Contribution to the technological sovereignty of the Russian Federation

Nuclear power engineering facility with an HTGR

The global trend towards decarbonisation and carbon neutrality in energy supply for industry, transport and utilities can be supported through the development of hydrogen energy. Nuclear power engineering facilities (NPEFs) can make a significant contribution to large-scale hydrogen production, replacing fossil fuels with high-temperature heat from the HTGR, which will reduce methane consumption compared to conventional processes and prevent emissions of methane combustion products into the atmosphere. The use of energy from nuclear reactors is currently one of the main areas of focus in the global transition to hydrogen energy.

Replacing imported software tools and services for product life cycle management and process control

A project has been launched to replace imported solutions for an automated information system for requirements, change and configuration management (AIS RCCM).

The information system makes it possible to manage engineering information (the regulatory framework, project requirements, technical documentation) throughout the life cycle of supplied equipment, track data versions, establish relationships, configure access rights, etc. The AIS RCCM is an integrated information environment of the Mechanical Engineering Division enabling customers and manufacturers to share technical data.

Digitisation of engineering information management processes can help to speed up the implementation of ongoing projects and significantly improve their quality. In addition, this approach is mandatory for the implementation of certain current overseas NPP construction projects.

Plans for 2023

Key objectives for 2023:

- To increase revenue from new products and sales in foreign markets;
- To carry out existing contracts and develop cooperation with foreign companies and industrial partners;
- To consolidate the Division’s positions in target markets;
- To expand the range of equipment supplied by the Division and its sales footprint.

Nuclear power industry:

- To ensure the supply of key equipment and perform work as part of the construction of ROSATOM’s new NPPs;
- To assess the possibility for the Mechanical Engineering Division to manufacture NPP equipment previously produced by enterprises outside the industry: multi-stud tensioners (MSTs) for main reactor joints and flange connectors of steam generators; inspection cavity equipment and embedded parts; main steam valve units; storage pool racks (for sealed fuel storage) and storage racks for fuel assemblies (for fresh fuel);
- To increase the volume of servicing contracts;
- To explore the possibility of supplying a wide range of equipment as part of the import substitution programme.

Gas and petrochemical industry:

- To produce and supply LNG pumps for the Arctic LNG 2 and Baltic GCC projects, produce and test pilot cryogenic LNG pumps for gas carriers;
- To implement the project to develop and manufacture LNG loading arms for the Baltic Gas Chemical Complex;

- To implement the project to develop and manufacture coil-wound heat exchangers for LNG production with mixed refrigerants for process lines supported by gravity-based structures (GBSs);
- To implement the project to develop and manufacture ethane evaporators for the Arctic Cascade 2 process.

Thermal power industry:

- To complete the supply of equipment for waste-to-energy plants and prepare the first two plants for commissioning;
- To develop the project to build a municipal waste incineration plant;
- To participate in tenders for the supply of equipment as part of the programme to upgrade thermal power facilities and for new construction projects.

Icebreaker fleet:

- To sign revenue contracts for the supply of equipment for follow-on nuclear icebreakers and auxiliary equipment (filters, heat exchangers, deck equipment), and large-sized castings;
- To complete the manufacture of castings of inboard struts (port and starboard) and ship them to the customer; carry out procurement procedures under the contract for the package supply of the nuclear propulsion unit for the *Lider* nuclear icebreaker (Project 10510).

Power ships based on modernised FPUs

The Division will continue the construction of FPUs. The project to provide power supply for the Baimskaya Ore Zone has given impetus for the development of an entire family of FPUs differing in terms of their capacity and applications (designed for use in the Arctic and in tropical regions), providing ample opportunities for the implementation of large-scale industrial projects.

For details, see ‘Performance of the Mechanical Engineering Division in 2022’.

1.11.4. Engineering Division

Key results in 2022:

- The Division started the construction of El Dabaa NPP (power units No. 1 and 2) and new power units in China at Tianwan NPP (power unit No. 8) and Xudabao NPP (power unit No. 4).
- Construction is nearing completion and pre-commissioning is beginning at power unit No. 1 of Rooppur NPP in Bangladesh.
- Preparations are being made for connecting the second power unit of the Belarusian NPP to the grid.

ROSATOM’s Engineering Division comprises leading companies in the nuclear industry: JSC Atomstroyexport (JSC ASE, Nizhny Novgorod), JSC Atomenergoproekt (the Joint Design Institute with branches in Moscow, Saint Petersburg and Nizhny Novgorod) and a number of subsidiaries.

Its key business areas include:

- Design and construction of large NPPs;
- Digital technologies for managing complex engineering facilities based on the Multi-D platform;
- Project management services and supply of NPP equipment.

Key operating results

In 2022, concreting of the nuclear islands was started at power unit No. 8 of Tianwan NPP and power unit No. 4 of Xudabao NPP in China (in February and May respectively).

In Egypt, a licence was obtained for the construction of power unit No. 1 of El Dabaa NPP, and concreting of its foundation slab was started. A construction licence was obtained, and an official ceremony was held to mark the start of concreting of the foundation slab of power unit No. 2 of El Dabaa NPP.

In August, a licence was obtained for the construction of power units No. 5 and 6 of Paks II NPP in Hungary.



Contribution to the technological sovereignty of the Russian Federation

Key factors supporting the Division’s contribution to the technological sovereignty of the Russian Federation include its proven track record in project implementation, the ability to provide NPP customers with an integrated product, as well as competitive technologies supported by the improved design of reference NPPs based on Generation III+ reactors and rapid development of Generation IV fast neutron reactors.

The core business of the Division is focused on the design and construction of large NPPs equipped with VVER-1200 reactors. The improvement of NPP designs based on Generation III+ reactors and of the relevant construction processes, along with non-nuclear innovative technologies for the digitisation of core processes and functions makes a significant contribution to the development of the Division’s business, Russia’s technological self-sufficiency and energy security.

NPP cybersecurity

EPC contracts for the construction of Russian-design NPPs abroad stipulate that design documentation for the NPPs must incorporate cybersecurity requirements for computerised systems that are fully compliant with the standards of the International Atomic Energy Agency (IAEA), recommendations provided in standards of the International Electrotechnical Commission (IEC) and requirements of the industry regulator.

This area is becoming increasingly important for projects and operations as methods for cyberattacks on critical infrastructure facilities are evolving, which necessitates an improvement of tools and measures for ensuring nuclear and radiation safety and nuclear security.

To accomplish this objective, the Engineering Division has established a new project area: NPP Cybersecurity.

A set of documents has been developed for overseas NPP projects of JSC Atomenergoproekt, whereby the principles that help to mitigate the potential risk of cyberattacks are incorporated as early as at the NPP design stage. An NPP cybersecurity programme, a risk assessment methodology and a cybersecurity architecture plan have been developed. The Division has carried out an assessment of risks related to potential attacks that can undermine the nuclear and radiation safety and nuclear security of a facility and has taken into account the standards applied by multiple international organisations. 12 months of thorough work have resulted in the development of a defence-in-depth information security model.

In addition, in order to improve NPP safety and performance, an assessment of NPP productivity (availability analysis) has been performed using dedicated methodologies developed by JSC Atomenergoproekt; this has also enabled the Engineering Division to develop new project competences, such as NPP maintenance, repairs and operation, and NPP productivity assessment (availability analysis).

The Division has prepared a competence development plan for the period from 2023 through 2026, which includes developing university curricula for the training of specialists; a detailed analysis of the regulatory framework in ROSATOM’s countries of operation; expanding the project portfolio; improving the regulatory framework in the Russian Federation; professional development of the Division’s employees; research activities.

The Division plans to leverage the acquired competences not only in all future NPP projects in the industry, but also when upgrading operating NPPs as part of a regular safety assessment.

Participation in the Proryv Project

One of the Division’s key focus areas in terms of the development of modern technologies that serve to enhance Russia’s technological sovereignty and energy security is the closed nuclear fuel cycle (CNFC).

The Engineering Division is working on three NPP designs with fast neutron reactors (the Proryv Project): BN-1200M, BREST-OD-300 and BR-1200, which are inherently safe.

For details, see the website of the Proryv Project at www.proryv2020.ru.

Import substitution in the sphere of IT

In 2022, the Engineering Division was faced with new challenges: the need for accelerated implementation of a programme to replace imported computer-aided design and engineering information management systems as foreign platforms became unavailable. Accordingly, the Division initiated the following IT projects:

- A project to develop a network scheduling module that does not rely on imported solutions and is based on a platform developed in-house by the Joint Design Institute;
- Import Substitution in Information System Design. An Engineering Information Management (EIM) System for Capital Construction Projects;
- Import Substitution in Information System Design. A 2D and 3D Computer-Aided Design (CAD) System for Capital Construction Projects.

Import substitution in the sphere of R&D

In 2022, the Division carried out the following research and development activities aimed at import substitution:

- A methodology was developed for assessing the maturity of the requirements management process; patent research was carried out;
- The possibility of replacing imported materials with Russian analogues during the civil design of NPPs was assessed; technical specifications were drafted;
- Local production of ISO-compliant pipeline products was launched;
- Modern design standards and technologies were developed for the design, manufacture and assembly of safety class 2, 3 and 4 thin-walled pipelines in a standardised size range;
- A methodology was developed and tests of pipeline components and welded joints were carried out in the original state and after artificial ageing simulating the impact of 60 years of operation;
- The BARS 3.0 software suite was developed; it is designed for probabilistic safety assessment of nuclear installations and other nuclear facilities;
- Software was developed for functional units of an information system for managing the ageing of NPP structures, systems and components and their interfaces; materials testing was carried out on representative specimens of thermal and electrical equipment, concrete, cable products, instruments and controls and automatic equipment for NPPs, and their ageing mechanisms were examined.

Resource efficiency in NPP construction

- A wide range of R&D activities has been initiated to significantly reduce the consumption of materials and the effort expended during the manufacture of industrial building structures for NPPs;
- R&D activities have been initiated with a focus on comprehensive development of a high-speed concreting and reinforcement technique;
- Research focused on temporary roads has been completed; it is aimed at conserving resources during the construction and use of temporary roads for construction machinery during NPP construction. For the first time in operational practice, all temporary roads have been differentiated in terms of their purpose, service life and design, with the standardised design of Kursk NPP-2 used as an example; a regulatory document has been drafted that stipulates the construction technique for temporary roads involving the use of reusable prefabricated components and establishes the procedure for the handling of decommissioned pavement components;

- Decisions have been made to reduce the consumption of materials by using high-strength concrete and rebar, high-strength rolled steel and optimal design solutions during the construction of NPPs equipped with VVER reactors;
- Decisions have been made to reduce the effort expended during the construction of NPPs equipped with VVER reactors, primarily at the construction sites, in order to reduce the duration of construction through the application of industrial construction methods supported by the use of large-size prefabricated reinforcement units and reinforced formwork, including permanent formwork made of steel and steel fibre reinforced concrete, which are connected with loop rebar joints or threaded couplings after assembly (which eliminates the need for labour-intensive welded joints).

Plans for 2023:

- To reach key milestones for NPP construction projects in Russia and abroad;
- To ensure business continuity and promote international cooperation with potential customer partners.

For details, see ‘Performance of the Engineering Division in 2022’.

1.11.5. Power Engineering Division

Key results in 2022

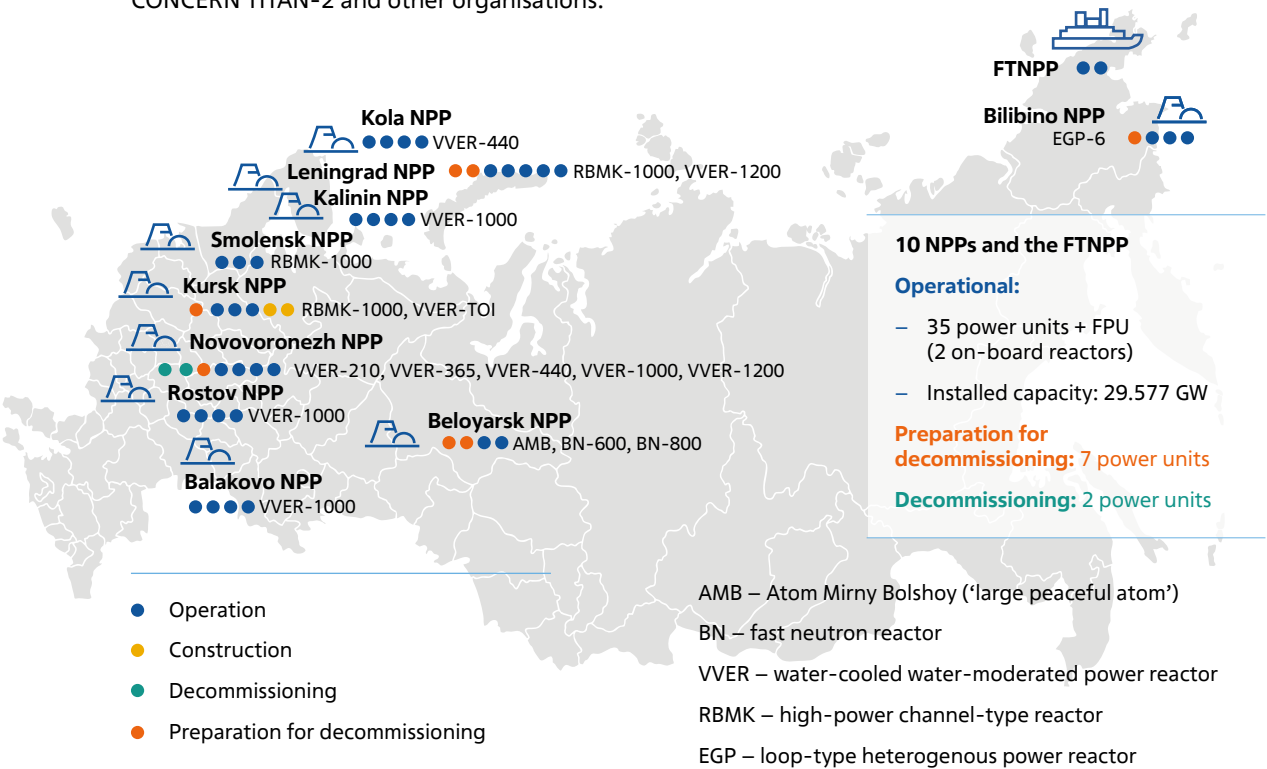
- Electricity output at Russian NPPs reached 223.4 billion kWh (102.5% of the target set by the Federal Antimonopoly Service of Russia).
- At the construction site of Kursk NPP-2, the reactor vessel was moved into final position at power unit No. 1, and concreting of the floor slab for the reactor coolant pump was completed at power unit No. 2.
- Design documentation for the construction of power units No. 3 and 4 of Leningrad NPP-2 was developed.
- Rosenergoatom’s revenue from the sale of innovative products increased to RUB 199.7 billion (25% of the total revenue).

The Power Engineering Division of ROSATOM (its holding company is JSC Rosenergoatom) is the only NPP operator in Russia and a major player on the Russian electricity market.

The Division ranks first among major power generating companies in terms of the share in the total electricity output in Russia and is the second largest company globally in terms of installed NPP capacity.

The main business areas of the Division include power and heat generation at NPPs and the operation of nuclear facilities (nuclear power plants), radiation sources, and storage facilities for nuclear materials and radioactive substances, in accordance with Russian legislation.

The Division includes JSC Rosenergoatom (the central administration and branches, including 10 NPPs, the world’s first FTNPP, as well as the Directorate of the Baltic Nuclear Power Plant under Construction, the Capital Projects Implementation Branch Office, the Technology Branch Office, the Pilot and Demonstration Engineering Centre for Decommissioning, the Pilot and Demonstration Engineering Centre for the Decommissioning of Power Units with Channel-Type Reactors, and the Akkuyu Engineering Centre), as well as 20 subsidiaries and more than 20 controlled entities, including JSC Atomenergoremont, JSC AtomTechEnergo, JSC VNIIAES, LLC Energoatominvest, JSC CONSYST, JSC Atomdata-Centre, JSC CONCERN TITAN-2 and other organisations.



Key operating results

As at 31 December 2022, the Division operated 35 nuclear power units at NPPs and the power unit of the floating thermal nuclear power plant (FTNPP) with total installed capacity of 29.6 GW, including:

- 22 power units with VVER reactors (including 13 power units with VVER-1000 reactors, four power units with VVER-1200 reactors and five power units with different versions of VVER-440 reactors);
- 11 power units with channel-type reactors (eight power units with RBMK-1000 reactors and three power units with EGP-6 reactors);
- Two power units with sodium-cooled fast neutron reactors (BN-600 and BN-800).

In 2022, electricity output at NPPs totalled 223.4 billion kWh, or 102.5% of the balance target set by the Federal Antimonopoly Service (FAS) of Russia (217.9 billion kWh) and 100.4% of the actual electricity output in 2021 (222.4 billion kWh).



Contribution to the technological sovereignty of the Russian Federation

ROSATOM’s strategic goals include achieving global leadership in state-of-the-art technology.

In 2022, R&D funding as part of the Capital Investment Programme (CIP) totalled RUB 11,069.9 million.

In 2022, Rosenergoatom’s revenue from the sale of innovative products increased to RUB 199.7 billion, which is more than 25% of its total revenue.

Key focus areas for Rosenergoatom’s technological development include the following:

- Improving design solutions for conventional VVER technology;
- Optimising design solutions to increase the efficiency of the turbine island of NPP power units;
- Providing a rationale for the extension of the fuel cycle and operation in a load following mode for new NPP power units;
- Developing new low-waste technologies for liquid radioactive waste (LRW) management;
- Validating hydrogen explosion safety of NPP power units in the event of severe accidents;
- Developing new VVER technologies involving spectral reactivity control and supercritical coolant pressure in the primary circuit;
- Developing nuclear hydrogen technologies.

Practical development of new nuclear power generation technologies forms part of a Federal Project titled ‘New Nuclear Power Industry, Including Small Nuclear Reactors for Remote Areas’ included in the Comprehensive Programme ‘Development of Technical Capabilities, Technology and Scientific Research in the Use of Nuclear Energy in the Russian Federation until 2024’ (hereinafter referred to as the Federal Project and the Comprehensive Programme respectively)². The goals of the Comprehensive Programme include supplying clean and affordable energy to remote areas of the Russian Federation, entering the growing global markets for closed-cycle technologies and fuel, as well as the market for small NPPs.

As part of the Federal Project, Rosenergoatom has initiated the testing of technologies for the use of MOX fuel in the BN-800 fast reactor at Beloyarsk NPP. By the end of 2022, 93% of the reactor core was loaded with MOX fuel, and in 2023, it will be fully loaded.

As part of the Federal Project, Rosenergoatom has initiated the development of a design for a two-unit NPP with a medium-power VVER spectral shift control reactor. Potential advantages of the design include the possibility of fully loading the core with MOX fuel, a reduction in the consumption of natural uranium, the possibility of eliminating the use of boron control during reactor operation at power, and a reduction in the amount of radioactive waste.

1. According to the report of JSC SO UPS on the operation of the UPS of Russia in 2022.
2. The Programme has been extended until 2030 by Decree No. 202 of the President of the Russian Federation dated 14 April 2022 on the Extension of the Comprehensive Programme ‘Development of Technical Capabilities, Technology and Scientific Research in the Use of Nuclear Energy in the Russian Federation until 2024’.

Rosenergoatom plans to build a two-unit medium-power NPP at the Kola NPP-2 site, with power unit No. 1 to be commissioned in 2035 and with a potential for the future roll-out of such power units at new sites.

Plans for 2023

Production operations

The target for electricity generation at NPPs for 2023 has been set at 214.2 billion kWh (in line with the balance target of the Federal Antimonopoly Service of Russia and the target of the Government Programme of the Russian Federation ‘Development of the Nuclear Power and Industry Complex’).

In 2023, Rosenergoatom plans to complete the conversion of the BN-800 reactor core at Beloyarsk NPP to MOX fuel.

Construction of new power units

NPP power units	Plans for 2023
Kursk NPP-2, power units No. 1 and 2	<ul style="list-style-type: none">— To achieve a completion percentage of 50.72%;— To install diesel generators to ensure emergency power supply for safety systems in buildings 11-12UBN at power unit No. 1;— To complete the installation of equipment in the reactor pit at power unit No. 2.
Leningrad NPP-2, power units No. 3 and 4	To obtain a licence for the construction of nuclear facilities at power units No. 3 and 4.

International business:

- To reach key milestones in the construction of Akkuyu NPP (Turkey) and El Dabaa NPP (Egypt);
- To continue the commissioning of power unit No. 2 at the Belarusian NPP and power unit No. 1 at Rooppur NPP (Bangladesh);
- To ship the first batches of cobalt-60 produced at Smolensk NPP and Kursk NPP;
- To ensure that the Division’s share in the global market for cobalt-60 for sterilisation reaches up to 30%;
- To carry out scheduled preventive maintenance of power units abroad, including the supply of the necessary equipment and provision of technical support by the personnel of Russian NPPs.

For details, see ‘Performance of the Power Engineering Division in 2022’.

1.12. RESOURCE MANAGEMENT

1.12.1. Corporate governance

Corporate governance system

The corporate governance system in the nuclear industry is currently underpinned by the following key principles:

- Standardisation of governance in the organisations in the Russian nuclear power and nuclear weapons sectors, organisations of various legal forms specialising in nuclear and radiation safety, nuclear science and technology and personnel training, with due regard to the special characteristics of each enterprise and organisation;
- Removing non-operating and inactive organisations from the nuclear industry and eliminating redundant corporate ownership levels;
- Avoiding excessive expansion of the area of competence of corporate governance bodies of nuclear organisations and transferring a number of ‘optional’ issues to the level of cooperation between them based on regulatory documents adopted in the industry with regard to various groups of business processes;
- A division-based management model within the civilian part of the nuclear industry, which involves creating core business divisions of ROSATOM (e.g. the Mining, Fuel, Mechanical Engineering, Power Engineering and Engineering Divisions), as well as a number of business incubators and functional industry organisations whose holding companies own/manage various organisations in the nuclear industry, depending on their areas of business.

GRI 2-9 Governing bodies

Supervisory Board¹

The Supervisory Board is ROSATOM’s highest governing body (in accordance with Article 23 of Federal Law No. 317-FZ of 1 December 2007 on State Atomic Energy Corporation Rosatom, hereinafter referred to as the Law).

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.

GRI 2-10 The Chairman of ROSATOM’s Supervisory Board is appointed by the President of the Russian Federation from among members of ROSATOM’s Supervisory Board simultaneously with the appointment of the members of ROSATOM’s Supervisory Board.

GRI 2-15 The Supervisory Board members, except for ROSATOM’s Director General, are not permanent employees of ROSATOM. They may serve on ROSATOM’s Supervisory Board while simultaneously holding public office in the Russian Federation, in a constituent entity of the Russian Federation or at the municipal level, as well as national or municipal civil service positions. ROSATOM’s Director General may not simultaneously chair the Supervisory Board.

GRI 2-11

GRI 2-12 The powers and functions of the Supervisory Board are stipulated in the Law. The Supervisory Board approves ROSATOM’s business strategy and the long-term operational programme.

1. <https://www.rosatom.ru/about/management/supervisoryboard/>

There are no collective advisory bodies (committees) under the Supervisory Board.

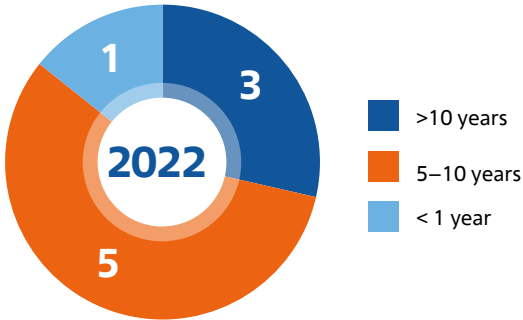
Out of the nine members of the Supervisory Board, one is female (accounting for 11% of the total number of Supervisory Board members).

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

In 2022, the following changes occurred in the composition of the Supervisory Board: one person was appointed to the Supervisory Board, while another was dismissed from the Supervisory Board.

Tenure of the members of the Supervisory Board (as at 31 December 2022), persons

GRI 2-9



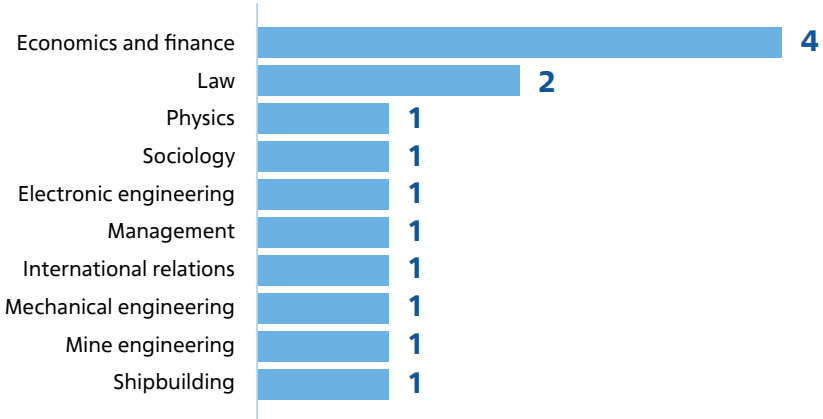
GRI 2-16 In 2022, the Supervisory Board held 18 meetings, including two in-person meetings, and considered 39 issues.

In 2022, the Supervisory Board approved the following:

- The report on progress against key performance targets of ROSATOM in 2021 (minutes No. 160 dated 25 April 2022);
- ROSATOM’s key performance targets for the period from 2022 through 2024 (minutes No. 156 dated 16 February 2022);
- Key performance targets of federal nuclear organisations for 2022 (minutes No. 160 dated 25 April 2022);
- ROSATOM’s annual report for 2021 (minutes No. 163 dated 28 June 2022).

In accordance with Article 25 of the Law, compliance with instructions from the Supervisory Board and its Chairman is monitored by the Director General of ROSATOM.

Educational profile of the members of the Supervisory Board¹



1. The data take into account the fact that some members of the Supervisory Board hold more than one degree.

Director General of ROSATOM

GRI 2-11 The powers of the Director General are stipulated in the Law. 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 5 October 2016).

The remuneration of the Director General is determined based on an evaluation of performance against KPI targets that apply to all employees of the Corporation.

ROSATOM’s Management Board

The Corporation’s Management Board is ROSATOM’s collective executive body. The Corporation’s 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 work of ROSATOM’s Management Board is managed by ROSATOM’s Director General (paragraph 1 of Article 28 of the Law).

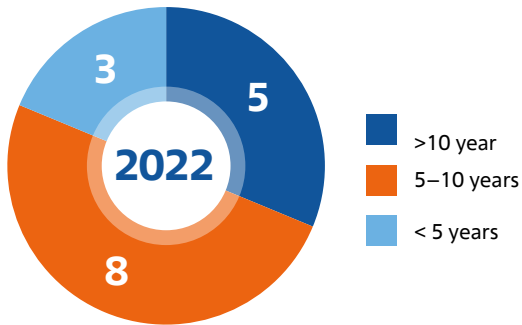
ROSATOM’s Management Board exercises the following powers¹:

- GRI 2-12
- 1) Submitting proposals concerning the Corporation’s key performance indicators for the next year to the Supervisory Board for approval;
 - 2) Defining the position of the shareholder (the Corporation) on matters related to the operations of joint-stock companies whose shares are owned by the Corporation, except for matters that fall within the competence of the Supervisory Board;
 - 3) Defining, under the procedure established by the Government of the Russian Federation, the position of the shareholder, namely the Russian Federation, on behalf of which the Corporation exercises shareholder powers, on matters on the agenda of the general meetings of shareholders of joint-stock companies in the nuclear power industry whose shares are under federal ownership, except as stipulated by laws and regulations of the Russian Federation;
 - 4) Drafting ROSATOM’s business strategy, ROSATOM’s long-term operational programme (including sustainability matters) and ROSATOM’s financial plan, including defining the amount of expenditure and focus areas for allocations from ROSATOM’s special reserve funds;
 - 5) Formulating proposals for the allocation of ROSATOM’s earnings;
 - 6) Formulating proposals for the establishment of branches, the opening of representative offices and for the establishment of ROSATOM’s entities;
 - 7) Approving the list of projects to be financed using ROSATOM’s special reserve funds;
 - 8) Approving the procedure for contributing to ROSATOM’s revenue a portion of earnings of enterprises under ROSATOM’s jurisdiction that remains available after the payment of taxes, fees and other mandatory payments;
 - 9) Approving ROSATOM’s annual report before it is submitted to the Supervisory Board;
 - 10) Approving the annual financial statements of ROSATOM’s entities;
 - 11) Exercising other powers conferred on ROSATOM’s Management Boards by the Supervisory Board.

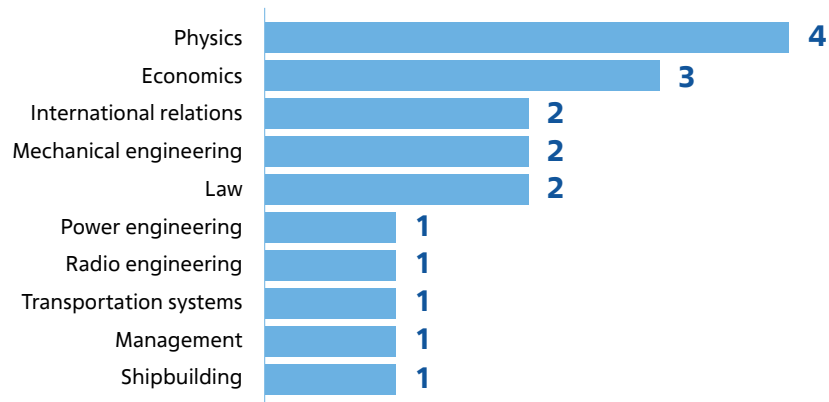
1. Article 29. Powers of the Management Board of the Corporation https://www.consultant.ru/document/cons_doc_LAW_72969/2f9a2cc0b742f12a669e30e81cbba087555c3116/

GRI 2-19 The Management Board comprises 16 members (100% of them are men). Members of the Management Board receive no remuneration for serving on ROSATOM’s Management Board.

Tenure of the members of ROSATOM’s Management Board (as at 31 December 2022), persons



Educational profile of the members of the Management Board¹



1. The data take into account the fact that some members of the Management Board hold more than one degree.

Criteria for appointment to the Management Board

In accordance with Article 28 ‘Management Board of the Corporation’ of the Law, members of ROSATOM’s Management Board are appointed and dismissed under the resolution of ROSATOM’s Supervisory Board on the recommendation of ROSATOM’s Director General. Members of ROSATOM’s Management Board are permanent employees of the Corporation or employees of ROSATOM’s organisations, joint-stock companies and their subsidiaries, as well as enterprises under ROSATOM’s jurisdiction.

In 2022, there were no changes in the composition of the Management Board.

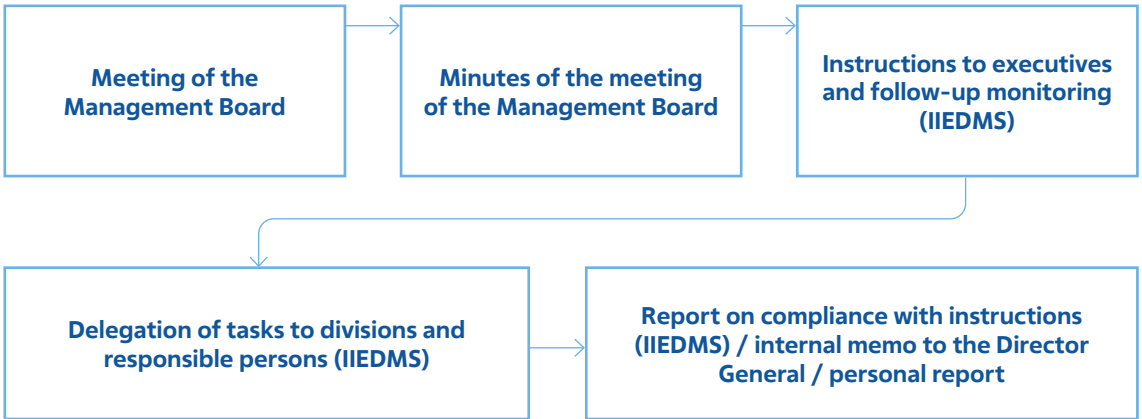
Meetings of the Management Board in 2022

In 2022, ROSATOM’s Management Board held a total of 43 meetings (all by absentee voting) and considered 333 issues. Key issues included the following:

- Performance against ROSATOM’s key performance targets in 2021;
- Approval of ROSATOM’s key performance targets until 2025;
- Changes in ROSATOM’s long-term operational programme;
- Approval of ROSATOM’s Innovative Development and Technological Modernisation Programme until 2030 (for the civilian sector) (hereinafter referred to as the Programme) as amended in 2022, the annual report on the implementation of the Programme in 2021 and the medium-term plan for the implementation of the Programme for the period from 2022 through 2025.

Mechanisms for implementing the resolutions of ROSATOM’s Management Board

Following a meeting of ROSATOM’s Management Board, resolutions adopted at the meeting are recorded in the minutes.



Compliance with instructions from the Management Board is monitored by the Office of the Director General.

ROSATOM’s financial and business operations are monitored by ROSATOM’s Auditing Commission.

Collective and advisory bodies of the Corporation

In 2022, ROSATOM had about 30 permanent committees, boards and commissions, including the following:

- The Strategic Council;
- The Steering Board of the Proryv (Breakthrough) Project;
- The Council for Physical Protection;
- The Ethics Board;
- The Council for Information Technology Architecture;
- The Unified Commission for the Procurement of Goods, Work and Services for Government Needs under a Closed Procedure;
- The Central Procurement Commission;
- The Operations Committee;
- The Staff and Incentives Committee;
- The Executive Committee on the Development of the Technology for New Materials and Substances High-Technology Area in the Russian Federation;
- The Investment Committee;
- The Committee on the Standardisation of Technical Specifications;
- The Steering Committee on Overseas NPP Personnel Training;
- The Committee on the Restructuring of Non-Core Assets, Real Property and Equity;
- The Committee on Cost within International Sales;
- The Committee on Strategic Partnerships, Mergers and Acquisitions;
- The Committee on Venture Capital Financing;
- The Charity Committee;
- The Committee on Contracting within International Sales;
- The Risk Committee;
- The Science Committee;
- The Technical Committee of the Proryv Project;
- The Committee on Procurement Strategies;
- The Central Arbitration Committee (in procurement);
- The Committee on Pricing in the Construction of Nuclear Facilities.

Improving the corporate governance system

The Corporation continued to adopt regulations governing cooperation between ROSATOM and the holding companies of its Divisions, business incubators and functional industry organisations.

The industry-wide mechanism for the conclusion of corporate integration and cooperation deals by ROSATOM and its organisations was improved.

Key changes in the corporate structure in 2022

- GRI 2-6
1. In order to promote the development of corporate volunteering and corporate social responsibility in the nuclear industry, the Autonomous Non-Profit Organisation Energy of Development was established. The Autonomous Non-Profit Organisation Energy of Development was founded by JSC ASE, JSC TVEL, JSC Rosenergoatom and JSC TENEX.
 2. A nuclear organisation acquired a controlling stake in PJSC Quadra – Power Generation, one of Russia’s largest regional power generation companies.
 3. In order to develop the logistics business in the industry, JSC Atomenergoprom increased its stake in the authorised share capital of LLC MC Delo, and Delo Group increased its stake in Global Ports Investments PLC.
 4. A nuclear organisation acquired shares in several subsidiaries in the Sales and Trading segment.
 5. Business acquisitions were made in the Mechanical Engineering segment.
 6. Other investments included investments in the industrial, energy and research sectors.

Non-arm’s length transactions

In accordance with Federal Law No. 317-FZ of 1 December 2007 on State Atomic Energy Corporation Rosatom, the Supervisory Board approves non-arm’s length transactions.

In 2022, ROSATOM’s Supervisory Board approved eight non-arm’s length transactions.

1.12.2. Risk management

Risk management system

In today’s world, companies need dynamic and flexible risk management in order to promptly respond to changes in the external agenda. The industry-wide risk management system (RMS) is integrated into the Corporation’s planning and management processes. The RMS is based on a continuous cyclical process of identifying, and assessing risks and managing those risks that can affect ROSATOM’s short- and long-term performance and the implementation of its strategy.

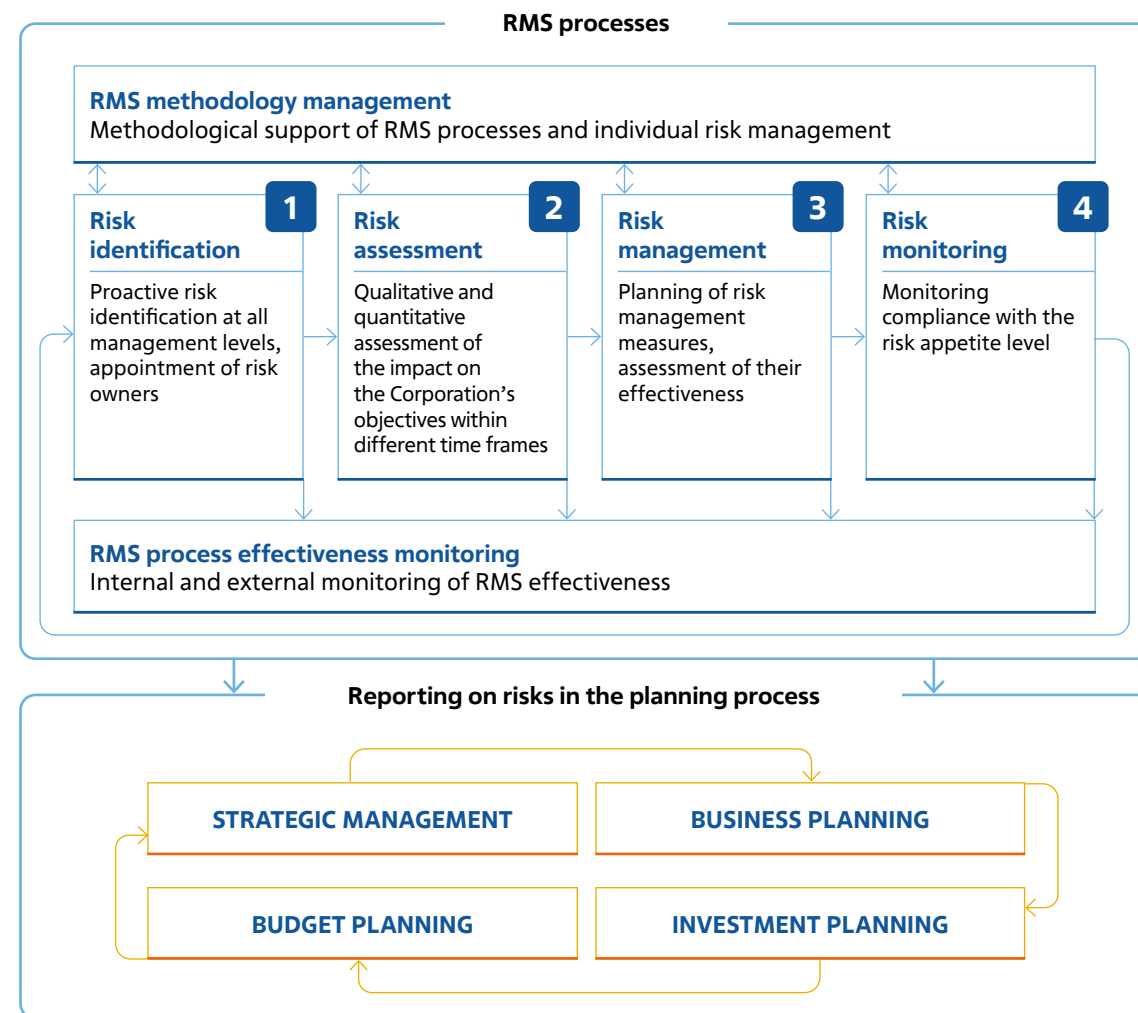
The RMS is being developed in accordance with the approved Risk Management Development Programme for the period from 2019 through 2024.

Results in 2022:

- The URAN (Risk Management: Analytics) Industry-Wide Risk Management System (URAN IRMS), an information system developed as part of project B-RM1-1 to build an Industry-Wide Risk Management System in ROSATOM, became fully operational;

- A list of key risk indicators was compiled, including a description, the calculation algorithm and frequency, sources of information and thresholds (baseline, warning and response thresholds);
- A system for early response to risks related to national and federal projects was in place;
- Key risks affecting ROSATOM's key financial and economic indicators (KPIs) were identified and assessed;
- Workshops, risk sessions and conferences were held to enable risk officers and employees within the hierarchy of the Risk Management function to share their experience; this included holding a roundtable discussion titled 'Risks and Opportunities: Responding to Challenges of the Global Economy' as part of the 12th ATOMEXPO 2022 International Forum.

Risk management process in ROSATOM



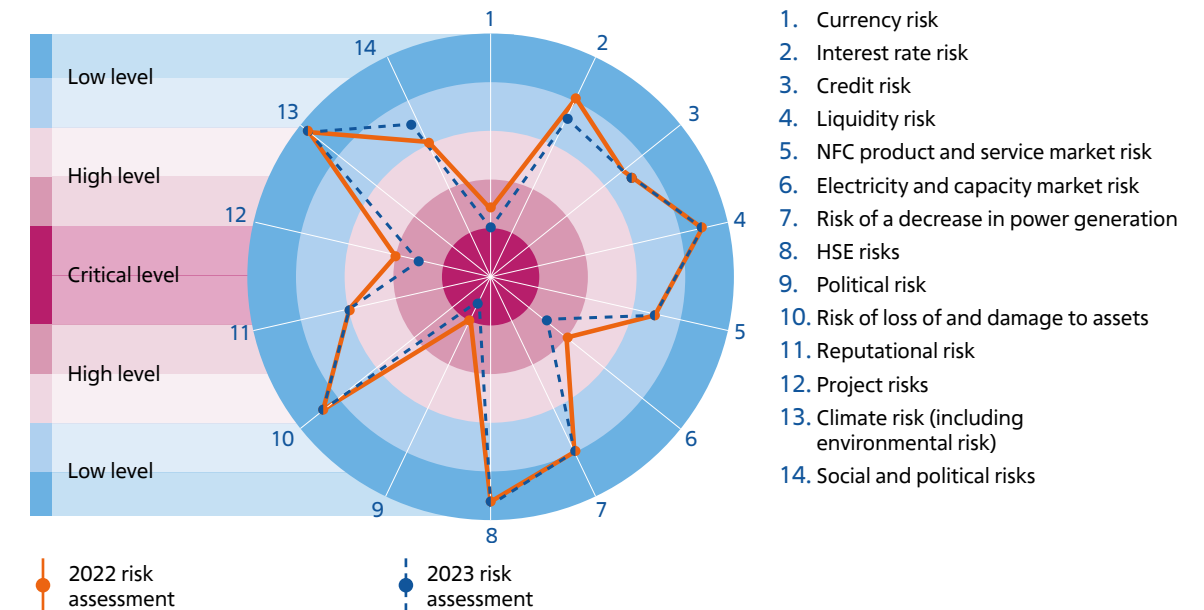
Organisational model of the risk management system



Specialised internal control bodies
(independent assessment of RMS performance)

Key business risks¹

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

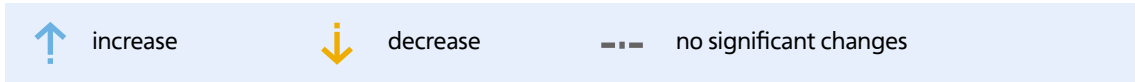


Comprehensive risk management measures largely offset the negative impact of external factors on the implementation of ROSATOM's strategy.

1. The report does not contain an exhaustive description of all risks that may affect ROSATOM's operations; it only provides information on key risks.

Risk management outcomes in 2022

Change in estimated risk levels for 2023:



ROSATOM’s strategic goals¹:

- 1

To increase the international market share
- 2

To reduce production costs and the lead time
- 3

To develop new products for the Russian and international markets
- 4

To achieve global leadership in state-of-the-art technology

Sustainability risks are presented in the table (see health, safety and environmental risks, climate and environmental risks, the risk of loss of and damage to assets, social and political risks in the regions of operation).

Risks and changes in risk levels (risk owners)	Risk description	Risk management practices	Connection with strategic goals
Financial risks			
1. Currency risk <div>↑ (Executives of ROSATOM’s Divisions)</div>	Adverse changes in exchange rates	Management approaches: <ul style="list-style-type: none">Applying currency clauses in commercial contracts and locking in exchange rates (where possible);Switching to settlements with counterparties in the currencies of friendly jurisdictions;Examining the possibility of switching to settlements with counterparties through banks in friendly jurisdictions;Using long-term pricing mechanisms with counterparties;Exploring opportunities for engaging Russian suppliers and contractors in order to reduce the foreign exchange position;Continuously monitoring exchange rates to enable prompt decision-making to mitigate currency risk;Setting the highest possible conversion rates when negotiating the terms of expense contracts;Monitoring the terms of foreign currency payments under revenue contracts and expense contracts concluded as part of performance of revenue contracts;Maintaining a balance of claims and liabilities denominated in foreign currencies (natural hedging). Results: <p>An optimal ratio of assets and liabilities denominated in the same currency was maintained.</p> <p>Foreign currency liabilities were met without raising additional funds to compensate for exchange rate fluctuations.</p> <p>In 2022, the Corporation recorded foreign exchange gains on currency conversion transactions.</p>	<div>1</div> <div>2</div> <div>3</div>

1. Sustainability risks are presented in the table (for details, see sections on climate, environmental, social and corruption risks).

Risks and changes in risk levels (risk owners)	Risk description	Risk management practices	Connection with strategic goals
2. Interest rate risk <div>↑ (ROSATOM’s Treasury Department)</div>	Adverse changes in interest rates, different timing of interest income and interest expenses	Management approaches: <ul style="list-style-type: none">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;Floating-rate loans on which interest rates may be increased are refinanced using the intra-group liquidity pool. Results: <p>The Corporation maintains a stable long-term loan portfolio. There was no significant increase in the risk level in 2022 due to the effective use of the risk management approaches described above.</p> <p><i>For details, see the section ‘Financial Management’.</i></p>	<div>1</div> <div>2</div> <div>3</div>
3. Credit risk <div>— — — (ROSATOM’s Treasury Department for banks; executives of ROSATOM’s organisations for other counterparties)</div>	Failure by counterparties to fulfil their obligations in full and on time	Management approaches: <ul style="list-style-type: none">Setting and monitoring limits for counterparty banks;Using suretyship, guarantees, restrictions on advance payments in favour of external counterparties;Monitoring the status of accounts receivable and the financial position of counterparties;An internal counterparty solvency rating system. Results: <p>Losses through the fault of counterparties were minimised.</p>	<div>1</div> <div>2</div>
4. Liquidity risk <div>— — — (ROSATOM’s Treasury Department, Heads of Divisions)</div>	Lack of funds for the fulfilment of obligations by ROSATOM and its organisations	Management approaches: <ul style="list-style-type: none">Centralised cash management (cash pooling);Rolling liquidity forecasts and cash flow budget;Maintaining required amounts of open lines of credit with banks (funds committed by banks);Reducing the period of keeping spare cash on bank deposits when this is advisable from an economic perspective;Discussing matters related to state support with Russian federal executive authorities;Active use of project financing instruments as part of implementation of projects and programmes by ROSATOM and its organisations;Maintaining the credit rating assigned to the Corporation by the national rating agency JSC Expert RA. Results: <p>ROSATOM maintained sufficient liquidity to repay liabilities on time, preventing unacceptable losses and reputational risk.</p> <p><i>For details, see the section ‘Financial Management’.</i></p>	<div>1</div> <div>3</div>

Risks and changes in risk levels (risk owners)	Risk description	Risk management practices	Connection with strategic goals
Commercial risks			
5. Nuclear fuel cycle (NFC) product and service market risk — — — (Executives of the relevant Divisions of the Corporation)	Adverse changes in the pricing environment and demand on markets for natural uranium and uranium conversion and enrichment services	Management approaches: <ul style="list-style-type: none">— Maintaining an optimal balance between market-focused and escalation pricing (benchmark price inflation) in contracts;— Embedding quantitative flexibility and options in contracts with suppliers to align purchase and sales volumes;— Discussing the volume of future orders with customers in advance;— Promoting products in new market segments;— Improving the technical and economic characteristics of nuclear fuel; developing new types of fuel;— Establishing partnerships in the form of joint ventures (JVs) with foreign suppliers of NFC products and services;— Using long-term pricing mechanisms; aligning pricing mechanisms used for procurement and those used in contracts with a high level of commodity risk;— Taking into account the current market performance and established operational limits in the course of operations;— Product supply diversification. Searching for partners in friendly jurisdictions;— Exploring opportunities for concluding additional commercial contracts on the spot market to mitigate the risk;— Accelerating product shipments, optimising working capital, including faster receipt of payments from counterparties. Results: <p>By implementing the above measures and taking advantage of opportunities offered by a rise in product prices, the Corporation was able to mitigate the risk.</p> <p>The risk level remains unchanged, as quotations for natural uranium and the separative work unit are currently low, which limits their downside, while creating an upside if the market environment improves.</p>	<div>1</div> <div>2</div> <div>4</div>
6. Electricity and capacity market risk ↑ (Director General of JSC Rosenergoatom)	Adverse changes in electricity and capacity prices	Management approaches: <ul style="list-style-type: none">— Participating in the working group on forecasting hosted by the Association NP Market Council;— Monitoring price drivers;— Updating price forecasts on a monthly basis.	<div>1</div>

Risks and changes in risk levels (risk owners)	Risk description	Risk management practices	Connection with strategic goals
Operational risks			
7. Risk of a decrease in power generation — — — (Director General of JSC Rosenergoatom)	Decrease in power generation due to equipment shutdowns and unavailability	Management approaches: <ul style="list-style-type: none">— In order to improve NPP safety, reliability and resilience, prevent equipment failures, meet the load schedule and achieve the target for power and heat supply while meeting the established schedule of repairs at NPP power units, to accelerate efforts to achieve key targets for power generation, and in order to systematise efforts aimed at ensuring that NPP managers assume a greater personal responsibility, the relevant orders were issued in 2022.— Scheduled repairs of NPP power units are carried out annually in accordance with the approved schedule; NPP life extension and equipment upgrade programmes are implemented to increase installed capacity and power generation at operating power units (including the possibility of power units operating at above nameplate capacity). Results: <p>In 2022, nuclear power generation reached a record high of 223.4 billion kWh, totalling 102.5% of the balance target set by the Federal Antimonopoly Service (FAS) of Russia and 100.4% of electricity output in 2021. The capacity factor stood at 86.21% in 2022. Russian NPPs forming part of the Unified Power System of Russia accounted for 19.9% of the total electricity output within the Unified Power System of Russia.</p> <p>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.</p> <p>The implementation of risk management measures and the use of tools of the ROSATOM Production System make it possible to offset the impact of negative factors.</p> <p><i>For details, see 'Performance of the Power Engineering Division in 2022'.</i></p>	<div>1</div>

Risks and changes in risk levels (risk owners)	Risk description	Risk management practices	Connection with strategic goals
8. Health, safety and environmental (HSE) risks (Executives of ROSATOM's Divisions)	Major accidents/incidents in nuclear enterprises	Management approaches: <ul style="list-style-type: none">Occupational safety and health monitoring in nuclear organisations, including inspections and preventive visits, development of action plans and implementation of risk mitigation measures;Implementation of measures to improve HSE performance in the enterprises, including measures to enhance occupational safety, reduce the impact of ROSATOM's operations on the health of the local population and prevent irreversible changes in the natural environment in the towns and cities where nuclear facilities are located;Measures to upgrade process equipment and improve production processes in the enterprises;Monitoring of individual radiation risk exposure of employees and measures to reduce it;Monitoring of the radiation level and the environmental situation in ROSATOM's regions of operation;Constant readiness of emergency and incident response teams and equipment;Special reserve funds formed by ROSATOM to ensure safety at all stages of the life cycle of its production facilities;Arranging civil liability insurance against damage resulting from accidents for enterprises that own hazardous industrial facilities;Calculation and monitoring of indicators used for assessing the probability of potential negative impacts of industrial safety violations at hazard class 1 and 2 industrial facilities;Timely updates to internal regulations of the organisations, as required by legislation and federal rules and standards;Technical inspection of equipment used at hazardous industrial facilities;Maintaining a high level of professionalism, accountability and safety culture among employees, including certification of operating personnel at hazardous industrial facilities;Continuous monitoring of the use of personal protective equipment by employees in the workplace;Improvement of project management practices in the sphere of occupational safety and health. Results: Safe operation of ROSATOM's organisations, including hazardous industrial facilities.	4

For details, see the chapters 'Safety Report' and 'Social Report'.

Risks and changes in risk levels (risk owners)	Risk description	Risk management practices	Connection with strategic goals
9. Political risk (ROSATOM's International Relations Unit and International Business Development Unit)	Changes in the regulatory and political climate in foreign countries imposing restrictions on the operations of ROSATOM and its organisations	Management approaches: <ul style="list-style-type: none">Coordination with the Russian Ministry of Foreign Affairs and other authorities, including through ROSATOM's representatives in Russian embassies and trade missions abroad;Updating and implementing the relevant action plan on a quarterly basis amid sanctions pressure on the Russian Federation;Providing political support for global operations of nuclear organisations;Using the platform of specialised international organisations for communication and awareness campaigns;Establishing partnerships with local and foreign regional companies and searching for alternative partners;Examining alternative options for the supply of equipment that has been produced by the Corporation or is in production;Taking into account political interests of governments in the Corporation's end markets;Strict compliance with international requirements governing relations in the sphere of peaceful use of nuclear energy: nuclear non-proliferation, export control, security and physical protection;Further product diversification (wind power, nuclear medicine);Systematic engagement with the IAEA and partner countries with a focus on nuclear infrastructure;Using national currencies for settlements;Active media outreach; supporting the operation of information centres; ensuring openness and transparency during the construction of nuclear facilities abroad, including through active community engagement. Results: Despite a challenging global political situation, ROSATOM fulfils all its international commitments to build Russian-design nuclear facilities abroad. The conclusion of 17 intergovernmental and interdepartmental agreements on the peaceful use of nuclear energy is a positive sign. At year-end 2022, ROSATOM's portfolio of overseas projects comprised 34 nuclear power units in 11 countries worldwide. Overseas projects involving the construction of 23 power units in eight countries are in the active stage of implementation. Explanation of the increase: <ul style="list-style-type: none">Growing sanctions pressure on the Russian Federation;Political and economic pressure on the Corporation's foreign partners in order to force them to suspend or terminate cooperation with ROSATOM;Political and economic instability on target markets and politicised decisions on the selection of nuclear technology suppliers;	1 3 4

Risks and changes in risk levels (risk owners)	Risk description	Risk management practices	Connection with strategic goals
12. Project risk ↑ (Executives of ROSATOM's Divisions)	Changes in the macro-economic indicators of the countries participating in the projects; contractors' failure to fulfil their commitments with regard to the schedule and quality of work to be performed	Management approaches: <ul style="list-style-type: none">Full-cycle risk management applied in NPP construction projects, including risk identification and assessment, development and implementation of risk management measures, risk monitoring, updates to the risk register, and reporting;Improving project management and risk management systems;Negotiating the main terms and conditions of contracts with customers in advance;Developing risk maps for new business areas;Regular monitoring and control of achievement of key milestones, financial and physical targets for overseas projects;Regular monitoring and communication with customers concerning the schedule for NPP maintenance and training of foreign NPP personnel abroad, as well as other matters related to the implementation of overseas projects;Implementing best project management practices (including ROSATOM's industry-wide risk management system and the TCM NC cost and schedule management methodology) and industry-wide guidelines for projects and investment activities in project companies;Steps taken both by shareholders and at the operational level to enhance risk-based project management;Improving project management practices;Developing action plans for engagement with foreign customers;Concluding long-term contracts and locking in electricity prices;Developing standardised design solutions;Implementing a programme to reduce the cost and duration of NPP construction;Implementing procedures forming part of an industry-wide approach to managing risks associated with NPP construction projects;Using opportunities for the redistribution of available credit resources between projects;Concluding agreements that impose penalties for the full or partial repudiation of commitments;Developing alternative projects meeting the established criteria;Concluding long-term offtake contracts.	1 3 4

Risks and changes in risk levels (risk owners)	Risk description	Risk management practices	Connection with strategic goals
		Results: <p>Risk management measures implemented by the Corporation have enabled it to avoid a negative impact on key performance indicators. For key components that are no longer unavailable, alternative suppliers have been found, and further steps are being taken to replace imports. Project implementation stages are monitored in real time; RPS methodologies are being implemented. The Corporation is expanding its product portfolio (offers) and entering new end markets, including by establishing JVs and acquiring the relevant assets. Procurement of imported equipment is brought forward, with prices locked in and the warranty period extended. The risk is expected to rise due to the lengthening of supply chains and the fact that major suppliers of IT equipment have left the Russian market because of sanctions pressure.</p>	
13. Climate and environmental risk — — — (Executives of ROSATOM's Divisions)	Adverse climate change/ impacts of natural disasters on the operations of ROSATOM and its organisations; risk of environmental damage from the operation of nuclear facilities and other facilities in the industry	Management approaches: <ul style="list-style-type: none">At the stage of NPP design, ROSATOM carries out a comprehensive assessment of risks associated with the climatic characteristics of the region where the proposed NPP construction site is situated;Implementation of industry-wide policies on sustainable development and environmental protection. Taking into account adverse natural phenomena (including earthquake tendencies) and climatic factors at the design stage. Industrial environmental control and monitoring;Parameters of the NPP construction site are continuously monitored;Environmental monitoring is performed, including radiation monitoring at the NPP construction site and in the radiation control area using mobile radiation monitoring equipment at ARMS stations in accordance with the Environmental Radiation Monitoring Programme;Annual reports presenting the findings of site monitoring, environmental and radiation monitoring are published on an annual basis. Annual reports are submitted to the Nuclear Regulatory Authority of Turkey (NDK), the general design contractor (JSC Atomenergo-proekt) and the holding company (JSC REIN);Steps are being taken to determine the zero background radiation level at the NPP construction site;To maintain the balance of local ecosystems, all enterprises involved in various stages of the production process strictly comply with technological standards for natural uranium mining and processing. Active steps are being taken to reduce the relevant impacts and improve the environmental safety of the production cycle.	1 4

Risks and changes in risk levels (risk owners)	Risk description	Risk management practices	Connection with strategic goals
		<p>Results:</p> <p>Pollutant emissions into the atmosphere from NPPs do not exceed permitted limits and are significantly below the limits set by environmental regulators. The majority of pollutant emissions from NPPs are generated by start-up and backup boiler houses, boiler houses of healthcare centres and backup diesel generators, which are regularly started up for routine testing.</p> <p>For many years, NPPs account for less than 0.01% of the total volume of pollutant emissions into the atmosphere from Russian enterprises.</p> <p>Despite the progress that has been made, NPPs continue to systematically implement measures to reduce the man-made impact on the atmosphere: ROSATOM is improving technological solutions used to enhance the fuel efficiency of its facilities; the Corporation has switched to higher-grade fuel oil (with lower sulphur content); painting techniques are being improved; efficient gas scrubbers and dust collectors are put into operation.</p>	
14. Social and political risks in the regions of operation	Loss of public approval for the location of infrastructure facilities	<p>Management approaches:</p> <ul style="list-style-type: none">— ROSATOM operates in a socially important sector of the economy. The Government of the Russian Federation makes a direct impact on ROSATOM's operations by financing individual federal projects and federal target programmes. As a result, the Corporation and its organisations are characterised by a high level of financial resilience sufficient to withstand the negative economic consequences of social and regional risks;— ROSATOM engages with regional and municipal governments on matters related to promoting regional development, increasing regional tax revenue and maintaining social and economic stability in the regions;— In order to reduce social risks in its regions of operation, the Corporation implements a set of measures (public consultations, engagement with non-governmental organisations and the media) to inform the general public about the operations of its regional manufacturing enterprises, plans for their future development and their stability, and the fact that its operations do not pose any environmental risks;— Simultaneously, the Corporation conducts environmental upgrades in the back-end segment, introducing new RAW and SNF processing technologies and reducing the volume and radioactivity of waste. <p>Result: the situation in the towns and cities where ROSATOM operates remains stable. Operational continuity has been ensured in the Corporation's enterprises.</p>	



(ROSATOM and executives of the Corporation's Divisions)

Other risks

Licensing risks. ROSATOM currently has all necessary licences. Where necessary, the Corporation can promptly obtain licences for new businesses and renew existing licences.

Logistical risks. Regions in which the core operations of ROSATOM and its organisations are situated have well-developed infrastructure and transport links. ROSATOM's organisations implement preventive measures to ensure reliable supplies: they maintain emergency stocks of materials and equipment, organise exercises for emergency response and recovery teams and implement other measures to ensure the continuity of production and logistical processes.

Risk insurance

Risk insurance is one of the main risk management approaches used by ROSATOM.

To improve the reliability of insurance coverage, in 2022, the Corporation continued to cooperate with the insurance community in order to insure Russian operators against property risks. A significant share of liability of Russian NPPs for potential nuclear damage was transferred for reinsurance to the Russian Nuclear Insurance Pool (RNIP) and the Russian National Reinsurance Company (RNRC). This proves that the insurance community acknowledges the safety and reliability of Russian NPPs to be adequate.

In 2023, the Corporation plans to continue to engage RNIP and RNRC experts to audit key enterprises in the industry for insurance purposes.

Objectives for 2023 and the medium term

Plans for 2023 include activities stipulated in the Risk Management Development Programme for the period from 2019 through 2024. The Programme takes 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 aligned with global best practices in ROSATOM).

The following three key objectives for the development of risk management in the Russian nuclear industry have been set for 2023:

- To develop an automated risk assessment and management system, which will, among other things, enable ROSATOM to maintain and update a knowledge base of typical risks and risk management measures;
- To develop the risk management expert community in the industry;
- To adopt procedures (including initial assessment) for managing risks associated with projects and programmes in the sphere of new business development.

In 2023, the Corporation plans to perform activities in the URAN IRMS and activities forming part of the second stage of the URAN IRMS project (under the resolution of the Steering Board of ROSATOM's URAN IRMS project). Key activities forming part of the second stage will include the following:

- Integration with the system supporting investment activities (the Sirius information system), the Digital Science system of digital services and TCM NC;
- Implementation of modelling and quantitative risk assessment tools.

1.12.3. Internal control system

Key results in 2022

- Inspections conducted in ROSATOM and its organisations by Russian regulatory agencies did not reveal any major violations.
- Based on the findings of monitoring, internal control performance was highly rated by internal customers (with a score of 6.4 out of 7 against a target of 5.7).

The internal control system in ROSATOM and its organisations is based on:

- Russian laws and regulations;
- The IAEA requirements;
- The COSO model (The Committee of Sponsoring Organisations of the Treadway Commission);
- Guidelines for Internal Control Standards for the Public Sector by the Internal Control Standards Committee of the International Organisation of Supreme Audit Institutions (INTOSAI).

Key characteristics of the internal control system include the following:

- Preventive control and development of timely, comprehensive and practicable corrective measures;
- Efficient communication and cooperation with operating divisions at all stages of operations;
- Proactive change management;
- Growing demand from executives in ROSATOM’s organisations for advisory services provided by the Internal Control and Audit Function (ICAF).

Results in 2022

The following measures were implemented in order to improve the internal control system:

- Methodological Approaches to the Internal Audit of Performance of the System of Internal Controls in Business Processes were developed;
- The application of incentives for employees of specialised internal control bodies (SICBs) who have special knowledge (expertise and practical experience) and act as competence centres in the Divisions was examined taking into account performance in 2021;
- The SICBs of ROSATOM’s organisations assumed greater responsibility through an updated leadership model;
- Progress was made in the development of control activities in terms of supporting the implementation of sustainable development principles.

For the SICBs to provide reasonable assurance regarding the achievement of ROSATOM’s strategic goals, the following steps were taken in 2022:

- Financial and business audits were focused on monitoring the implementation of projects and strategic programmes and minimising material risks;
- Following an audit of projects focused on the rehabilitation of disturbed land (Usolyekhimprom, the Baykalsk Pulp and Paper Mill, the Krasny Bor landfill), ROSATOM prepared a comprehensive development plan focused on repairing historical environmental damage;

- Following an audit of development of port infrastructure along the Northern Sea Route, measures were developed to enhance the efficiency of the internal control system with a focus on the use of subsidies, as well as timely and complete reporting;
- Following an audit of industrial dismantling of nuclear submarines, control over the performance of government contracts aimed at fulfilling the state defence order was enhanced;
- Following an audit of implementation of ROSATOM’s digital strategies, a set of measures was implemented to optimise digital operations and speed up decision-making;
- The percentage of significant instances of non-compliance with sustainability guidelines adopted in the industry in audited organisations decreased by 64% compared to 2021;
- Measures were implemented to minimise operational risks related to sanctions.

The ICAF takes steps to create and maintain an internal professional community of auditors in the nuclear industry:

- Steps are taken to improve the intranet portal and the forum for the sharing of experience;
- Online meetings of internal auditors and controllers in the nuclear industry are held on a monthly basis in order to share best practices and practical experience in the sphere of internal audit, risk management and internal control (every event is attended by more than 180 people; 13 events were held in 2022);
- A centralised independent assessment of compliance with the professional standard for internal control officers (internal controllers) was carried out successfully for 150 employees of the SICBs of ROSATOM and nuclear organisations.

Outcomes of control activities in 2022

In the reporting year, ROSATOM’s SICBs conducted 728 inspections in Russian nuclear organisations. External supervisory bodies conducted 13 inspections, including nine inspections by the Accounts Chamber of the Russian Federation. No instances of misuse or illegal use of budget funds or assets were detected.

Following the inspections, the ICAF developed 692 corrective measures and approved them for implementation.

Based on the findings of inspections conducted in the reporting year, disciplinary sanctions were imposed on 293 employees of nuclear organisations, including seven senior managers.

Stakeholder control

The Corporation continues to operate the Partner Special Monitoring and Analytics Unit designed for integrating ROSATOM’s information systems in real time; it contains full information on complaints regarding procurement processes in the nuclear industry, as well as indicators for online monitoring of procurement procedures.

The Corporation continues to maintain a public information system for calculating the business reputation score of suppliers, which is one of the key risk assessment tools used in the course of procurement in the nuclear industry. The Uniform Industry-Wide Guidelines for Assessing the Business Reputation of Suppliers were updated. The information system for calculating the business reputation score of suppliers was migrated to modern software that does not rely on imported solutions; the recording of negative information on certain grounds was automated through integration with information systems applied in the industry. ROSATOM and JSC Russian Post signed a memorandum on the joint use and development of the information system for calculating the business reputation score of suppliers.

The Corporation carries out methodological work to produce recommendations and proposals for improving procurement processes in the nuclear industry based on the findings of investigation of complaints. A methodology has been developed for monitoring current procurement procedures.

Webinars are held for employees of the procurement function and controllers; they are focused on the most frequent issues and irregularities in the sphere of procurement.

As part of advisory activities, explanatory letters on individual issues are sent to customers to prevent similar violations. Advisory support is provided to employees of the procurement function regarding the application of provisions of the UIPS. A Q&A forum for employees in the industry has been put into operation as part of the Partner Special Monitoring and Analytics Unit to address questions related to the application of the business reputation score of suppliers.

The Central Arbitration Committee and the arbitration committees of the Power Engineering, Fuel and Engineering Divisions received 636 reports (complaints) from stakeholders regarding violations of procurement rules established by Russian legislation, the UIPS and other regulations of ROSATOM and its organisations supporting the UIPS. 365 complaints were investigated; 81 complaints (22.2% of the total number of investigated complaints) were deemed to be valid. Other complaints were withdrawn by complainants 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);
- Because the defendant had taken corrective measures to address the violation before the complaint was investigated by an arbitration committee.

Systematic efforts of arbitration committees (including detailed explanations provided to customers/procurement authorities during the investigation of complaints concerning the nature of detected violations), the publication of biannual practice reviews and a library of arbitration practices maintained on the official procurement website of the nuclear industry helped to minimise the number of violations in the procurement process, which was reflected in a 25% decrease in the number of valid complaints as a percentage of the total number of purchases (from 0.14% in 2021 to 0.11% in 2022). The reversal of decisions on the recommendation of the Central Arbitration Committee following the investigation of just four complaints concerning the customer’s failure to rebid enabled organisations in the industry to save about RUB 200 million. Following the investigation of complaints, a proposal was submitted to the Central Arbitration Committee, and steps were taken to enable foreign bidders to participate in the procurement process.

In addition, the Central Arbitration Committee reviewed 14 complaints related to the calculation of the business reputation score of suppliers, which is 55% less than in 2021 (all complaints were found to be invalid).

Indicator	2020	2022	2022
Third-party inspections			
Number of inspections by external supervisory bodies	18	17	13
including the number of inspections by the Accounts Chamber of the Russian Federation	12	11	9
Outcomes of inspections			
Number of actual incidents or significant shortcomings detected by government agencies as a result of inspection of processes in ROSATOM and its organisations that had not been detected by the ICAF	0	0	0

Indicator	2020	2022	2022
Quality of organisation and performance of internal financial control and internal financial audit as assessed by the Russian Ministry of Finance, %	96.8	100	*
Internal inspections			
Number of inspections by specialised internal control bodies (SICBs)	646	722	728
Outcomes of inspections			
Number of corrective measures implemented following the inspections	667	575	692
Number of employees on whom disciplinary sanctions were imposed	369	358	293
including the number of senior managers	12	22	7
Stakeholder control			
Number of complaints filed with the arbitration committees of ROSATOM and its Divisions regarding violations of procurement rules	899	869	636
Number of reports (complaints) accepted for investigation	596	496	365
Outcomes of investigation of complaints in the sphere of procurement			
Number of valid complaints	140	113	81
Valid complaints as a percentage of the total number of investigated complaints	23.5	22.8	22.2
Valid complaints as a percentage of the total number of purchases	0.19	0.14	0.11

* Annual monitoring for the reporting fiscal year is conducted based on sources of information until 1 June of the year following the reporting year.

Plans for 2023

In 2023, efforts aimed at improving the performance of governance and internal control systems in ROSATOM and its organisations and further enhancing control activities will involve implementing a set of measures, including the following:

- Mastering project audit and strategic audit practices;
- Practising continuous auditing techniques;
- Developing control activities with a focus on improving sustainability maturity in the industry;
- Digitisation of control activities;
- Automation of the information system for calculating the business reputation score;
- Establishing an integrated nationwide system for assessing business reputation, with a single methodology centre at the Competition Policy Monitoring Office;
- Investigating complaints concerning procurement transactions made using the BRIEF solution and supplier verification.

1.12.4. Prevention of corruption and other offences

1.12.4.1. Prevention of corruption

ROSATOM's anti-corruption efforts are governed by the Anti-Corruption Plan of State Atomic Energy Corporation Rosatom and Its Organisations for the period from 2021 through 2024 developed pursuant to the Decree of the President of the Russian Federation on the National Anti-Corruption Plan for the Period from 2021 through 2024. Key focus areas include the following.

1. Ensuring that ROSATOM's employees fulfil their responsibilities and comply with prohibitions, restrictions and requirements for preventing or resolving conflicts of interest:
 - Informing ROSATOM's employees, including those newly hired, about anti-corruption responsibilities, prohibitions, restrictions and requirements;
 - Analysing information on the income of candidates for positions in ROSATOM (34 candidates and 55 of their close relatives in 2022); submitting declarations of income, expenses, property and liabilities (in 2022, the relevant information was provided with regard to 287 employees of ROSATOM and 415 members of their families); annual performance reviews at operational meetings chaired by ROSATOM's Director General; posting information on ROSATOM's official website under the established procedure (in 2022, the relevant information for 2021 was posted with regard to 131 employees);
 - Ensuring that ROSATOM's employees report gifts received in connection with their position or the performance of their official duties under the established procedures and hand over the gifts for valuation, sale (buyback) and the remittance of proceeds from their sale.
2. Consistently applying Russian anti-corruption laws in order to enhance the efficiency of mechanisms for preventing and resolving conflicts of interest:
 - Assigning responsibility to every executive for ensuring compliance of their subordinates with the provisions of anti-corruption standards and timely implementation of effective measures aimed at preventing and resolving conflicts of interest;
 - Appointing an official responsible for making entries in the register of persons dismissed due to a loss of trust and confidence and removing information from the register by sending information to the competent department of the Office of the Government of the Russian Federation;
 - Incorporating provisions stipulating that the organisation and its sole executive body are responsible for compliance with Russian or foreign anti-corruption laws in its region of operation, arranging and supporting the development and implementation of anti-corruption measures into the charters of nuclear organisations of any legal form (businesses, enterprises and institutions) as part of corporate actions involving their establishment, reorganisation and (or) acquisition;
 - Incorporating provisions into the templates of employment contracts with ROSATOM's employees requiring them to inform the employer about personal interest that may create a conflict of interest and to take measures to prevent it;
 - Posting methodological guidelines explaining the requirements of Russian legislation for preventing and resolving conflicts of interest on ROSATOM's official website at www.rosatom.ru;
 - Informing persons appointed to positions involving anti-corruption responsibilities, restrictions and prohibitions in writing about matters related to preventing and resolving conflicts of interest and about anti-corruption laws and regulations.

3. Enhancing anti-corruption initiatives in the sphere of procurement of goods, work and services for government or municipal needs and in the sphere of procurement of goods, work and services by certain types of legal entities:
 - Updating (as required) the Uniform Industrial Procurement Standard (the Regulations on Procurement) approved by ROSATOM's Supervisory Board (the UIPS);
 - Posting the annual procurement programme, the procurement plan and the procurement schedule, as well as amendments thereto, in the integrated procurement information system and making them publicly available; conducting procurement through online trading platforms; maintaining electronic registers of contracts;
 - Obtaining approval for all procurement procedures from anti-corruption departments, with the largest and most important procurement transactions to be approved by the authorised bodies of qualified buyers in order to prevent the risk of corruption in relations between customers and suppliers;
 - Annual submission of information on income by employees of the authorised bodies;
 - Ensuring that internal control and audit functions and (or) anti-corruption departments of ROSATOM and its organisations investigate reports of evidence of non-compliance detected in the procurement process; providing all stakeholders in the procurement process with an opportunity to contact the hotline by email or by phone or visit the procurement page on the official procurement website of the nuclear industry or on an online trading platform;
 - Making the procurement of simple standardised goods by ROSATOM more transparent, which involves introducing fully automated electronic procurement conducted through the UIS Procurement System and electronic trading platforms; taking steps to make non-competitive procurement methods more transparent;
 - Developing face-to-face and online anti-corruption training courses for employees of ROSATOM and nuclear organisations involved in the procurement process and rolling them out in cooperation with the Procurement, Logistics and Quality School of the Rosatom Corporate Academy.
4. Professional development activities focused on combating corruption:
 - Using the set of training programmes and training courses developed by ROSATOM's educational institutions with assistance from experts from the Russian Presidential Academy of National Economy and Public Administration, the Institute of Legislation and Comparative Law under the Government of the Russian Federation and the Academy of the Prosecutor General's Office;
 - Holding a wide range of training and awareness events that are accessible to virtually all employees of ROSATOM and its organisations under the established procedure.

Face-to-face training was provided for the following categories of employees stipulated in the National Anti-Corruption Plan:

- Persons newly hired by the Corporation and its organisations and appointed to positions involving responsibility for compliance with anti-corruption standards (more than 880 people);
- Employees in charge of procurement (more than 2,900 people);
- Employees responsible for preventing corruption and other offences (more than 5,900 people).

7,252 employees of ROSATOM and its organisations completed remote training courses.

1.12.5. Financial management

Key results in 2022

- The Company placed a second issue of ‘green’ exchange-traded bonds worth RUB 9 billion.
- A total of RUB 46.64 billion has been saved in the industry through intra-group financing since 2010.
- The credit ratings of ROSATOM and JSC Atomenergoprom were confirmed by rating agencies at the highest possible level: ruAAA with a stable outlook by Expert RA; AAA(RU) with a stable outlook by ACRA.

Implementation of ROSATOM’s financial strategy in 2022

Given the scale of ROSATOM’s business in Russia and abroad, the Corporation’s management attaches special importance to the financial resilience of nuclear organisations in a changing environment. The financial strategy is an integral part of ROSATOM’s overall business strategy. Its main aim is to ensure the financial resilience of the Corporation and its organisations in a changing external environment and to maximise the efficiency of financing and financial risk management.

ROSATOM’s key financial transactions have been centralised. Cash flow management is centralised through:

- A single industry-wide regulatory framework governing financial management (including the Uniform Industry-Wide Financial Policy);
- Vertical integration of treasury departments in ROSATOM’s companies, which are functionally accountable to ROSATOM’s Treasury Department. The established treasury structure enables 100% control of funds in the industry;
- Concentration of principal treasury functions of nuclear organisations in ROSATOM’s Treasury Department, which communicates with nuclear organisations in a shared information space 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 in all of ROSATOM’s organisations on a daily basis.

Targets set for 2022 in the financial strategy in terms of engagement with banks, debt portfolio management as part of the day-to-day operations and projects of ROSATOM and its organisations, and further centralisation of financial transactions were met. In order to improve the performance of the treasury functions, in 2022, the Corporation continued to work towards:

- Accumulating spare cash in the accounts of pool leaders¹;
- Improving the accuracy of payment scheduling (a rolling liquidity forecast);
- Maintaining a competitive cost of servicing of the consolidated debt portfolio;
- Centralising treasury transactions (complying with the financial policy);
- Introducing project financing instruments as part of project implementation by the Corporation and its organisations.

1. A pool leader is an organisation of the Corporation on whose accounts spare cash is accumulated and subsequently redistributed between ROSATOM’s organisations through loan agreements. The organisation performing the functions of a pool leader is appointed under the resolution of ROSATOM’s executive bodies.

In 2022, ROSATOM continued to implement and expand the scope of the project focused on further centralisation of the treasury function, including the rollout of the Payment Factory at JSC Atomenergoprom (hereinafter referred to as the Payment Factory). This project is aimed at further improving the performance of the treasury function in the industry.

A total of about RUB 46.64 billion was saved in the industry through intra-group financing between 2010 and 2022.

Green bonds

In 2022, JSC Atomenergoprom placed the second issue of ‘green’ exchange-traded bonds (series 001R-02) with a par value of RUB 9 billion. The issue was placed as part of the series 001R exchange-traded bond programme worth up to RUB 100 billion inclusive. The bonds have a maturity of three years.

Proceeds from the bond placement have been used to refinance expenditure on the implementation of the Wind Power programme.

The securities were more than eight times oversubscribed. As the bond issue was oversubscribed, the Company was able to lower the coupon rate to 8.95% per annum, which corresponds to an effective yield of 9.15%.

The Expert RA rating agency acting as an independent verifier confirmed that the bond issue complied with the Green Bond Principles (GBP) of the International Capital Market Association (ICMA) and with the provisions of the Russian Green Finance Guidelines developed by VEB.RF.

Parties to the transaction included all categories of investors, such as banks, managers, investment firms and insurance companies; it also generated demand from individuals.

Earlier, in 2021, JSC Atomenergoprom placed the first issue of ‘green’ exchange-traded bonds (series 001R-01) with a par value of RUB 10 billion. The issue was placed as part of the series 001R exchange-traded bond programme worth up to RUB 100 billion inclusive. The bonds have a maturity of five years. This was the first placement of exchange-traded bonds by a Russian issuer to finance renewable energy sources.

Receiving and maintaining credit ratings

In the reporting year, JSC Atomenergoprom continued to take steps to the maintain the credit rating assigned by the national rating agency, JSC Expert RA.

As at 31 December 2022, the national rating agency JSC Expert RA confirmed the credit rating assigned to JSC Atomenergoprom at ruAAA with a stable outlook.

In addition, in 2022, the Analytical Credit Rating Agency (ACRA) confirmed the credit rating assigned to the Corporation at the highest possible level, AAA(RU), with a stable outlook.

Raising financing for day-to-day operations and for projects

As part of its day-to-day operations and project activities, the Corporation successfully maintained the average interest rate on its total debt portfolio denominated in Russian roubles at 8.9% as at 31 December 2022. Despite turbulence on the Russian financial market amid unprecedented sanctions pressure on financial and industrial sectors of the Russian economy, throughout 2022, ROSATOM maintained sufficient liquidity to ensure that it and its organisations operate normally and fulfil their contractual obligations on time.

Both JSC Atomenergoprom and other organisations of ROSATOM continued to obtain funding on preferential terms, including for the implementation of digital transformation projects aimed at improving management efficiency in the nuclear industry and implementing domestically produced IT solutions that do not rely on imported technology as part of a subsidy programme run by the Ministry of Digital Development, Communications and Mass Media of the Russian Federation pursuant to Decree No. 1598 of the Government of the Russian Federation dated 5 December 2019.

ROSATOM continued to use suretyship to secure obligations of organisations in the industry to their counterparties. This measure helps to reduce both the cost of bank guarantees and the cost of financing raised by the Corporation (including interest expenses).

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

ROSATOM continued to search for sources of financing for projects in traditional and new business areas:

- As part of the development of a concession model for the financing of construction of a pilot small nuclear power plant in the Sakha Republic (Yakutia), an agreement on the implementation of a zero-carbon nuclear power generation project in the Arctic zone of the Sakha Republic (Yakutia) in the form of a public-private partnership was signed with the Ministry for the Development of the Russian Far East and Arctic at the 2022 St. Petersburg International Economic Forum, and an agreement on cooperation in the development of a mineral resource centre in the Arctic zone of the Sakha Republic (Yakutia) was signed with the Ministry for the Development of the Russian Far East and Arctic, the Ministry of Natural Resources and Environment and the Head of the Sakha Republic (Yakutia) at the 2022 Eastern Economic Forum;
- Financial documents were signed to finance the construction of three industrial facilities as part of the implementation of the Infrastructure for the Management of Hazard Class 1 and 2 Waste Federal Project. Loans to be provided by the financial partner will total RUB 22.1 billion. The project involves setting sustainable development targets, the achievement of which will result in a decrease in the cost of financing;
- As part of the project to build the multipurpose fast neutron research reactor (MBIR), conditions precedent were met for obtaining project financing, and the first drawdown was made under the syndicated loan agreement based on the principles of the Project Finance Factory (pursuant to Decree No. 158 of the Government of the Russian Federation dated 15 February 2018), with the target amount of funding to be raised from the banks totalling RUB 23.3 billion;
- A dedicated consortium of banks was formed to finance a project to build a plant that will produce lithium-ion batteries and energy storage systems in Russia (under a syndicated loan agreement based on the principles of the Project Finance Factory).

Approaches to taxation

ROSATOM is a major taxpayer in Russia. Its organisations make significant contributions to budget revenue in their regions of operation. Information on taxes paid is regularly provided to regional administrations, the Government and the President of the Russian Federation. The Corporation views strict compliance with laws as a necessary prerequisite for the implementation of its strategy.

In order to develop a single approach and minimise tax risks, ROSATOM develops and regularly updates the following uniform industry-wide documents regulating tax matters: the Uniform Accounting Policy for Taxation; the Methodological Guidelines on Tax Due Diligence of Transactions; the Methodological Guidelines and Procedure for Communication on Transfer Pricing Matters; the Procedure for Calculating Income Tax for Controlled Foreign Companies and the Methodological Guidelines on Inspecting and Classifying Foreign Entities for the Purpose of Income Tax Calculation in the Russian Federation; the

Procedure for Compiling Country-by-Country Data; the Methodological Guidelines on Identifying and Assessing Risks to Be Identified for the Purpose of Tax Monitoring; the Methodological Guidelines on Assessing the Applicability of Benefits under Tax Treaties (MLI).

ROSATOM has developed and operates a corporate risk management system on an ongoing basis. The tax risk management process involves risk identification and assessment, as well as the development and implementation of controls aimed at preventing or minimising risks, analysing the outcomes of the relevant measures and disclosing information on risks. Tax risk management approaches are regulated by uniform industry-wide guidelines and recommendations. In addition, those organisations that have joined the tax monitoring programme prepare quarterly tax risk reports to be submitted to tax authorities, as required by the Federal Tax Service of Russia (the risk register is compiled and updated based on the Industry-Wide Risk Library). ROSATOM monitors the performance of the tax function of its subsidiaries; this involves setting the relevant key performance targets (for the materiality of errors and for the share of non-deductible expenses).

Stakeholder engagement and management of tax issues

Between 2013 and 2022, major organisations in the industry formed part of the consolidated taxpayer group, with JSC Atomenergoprom as a responsible member of the consolidated taxpayer group that collects data and files income tax returns. ROSATOM actively cooperates with the Federal Tax Service in developing the tax monitoring system in the Russian Federation. Starting from 2020, 24 organisations in the industry, including ROSATOM, JSC Rosenergoatom, JSC TENEX, and enterprises in the Fuel and Engineering Divisions joined the tax monitoring programme. Another nine organisations are to join the programme as from 2024.

In the course of tax monitoring, the organisations use the Tax Monitoring Data Mart information system. This is a centralised industry-wide IT solution for information exchange with the Federal Tax Service. This system provides tax officials with real-time access to detailed data underlying the tax reports of the enterprises, including scanned contracts and primary accounting records.



ORGANISATIONS HAVE JOINED THE TAX MONITORING PROGRAMME SINCE 2020

Reporting by budget level in the Russian Federation

Tax payments by ROSATOM to budgets of different levels in the Russian Federation, RUB billion

Level of the budget system	For 2020	For 2021	For 2022	2021/2022, %
Federal	150.5	170.5	213.0	24.9%
Regional	99.0	78.2	77.8	-0.5%
Local	0.4	0.5	0.6	20%
TOTAL:	249.9	249.3	291.4	16.9%

Plans for 2023 and for the medium term:

- 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 organisations;
- To continue to centralise cash management;
- To focus on maintaining relations with supporting banks as the most reliable partners providing accessible funds in terms of both volumes and cost;
- To fulfil all obligations (including covenants) to existing lenders and rating agencies;
- To discuss ROSATOM’s project financing arrangements in order to reduce recourse on the group and minimise 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 Corporation (where 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 organisations in the industry on acceptable terms and conditions;
- To continue to discuss potential areas of cooperation in the sphere of digitisation with credit institutions.

1.12.6. Investment management

Key results in 2022

- The investment programme was 83% completed (+7 p.p. compared to 2021).
- Return on the investment portfolio stood at 16.7% (+0.1 p.p. compared to 2021).

ROSATOM’s approaches to investment management

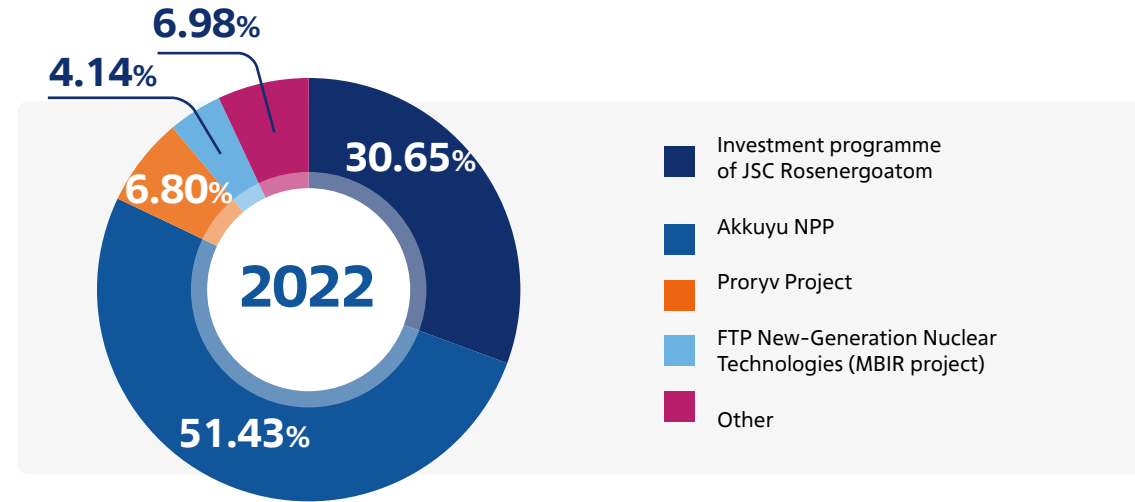
- A distributed system has been built for investment decision-making by the governing bodies of ROSATOM and its organisations; it is aligned with the distribution of competence centres in the industry;
- A phase-gate approach is applied to project implementation, with decisions on key milestones made in a staged process;
- Key projects are monitored at the level of the Corporation;
- Investment decisions related to day-to-day operations of assets are delegated to ROSATOM’s organisations in order to speed up the decision-making process;
- To improve the quality of investment decision-making, opinions of experts independent from the project initiator are taken into account;
- ROSATOM’s project portfolio is built as a set of projects of organisations in the industry for a year and for the medium term based on available investment resources and the required rate of return;
- 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;
- A comprehensive audit is conducted, which helps to formulate recommendations on how to improve project planning and implementation;
- Measures to raise external financing for projects are being developed.

Results in 2022

In 2022, ROSATOM’s investment programme was 83% completed¹. Performance against the targets of the investment programme (including in the Divisions) increased by 7 percentage points compared to 2022 due to the gradual lifting of COVID-related restrictions.

At the same time, return on ROSATOM’s investment portfolio stood at 16.7%².

1. Including the investment programme of JSC Rosenergoatom.
2. Calculated for the period from 2022 through 2099.

Breakdown of investments in significant projects¹

Performance of the Digital Evolution Ventures Fund

In 2018, a venture capital fund, Digital Evolution Ventures, was founded in ROSATOM by JSC Atomenergoprom and LLC Orbita Capital Partners. Its key task is to create a diversified portfolio of promising projects in various development stages. As part of its investment activities, the Fund has prioritised and continues to focus on innovative projects in the sphere of digitisation, automation, energy storage systems, the development of artificial intelligence (AI), medical technologies and the development of user-friendly online services, which have a high potential for return on investment in the medium term and support long-term global competitiveness of various sectors of the Russian economy.

Although the Fund has been operating in a challenging economic environment in the country and amid challenges posed by the imposition of international sanctions, which have seriously affected the venture capital market, the Fund continued to search for and select promising companies that are able to make an important contribution not only to ROSATOM's business but also to the Russian economy throughout 2022. As a result, the project pipeline includes more than 500 companies across various sectors of the economy: AI and MedTech (each accounting for 19% of the total number of projects in the pipeline), the Smart City (17%), Digital Solutions (13%), etc. The investment portfolio comprises 12 promising projects focused on various technologies, with investment totalling about RUB 1.2 billion; more than 15 companies across various business areas (artificial intelligence, a logistics platform, development of solutions for business process optimisation, medical technologies, metalworking equipment, digital twins, microelectronics, neurorehabilitation, image recognition, etc.) are being actively reviewed, with potential investments totalling about RUB 2.5 billion.

Given that 2023 will be the final year when the Fund invests in new projects, in the coming period, the Fund will focus on closing deals on projects that it was actively reviewing in 2022, improving the performance of portfolio companies to enable them to move to the scale-up stage, and exploring opportunities for extending the Fund's investment period and expanding its size.

1. Apart from NPP construction in Russia.

Measures to improve investment efficiency

In the reporting year, further steps were taken to fine-tune the project management model for the implementation of federal projects by ROSATOM and its organisations taking into account the updated requirements of the Department of Project Activities of the Government of the Russian Federation.

Employees in the industry continued to develop their competences at the Project Management School. 306 people underwent assessment, subsequent training and certification in 2022.

Investment processes were adapted, given the need for prompt response amid the deteriorating international situation: project ranking criteria for building the project portfolio were revised; review and approval processes for import substitution projects were simplified.

Given external restrictions imposed on the Russian Federation in 2022, the Corporation restructured its project portfolio in order to minimise risks. Projects exposed to risks related to the actions of unfriendly countries were refocused on the Russian Federation and/or friendly countries in terms of both supplies of resources (equipment and components required for implementation) and revenue generation.

The Corporation adopted an approach to the financial autonomy of its Divisions depending on the level of risk involved in investment projects. It enables ROSATOM to monitor projects that are the most significant in terms of risks and at the same time to speed up investment decision-making by delegating projects not involving risks to which ROSATOM is exposed to the level of Financial Responsibility Centre 2.

The project to reduce red tape in the investment process produced the first results: the project review process was streamlined; a new project manager tool for verifying the completeness and content of project data sheets was introduced; a network scheduling tool based on standard office software was developed to replace specialised IT systems.

The Investment Strategy tool was operationalised in Financial Responsibility Centre 2; this is an additional medium-term investment and project planning tool that forms part of the overall industry-wide investment strategy and contains information on focus areas of investment activities and organisations in the industry that are participating in them.

A project to migrate the Sirius information system (project portfolio management) to a new software platform that does not rely on imported technology was approved and is being implemented in accordance with ROSATOM's plans.

Plans for 2023 and for the medium term:

- To continue to reduce red tape in investment and project processes and to develop project methodology on a systematic basis;
- To align the medium-term investment planning mechanism (investment strategy) with strategic and budget planning tools and schedules;
- To expand the practical application of road maps in portfolio investment management;
- To adjust project execution plans in order to minimise the lag caused by COVID-19 pandemic restrictions imposed in 2021 and the deterioration of the international situation in 2022;
- To increase the level of digitisation of projects and investment activities.

1.12.7.Procurement management

Key results in 2022

- Savings from competitive tendering procedures (using ROSATOM’s own funds and federal budget funds) totalled RUB 28.16 billion.
- The share of electronic procurement (excluding procurement for foreign projects) totalled 99%.
- Pursuant to the order of the Prime Minister of Russia to disclose information on counterparties, ROSATOM disclosed information on 19,406 counterparties (100%).

The Uniform Industrial Procurement Standard (UIPS) (the Regulations on Procurement) of ROSATOM is the main document that regulates the procurement activities of ROSATOM and organisations in the industry.

Governing and supervisory bodies in the sphere of procurement include:

- The Central Procurement Commission;
- Permanent procurement commissions of the Divisions;
- The contract management function (for procurement using federal budget funds in accordance with the Federal Law on the Contract System of the Federal and Municipal Procurement of Goods, Work and Services (Federal Law No. 44-FZ));
- The Central Arbitration Committee of ROSATOM and arbitration committees of the Divisions;
- The Chief Controller.

Official procurement website: www.zakupki.rosatom.ru.

ROSATOM ranks high in professional procurement rankings every year

In 2022, the Corporation was included in major procurement rankings and received the following awards:

- The Corporation topped the National Transparency Ranking in the Guaranteed Transparency category;
- ROSATOM received a commendation from JSC Russian Small and Medium Business Corporation for expanding access to procurement procedures for small and medium-sized businesses;
- ROSATOM topped the ranking of customer loyalty to small and medium-sized businesses and received an award from JSC Russian Small and Medium Business Corporation for expanding reliable end markets and developing partnerships with small and medium-sized businesses;
- ROSATOM’s Director for Procurement, Logistics and Quality Management was included in the top 5 in the Ranking of the Best Chief Procurement Officers by the RAEX rating agency (RAEX Analytics) and Expert RA;
- ROSATOM’s Head of Quality Management received an award from the Russian Organisation for Quality for outstanding practical achievements in the sphere of quality.

Implementation of the annual procurement programme¹

In 2022, the demand of nuclear organisations for products with the required price and quality was met in full.

Orders placed under a competitive tendering procedure in 2022

Type of procurement	Number of procurement transactions	Total value, RUB billion	Savings achieved, RUB billion	% of the value of completed procurement transactions
Using own funds of ROSATOM and its organisations	33,520	1,443.9	26.4	5.1%
Using federal budget funds ²	340	96.3	1.76	2.0%

As part of the annual procurement programme, contracts were concluded with 24,354 counterparties. The share of electronic procurement (excluding procurement for foreign projects) totalled 99%.

Volume of procurement through competitive tendering and achieved savings³, RUB billion

Indicator	2020	2021	2022
Total value of orders placed under an open competitive tendering procedure	951.05	1,087.3	1,540.2
Using ROSATOM’s own funds	903.3	1,003.3	1,443.9
Using federal budget funds	47.75	84.00	96.3
Total savings, including:	30.87 (6.2%)	29.25 (4.28%)	28.16 (4.7%)
Savings from competitive tendering procedures using ROSATOM’s own funds	29.7 (6.6%)	28.0 (5.2%)	26.4 (5.1%)
Savings from competitive tendering procedures using federal budget funds	1.17 (2.5%)	1.25 (1.7%)	1.76 (2.0%)

Expanding access to procurement procedures for SMEs

In 2022, nuclear enterprises concluded 40,707 contracts with small and medium-sized enterprises (SMEs) worth a total of RUB 312.9 billion; this included 51,745 contracts worth a total of RUB 191.8 billion concluded with SMEs by enterprises subject to Decree No. 1352 of the Government of the Russian Federation. The value of contracts concluded following tendering exclusively among SMEs totalled RUB 65.1 billion. The target share of procurement from SMEs was achieved.

In 2022, representatives of ROSATOM and its organisations took part in 10 workshops held jointly with JSC Russian Small and Medium Business Corporation, which were attended by representatives of 895 SMEs. Overall, between 2016 and 2022, a total of 96 workshops were held, which were attended by 10,262 representatives of SMEs.

1. The annual procurement programme is publicly available at: <http://zakupki.rosatom.ru/Web.aspx?node=gpzz>.
2. Taking into account orders placed under an open competitive tendering procedure using the funds allocated through the Russian Ministry of Industry and Trade under Federal Law No. 44-FZ.
3. Savings from competitive tendering are the difference between the set initial maximum purchase price and the purchase price obtained as a result of competitive tendering. Only completed procurement procedures are taken into account.



CONTRACTS CONCLUDED WITH SMALL AND MEDIUM-SIZED ENTERPRISES (SMEs)

To apply new procedures for procurement from SMEs and new document forms, ROSATOM made adjustments to the UIS Procurement System. This included its integration with the integrated information system and selected electronic trading platforms, which made it possible to halve the workload of users in the industry and implement additional controls in order to minimise the number of errors in the course of procurement from SMEs.

In 2022, ROSATOM and JSC SME Bank concluded a cooperation agreement aimed at providing support to SMEs in ROSATOM's host towns and cities.

Data reliability audits, including supplier assessment

In 2022, ROSATOM continued to improve the procedure for conducting data reliability audits, which is a tool for confirming that a supplier is able to carry out a contract in good faith. To do so, manufacturers are audited by a commission set up by the customer and having the required competences and expertise regarding the contract being tendered.

In 2022, 204 audits were conducted among manufacturers, contractors and service companies participating in procurement procedures: 161 audits were successfully passed by manufacturers/suppliers; 15 potential suppliers of products failed the audit; another 28 enterprises refused to undergo an audit. 35 audits were conducted remotely using state-of-the-art information and communications technologies. Analytics on contract performance show that the audit procedure helps to increase the share of contracts performed on schedule.

In 2022, pursuant to the Order of ROSATOM on Amending Uniform Industry-Wide Methodological Guidelines on Data Reliability Audit, the threshold level for successfully passing an audit was raised to 80 points for manufacturers that have no experience in the manufacture of types of equipment classified as safety class 3 or higher in the course of procurement of similar products. The audit included an assessment of sustainability maturity of 29 suppliers/contractors.

In the context of supplier assessment, it is also important to improve the industry-wide procurement and logistics system and develop relations with suppliers and the relevant mechanisms for communication and cooperation. In 2022, ROSATOM continued to develop the logistics process by improving the relevant methodology.

To improve the quality of products supplied to ROSATOM, as from 15 January 2022, the selection criterion stipulating that all measures to address the root causes of nonconformities detected during the performance of contracts concluded earlier must be implemented before the deadline for submitting tender bids is applied not only to suppliers under the contract but also to joint contractors that they engage (manufacturers and subcontractors). This selection criterion is currently applied by more than 200 nuclear organisations in the course of procurement of critical products, large-scale procurement (with a value totalling RUB 100 million or more), the procurement of equipment forming part of those components of nuclear facilities that are critical for their safety and security, and goods that have an impact on the safety and security of nuclear facilities (worth RUB 500,000 or more).

In 2022, ROSATOM successfully completed the project to develop its Unified Industry-Wide Quality Management System, UIS Quality. The System is designed for automating a number of processes, such as nonconformity management, inspection management, data reliability audit, recording non-conformance costs, preparing documents for claims management, and quality reporting. The use of the System has made it possible to reduce the lead time, improve product and process quality, and transition from hard copy documents to electronic document management involving the use of electronic signatures. In 2022, ROSATOM continued to take steps to integrate the UIS Quality System with related industry-wide and divisional information systems. To date, the System has been integrated with more than 20 information systems used in the industry, such as a trusted service platform enabling the use of enhanced unqualified electronic signatures, divisional accounting systems, a system for recording events at nuclear power plants (NPP Experience), the procurement management system (UIS Procurement), etc.

To date, more than 18,000 users from 250 organisations in the industry and 1,300 external counterparties have been connected to the system, and more than 90,000 documents have been registered. For all nonconformities recorded in the UIS Quality System, measures are developed and implemented to address the nonconformities and their root causes in accordance with the Uniform Industry-Wide Nonconformity Management Procedure. According to a survey, the level of user satisfaction with the functionality of the UIS Quality System was assessed at 94%.

Under the resolutions of ROSATOM's Supervisory Board, the Uniform Industrial Procurement Standard (the Regulations on Procurement) of ROSATOM (hereinafter referred to as the UIPS) was updated twice under the procedure approved by the Corporation. One of these updates was necessitated by amendments to Federal Law No. 223-FZ of 18 July 2011 on the Procurement of Goods, Work and Services by Certain Types of Legal Entities (hereinafter referred to as Law No. 223-FZ). Key changes included the following:

- In accordance with part 5.4 of Article 3 of Law No. 223-FZ, for customers subject to Law No. 223-FZ, a list of goods, work and services was approved with payment deadlines different from those set in part 5.3 of Article 3 of Law No. 223-FZ;
- In accordance with parts 15 and 16 of Article 4 of Law No. 223-FZ, amendments were made to the list of conditions prohibiting the customer from posting procurement information and conditions for selecting the form of procurement;
- An additional rationale was provided for direct procurement from the sole supplier of goods, work or services required for fulfilling the state defence order and for stockpiling products, feedstock, materials, semi-finished products or components, as stipulated in paragraphs 3–3.2 of Article 7.1 of Federal Law No. 275-FZ of 29 December 2012 on the State Defence Order (if the Government of the Russian Federation has adopted the relevant resolution on the implementation of special economic measures, as stipulated in Federal Law No. 61-FZ of 31 May 1996 on Defence, and if competitive tendering is impossible, including due to a lack of time for competitive tendering, provided that it is economically feasible for the customer or required for maintaining the production process);

- In accordance with part 7 of Article 3 of Law No. 223-FZ, amendments were made to the Regulations on the Procurement Commission concerning the procurement of goods, work and services using ROSATOM's own funds;
- In accordance with paragraph 13 of part 4 of Article 1 of Law No. 223-FZ, the procedure for maintaining and applying the List of Related Parties was revised;
- In accordance with parts 12, 14, 17, 31 and 32 of Article 3.4 of Law No. 223-FZ, amendments were made with regard to independent guarantees to be provided as tender security or contract performance security in the course of procurement when only SMEs are eligible for tendering. Such independent guarantees are subject to the provisions and requirements established by Law No. 223-FZ;
- The procedure for remote data reliability audit was formalised (engagement with teams using video conferencing and information and communications technologies; the testing of ICT solutions; the submission of a filled-in questionnaire for desk audit);



AUDITS CONDUCTED AMONG MANUFACTURERS AND CONTRACTORS

- The following changes were made to the Methodology for Calculating the Initial Maximum Price:
 - Adjustments for the exchange rate index are now applied not only to the procurement of long-lead equipment, but generally for imported goods when payments are made in roubles;
 - The adjustment procedure for aligning pricing sources with the terms of procurement was revised. It was stipulated that the price set in a technical and commercial proposal may be adjusted within a 20% range taking into account volumes after the technical and commercial proposal has been received;
- Amendments were made to the Methodology for Establishing Requirements and Tender Evaluation Criteria in Procurement Documentation and Bid Processing (the Selection and Evaluation Stages) concerning the following:
 - The use of information on the revocation of approval of the manufacturer quality assurance programme as a selection criterion in the tendering process;
 - Setting additional requirements for bidders and manufacturers in the course of procurement of equipment classified as safety class 3 according to federal rules and standards;
 - Amendments to requirements for documents confirming that machinery and equipment are in good order (information from the maintenance and repairs log), if the equipment is not second-hand.

To make non-competitive procurement procedures more transparent, optimise and speed up logistics processes, in 2022, ROSATOM continued to develop the online store used in the nuclear industry. As part of this approach, procurement has been fully automated and is conducted electronically on four online platforms. All actions

(calculation of the initial maximum price, requests for price reduction, selection of the winner, generation of records and conclusion of the contract) are performed via an electronic trading platform, which is an efficient measure for preventing corruption and other wrongdoings.

Amid restrictions related to the spread of the new coronavirus disease (COVID-19) and the imposition of sanctions, in 2022, further steps were taken in the industry to reduce procurement lead time. Pursuant to ROSATOM's orders, a number of simplifications were developed and introduced, including the following:

- To determine the fair price of products to be purchased, ensure pricing transparency and enable reasonable and efficient spending, provisional methodological guidelines on price audit were issued;
- To minimise errors on the part of bidding SMEs, uniform procedures for tendering exclusively among SMEs were updated; more specifically, documents such as the summary of costs, the schedule for the supply of goods (performance of work/provision of services), background information on experience and personnel are to be filled in on an electronic trading platform, with the bid and the technical proposal to be attached by the bidder;
- In order to establish price adjustment rules for contracts for the construction, renovation, major repairs or demolition of capital facilities due to a significant rise in prices for construction resources¹, pursuant to ROSATOM's order dated 17 March 2022, the Uniform Industry-Wide Methodological Guidelines on Price Adjustment under Contracts for the Construction, Renovation, Major Repairs or Demolition of Capital Facilities due to a Significant Rise in Prices for Construction Resources were approved;
- In order to establish an integrated schedule and cost control chain covering the entire life cycle of a facility through uniform coding of work and costs, WBS and CBS codes were incorporated into procurement regulations;
- The requirement stipulating that a bidder must have completed a plan of corrective measures to address delays in achieving key milestones during the fulfilment of orders from the Corporation and nuclear organisations for a similar procurement item started to be applied;
- In the course of procurement of critical equipment or equipment forming part of safety-relevant systems and components (including the procurement of products, components and semi-finished products for such equipment), the customer is required to review nonconformities detected earlier for similar equipment. If a critical nonconformity is discovered, requirements may be set stipulating that machinery and mechanisms, special devices and human resources must be in place to prevent similar nonconformities in the future;
- Further steps were taken to support the fullest possible transition to electronic document management (documents drafted while preparing for and conducting procurement procedures are approved and signed in the integrated industry-wide electronic document management system (IIEDMS) and are considered to be equivalent to documents signed in hard copy), with the requirement remaining in force that persons signing documents in the course of procurement activities must obtain an enhanced qualified electronic signature;
- A remote meeting format remained a preferred option: the Procurement Commission held its meetings using audio/video conferencing. Requirements for holding online meetings were incorporated in the technical specifications for UIS Procurement 2.0; permitting bodies (the Central Procurement Commission, the Committee on Cost, the Committee on Procurement Strategies) held meetings by correspondence or using audio/video conferencing;
- The handling of complaints related to procurement was also switched to a remote format.

To advance the automation of logistics and procurement processes, a shared information space has been created; it comprises the following industry-wide subsystems:

1. Taking into account the provisions of Decree No. 1315 of the Government of the Russian Federation dated 9 August 2021.

- Procurement 2.0, a subsystem developed as part of the import substitution programme and designed to automate procurement management business processes related to procurement planning and preparation, tendering and initiating the conclusion of a contract/supplementary agreement following the tendering;
- In 2021 and 2022, the first and second releases of UIS Procurement 2.0 (procurement planning and preparation for the publication of procurement notices) and an updated procurement website of the nuclear industry were piloted. Work is currently underway on the third release, which includes tendering functionality and is integrated with external resources, including integrated information systems and electronic trading platforms;
- The subsystem for communication with suppliers (UIS Contract) has been piloted. It is a platform containing information on contractual obligations and enabling the supplier and the customer to exchange information in a shared information space and to sign documents (using EQES and EUES¹). Suppliers can view all their contracts, the status, risks, fulfilled and outstanding obligations. The customer can generate ‘chains’ of contracts; the system provides information on how a breach of one contract may affect other contracts, which enables the customer to develop measures to minimise the risk of breach of contract in a timely manner and to create escalation chains required for decision-making. In 2022, the pilot operation of the first (‘Customer Portal’) and second (‘Supplier Portal’) releases was completed; the first group of reports was prepared; migration to a more efficient platform (‘Form Designer’) was completed;
- The Brief Digital Solution: this is a subsystem supporting the new approach to procurement automation. As part of the project, a prototype of the subsystem has been developed, and pilot procurement transactions have been made between related parties in the nuclear industry. This solution is designed to improve operational efficiency of the organisation of procurement and minimise the risk that products supplied to ROSATOM may be of poor quality; it will also help to enhance digital culture. As part of the project, the first and second releases of the subsystem have been piloted, and procurement transactions have been made between nuclear organisations; catalogues of products of nuclear organisations that supply or manufacture products have been populated in order to compile a general product catalogue. Preparations are underway for the piloting of the Brief functionality; this will involve encouraging third-party suppliers (not controlled by the Corporation) to use the solution;
- A project has been initiated to migrate the UIS Quality functionality to the shared information space.

To improve the overall efficiency and quality of procurement and contracting, in 2022, ROSATOM continued to develop the Qualified Buyer Service (QBS). The QBS performs the full range of competitive and non-competitive procurement activities and the relevant preparations. In 2022, services provided by the QBS to ROSATOM and JSC Atomenergoprom with regard to procurement under Law No. 223-FZ covered 88 out of 100 divisions, while services related to procurement under Law No. 44-FZ covered 100% of divisions of the internal customer.

Performance of the Qualified Buyer Service

Law	Number of completed procurement procedures	Value, RUB billion	Change, 2022/2021	Average lead time in 2022, days ² (2022/2021)
223-FZ	683	45.7	+150%	46 (-3)
44-FZ	328	96.3	+15%	36 (-2)

1. EQES (EUES) stands for an enhanced qualified (unqualified) electronic signature.
2. The time from the identification of needs to the contract award as part of the procurement process under Law No. 223-FZ and the time from the identification of needs to the tender award as part of the procurement process under Law No. 44-FZ.

In 2022, satisfaction with the quality of service was assessed at 98.8% out of 100% (the highest possible score on the rating scale established by the methodology).

Following the investigation of complaints by the Federal Antimonopoly Service of Russia, there were no complaints deemed to be valid. Following inspections conducted in 2022 by the Accounts Chamber, the Prosecutor General’s Office, the Auditing Commission and the internal financial audit function, no irregularities were detected in procurement activities.

A tailored professional approach has made it possible to optimise the procurement of certain products: translation services, asset and real estate valuation services, insurance services, due diligence services, market valuation services and legal support of transactions, the production and supply of trophies, etc. Other enterprises in the industry now also draw on this experience.

To support new businesses, the QBS actively participates in projects run by the Digitisation Unit, including the Navigator Digital Management System; projects of Private Institution Cifrum, the Business Intelligence Department, the Office of Support for New Businesses and the Northern Sea Route Directorate; an inter-divisional RPS project to streamline end-to-end processes over the APCS life cycle and an RPS project to improve the Current Payments subprocess. Furthermore, the contribution of the QBS to the implementation of these projects is highly appreciated by functional executives (with seven letters of appreciation received in 2022).

In order to ensure supply chain resilience and reliability, a 10-year demand plan (code-named ‘Atomplan’) has been developed in the industry. This enables ROSATOM to place long-term orders with suppliers both in and outside the industry, making it possible to develop products tailored to ROSATOM’s needs, launch batch production, cooperate on product quality and process flow optimisation, use flexible pricing, etc.

In 2022, ROSATOM developed and started to implement the first strategies for critical categories. In the coming years, ROSATOM plans to expand the scope of long-term orders to include other categories that are less important.

Training and development in the sphere of procurement

In order to develop employees’ competences to enable more effective use of procurement, logistics and quality management mechanisms, in 2022, the Procurement, Logistics and Quality School conducted a wide range of activities.

In 2022, 1,492 people participated in face-to-face training courses and webinars conducted by the Procurement School. Due to the easing of COVID-related restrictions, face-to-face training was resumed. A well-balanced combination of face-to-face and online training has proved to be efficient and convenient for the industry. During the year, free online courses on procurement, logistics and quality management available on industry platforms garnered more than 15,000 views. The Corporate Academy jointly with experts from ROSATOM and other organisations in the industry produced video and audio content focused on topics related to procurement and designed to provide training in the use of new tools and approaches and promote them.

In order to develop employees’ competences in the sphere of nonconformity management, in 2022, ROSATOM’s Technical Academy provided specialists with training in nonconformity management techniques and the use of modules of the UIS Quality System. A total of 1,166 specialists completed continuing professional education courses on these topics and received the relevant certificates.

1,492 PEOPLE

PARTICIPATED IN TRAINING EVENTS HOSTED BY THE PROCUREMENT SCHOOL

In addition, specialists in the industry were provided with online training using the RECORD Mobile system (10,023 people underwent training between 2017 and 2022). In 2022, 324 employees completed the Data Reliability Audit training programme at the Rosatom Corporate Academy in order to undergo certification qualifying them to audit manufacturers and contractors.

The Procurement Assistance Portal information system has been created; it enables employees of nuclear organisations to continuously gather information on existing and emerging issues without sending official letters to ROSATOM. In addition, all organisations in the industry are now able to search across all questions and answers and sort information by topic on the Procurement Assistance Portal. A topic directory has been developed for the Assistance Portal; all enquiries on the portal are sorted based on the topic directory and can be filtered. Keyword search across processed enquiries has been introduced, and a mechanism has been provided for the submission of notifications to the Department for Methodology and Procurement Organisation/to the initiator and the responsible person in the event of delays.

A framework for developing the Qualified Buyer function in nuclear organisations has been established in order to free procurement initiators from functions that are not relevant to their role; as a result, 19 qualified buyer functions have been established in the industry.

An integrated industry-wide support system has been created to handle complaints filed with antitrust authorities or courts with regard to requirements set out in procurement documents in accordance with the UIPS. This included creating a section titled 'Legal Precedents in Procurement', which contains answers to frequently asked questions concerning complaints with regard to procurement by enterprises in the industry, as well as industry practice of filing complaints related to procurement with the Federal Antimonopoly Service and courts.

The development of industry-wide remote communication channels continued in the industry. In 2022, a dedicated group, 'Procurement, Logistics, Quality', was launched on the ROSATOM. Life social media platform. Its participants can receive regular updates on key developments in the sphere of procurement and discuss specialised topics. At year-end 2022, the group comprised more than 300 specialists in procurement, logistics and quality management.

In 2022, the 'Procurement for Everyone' additional development track of the Procurement Officers' Club focused on information support (launched in 2021) was transformed into a series of webinars titled 'Procurement Environment'. In 2022, meetings started to be held regularly, twice a month. Topics to be covered were formulated primarily by industry specialists. More than 20 webinars were held in the reporting year; they were attended by more than 3,500 industry specialists.

In order to enable prompt communication with ROSATOM's specialists in procurement, logistics and quality management, a dedicated email box of the Procurement Officers' Club (zakupki-club@rosatom.ru) has been set up as part of the Procurement Officers' Club project. Industry specialists can use it to promptly get a reply and obtain advice on a wide range of matters related to their job.

In 2022, representatives of the Corporation and nuclear organisations regularly participated in conferences and other external events focused on the development of the procurement system.

At the GOSZAKAZ Annual National Forum and Exhibition (6–8 April 2022), ROSATOM's exhibition stand showcased its achievements in the sphere of procurement; the Corporation also provided visitors with information on new and promising innovations in the sphere of procurement being adopted by ROSATOM and its organisations. On 15–21 August 2022, ROSATOM's representatives participated in the ARMY 2022 Forum.

As part of procurement, logistics and quality management activities, ROSATOM continued to implement the programme adopted following the industry-wide session on procurement in the nuclear industry held on 17 November 2020. In the reporting year, ROSATOM's Council for Improving Transparency continued its work. In 2022, the Council held two meetings where the Council members representing the government, non-governmental organisations and the media discussed topical matters in the sphere of procurement, including the new digital space (the BRIEF project), proposals for the design of the ATOM-Plan planning and import substitution process, as well as other legislative initiatives.

An industry-wide workshop titled 'Improving the Procurement Management System in ROSATOM' was held on 31 March and 1 April 2022. The event was held in a hybrid format, with about 100 people attending the meeting in person and 300 employees participating online.

On 13 October 2022, the Corporation's representatives took part in the Russian Standardisation Week International Technology Forum, where they gave a presentation titled 'QMS Certification from the Perspective of the Customer'. Following the presentation, an extended meeting of the Committee of the Russian Chamber of Commerce and Industry on Technical Regulation, Standardisation and Product Quality titled 'Management System Certification Issues' was initiated and held in November 2022.

Plans for 2023 and for the medium term:

- To develop the Price Audit project, including conducting price audits under contracts concluded on the relevant terms and conditions (developing a price audit plan and programme, forming a team of price auditors for a specific contract, monitoring and supporting the work of auditors as part of pilot projects);
- To draft functional specifications for price audit automation and launch an IT project focused on price audit; to amend the pilot methodology for actual price audits and form a working group on the price audit methodology; to develop a training programme and provide training for price auditors; to develop a procedure for the conversion of an approximate contract price to a fixed contract price based on the findings of a price audit;
- To continue work focused on long-term planning and the conclusion of long-term contracts, including using partnership arrangements, developing production and joint projects;
- To develop a sustainability methodology for the supply chain in the industry;

- To update uniform procedures for tendering exclusively among SMEs and the relevant document forms, including continued automation (a formalised approach) using electronic bid forms for tendering among SMEs;
- To implement the framework for developing the Qualified Buyer function in nuclear organisations in order to free procurement initiators from functions that are not relevant to their role. To roll out the QBS across the industry;
- To continue to develop contract strategies for ROSATOM’s overseas nuclear construction projects based on the methodology developed in 2019;
- To create a shared information space for customers and suppliers covering the entire procurement cycle, from the identification of needs to the performance of contracts; to integrate local modules, industry-wide and national systems; to globalise data; to expand the application of electronic document management in procurement; to use robots in order to reduce the amount of time and effort spent on routine transactions;
- To provide extensive training for customers and suppliers in the use of the UIS Contract System using online courses and a training system (a simulator), which will significantly reduce the amount of time needed to master the required operations;
- To continue the modernisation of the UIS Procurement System (including methodological support for the project) and its migration to domestically developed software;
- To continue to implement the Brief digital solution, including expanding its functionality and encouraging third-party suppliers to use the Brief digital solution;
- To support the development of procurement legislation;
- To enable efficient work of ROSATOM’s Council for Improving Transparency;
- To implement the ‘Procurement for Everyone’ framework for the Procurement Officers’ Club;
- To create an industry-wide interactive procurement portal (a shared information space);
- To update training courses on quality management developed earlier jointly with ROSATOM’s Technical Academy and develop new courses on analytical reporting in the UIS Quality System and quality cost accounting.

1.12.8. Strategic communications

1.12.8.1. Stakeholder engagement

Key results in 2022:

- 77% of the population in Russia support the use of nuclear energy.
- Viewership of channels broadcasting the *Strana ROSATOM* TV programme in various regions of Russia totals 3.1 million people.
- 1.1 million people visited ROSATOM’s website during the reporting year.
- ROSATOM’s audience on social media increased by a total of 41,000 people.
- The Corporation’s representatives took part in more than 12 Russian exhibitions and 59 overseas exhibitions and conferences.

Approaches to stakeholder engagement

GRI 2-29 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.

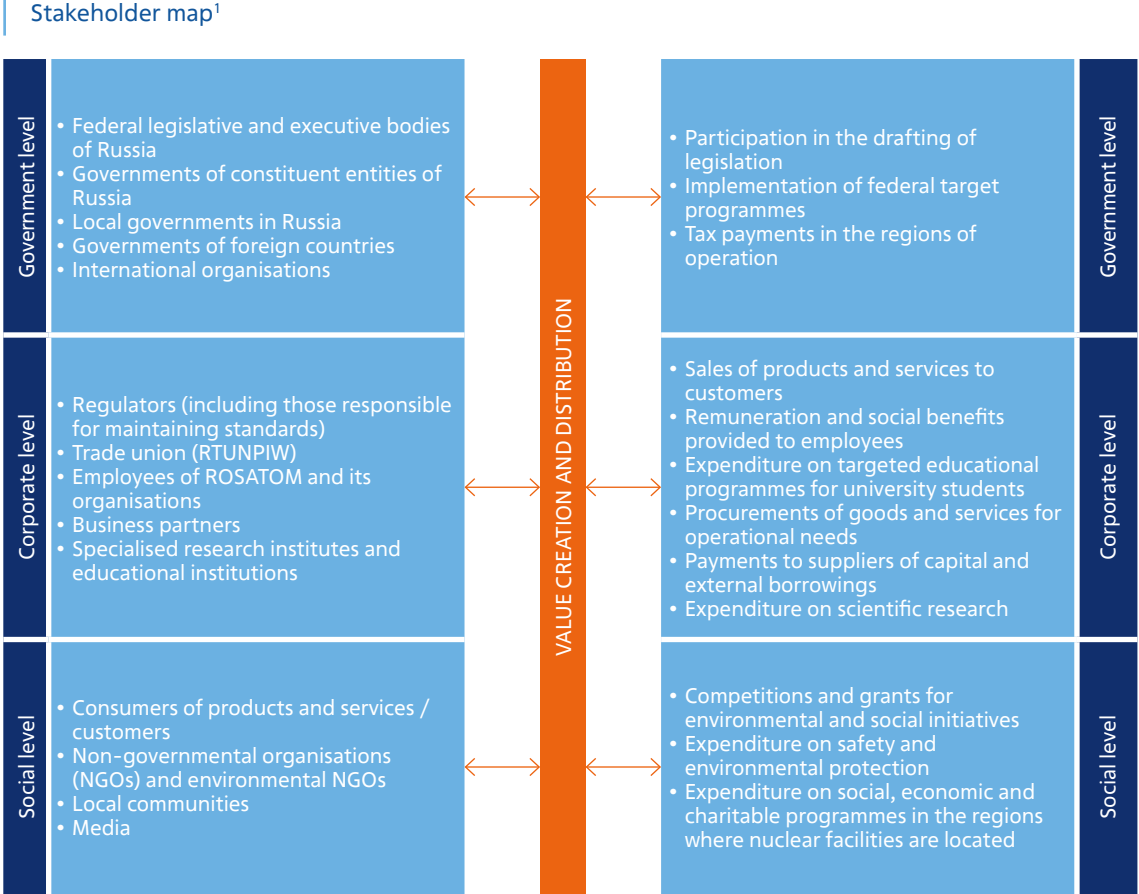
Targeted stakeholder engagement is aimed at achieving strategic goals and gaining public acceptance for nuclear power development.

The Corporation promotes systematic and constructive stakeholder engagement across all areas of its business and conducts communication and information campaigns for the general public.

Fundamental principles underlying stakeholder engagement are as follows:

- Respect for and accommodation of the interests of all participants;
- Open and productive cooperation;
- Timely provision of complete information on ROSATOM’s activities;
- Striving to provide specific benefits to all participants;
- Fulfilment of obligations.





Stakeholder interests

1. Ensuring non-proliferation of nuclear materials and technologies
2. Nuclear and environmental safety
3. Technological modernisation in the nuclear industry
4. Efficient use of budget funds
5. Economic performance of ROSATOM’s organisations
6. Compliance with international and Russian legislation
7. Responsible business conduct and competitiveness in global markets
8. Improvement of product and service quality
9. Transparency of ROSATOM’s operations, including transparency of procurement activities
10. Addressing the legacy of past business operations and defence efforts in the industry
11. Reliable electricity supply
12. Adequate remuneration to employees; promoting the professional development of employees; safe working conditions

1. The stakeholder map is based on an assessment of ROSATOM’s impact on stakeholders and/or their interests.

13. Improvement of the standard of living in the regions of operation
14. Talent development in ROSATOM and its organisations

Types of stakeholder engagement

- A. Cooperation with specialised international organisations, participation in international programmes and projects
- B. Participation in law-drafting activities
- C. Public consultations and public environmental impact assessments of NPP power unit construction projects
- D. Employee training and development programmes
- E. Social programmes, and projects
- F. Contribution to the development of the regions of operation
- G. Opinion polls, customer satisfaction surveys
- H. Philanthropy
- I. Hotlines
- J. Programmes of cooperation with specialised universities
- K. Dialogues, presentations, forums, conferences
- L. Open and competitive procurement procedures
- M. Programmes of cooperation with other companies
- N. Programmes of cooperation with government regulators (supervisory bodies) and law enforcement agencies
- O. Public governing and supervisory bodies
- P. Information and communications
- Q. Public reporting

Interests and types of engagement with stakeholders, experts and users of information

Federal legislative and executive bodies of Russia	1, 2, 4, 5, 6, 9, 11, 12, A, B, C, L, N, Q
Governments of constituent entities of Russia	2, 5, 10, 11, 13, C, F, J, K, O, Q
Local governments in Russia	2, 3, 5, 10, 11, 13, C, D, F, H, K, O, P
Governments of foreign countries	1, 2, 6, 7, 9, 10, A, D, J, K, P, Q
International organisations	1, 2, 3, 7, 8, A, K, P, Q
Regulators (including those responsible for maintaining standards)	2, 6, 7, 8, 9, 10, 11, A, C, L, N, Q
Trade union (RTUNPIW)	2, 3, 5, 6, 12, 11,13, 14, D, E, F, I, K, O
Employees of ROSATOM and its organisations	2, 3, 5, 6, 8, 10, 11, 12, 13, 14, D, E, F, H, I, J, O, Q
Business partners	2, 3, 5, 6, 7, 11, K, L, M, P, Q
Specialised research institutes and educational institutions	2, 5, 8, 11, 12, 14, D, G, J, K, P, Q
Consumers of products and services/customers	2, 3, 7, 8, 11, I, G, L, M, P
Non-governmental organisations (NGOs) and environmental NGOs	1, 2, 3, 5, 12, 13, A, C, H, I, N, P, Q
Local communities	2, 3, 8, 10, 11, 13, D, E, F, H, O, P
Media	2, 4, 5, 6, 9, 10, C, G, K, P, Q

Industry media

Nuclear Kids

Nuclear Kids (NucKids) (<http://www.nuckids.ru/>) is an annual international charitable art project for children from nuclear towns and cities across Russia, as well as children of employees of overseas enterprises partnered with ROSATOM. Since its launch, the project has covered 24 countries. Many NucKids alumni study and work at famous universities (such as the Russian Institute of Theatre Arts (GITIS), the Moscow Art Theatre School, the Russian State University of Cinematography (VGIK), the Oleg Tabakov Studio, etc.), perform in films and work in show business and in ROSATOM’s Divisions. In 2022, 68 participants from 32 Russian towns and cities, as well as from Hungary and Belarus took part in the summer session of the project. A theatrical production titled ‘Best Life. A Game’ was performed 11 times in Moscow, Saint Petersburg, Desnogorsk and Nizhny Novgorod; the total audience exceeded 3,000 people. The production titled ‘Winter Fairy Tale 2022’ staged as part of the project ended its run in January 2023. In 2022, 32 participants from 20 Russian towns and cities took part in the winter session. Rehearsals and the first performances of the production took place at the Presidential Lyceum in the Sirius Federal Territory, with 14 performances attended by a total of 5,500 people. In January 2023, 11 theatrical performances were given for children of employees of nuclear enterprises in Moscow and the Moscow Region, with the total audience exceeding 3,500 people.

To inform employees and other stakeholders about news and key events in the Russian nuclear industry, a range of corporate media outlets operates under the common brand name *Strana ROSATOM* (‘The Country of ROSATOM’):

- A newspaper (published weekly in all organisations in the Russian nuclear industry, with a circulation of 55,000 copies and a readership (including the online version) exceeding 300,000 people);
- A TV news programme (aired weekly in 24 nuclear towns and cities; the viewership of the channels broadcasting the programme totals 3.1 million people).

Online communications

In 2022, ROSATOM continued to actively communicate with its stakeholders on the Internet. Information is disclosed both on ROSATOM’s official website (www.rosatom.ru) and on official community pages on social media.

In 2022, the number of visitors of ROSATOM’s official website remained at the level of 2021 and totalled about 1.1 million people, or an average of 4,000 to 7,000 visits every weekday. ROSATOM published press releases informing the general public about the activities of the Corporation and its organisations almost every day. Key events involving ROSATOM received extensive coverage.

In 2022, the Corporation launched new community pages on Telegram and Yandex.Zen. The audience of ROSATOM’s community pages increased by a total of more than 41,000 people, with the largest increase recorded for the group on VKontakte: +24,000 people (+22% compared to 2021).

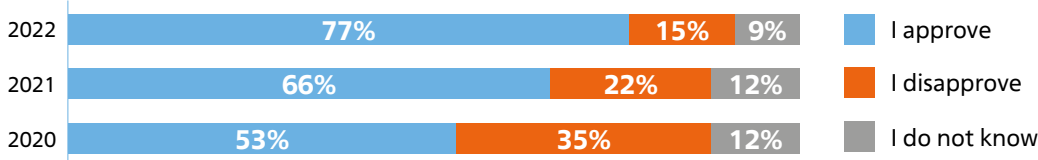
Opinion polls

ROSATOM analyses the public perception of the development of nuclear power in Russia on an annual basis and adjusts its communication with stakeholders accordingly.

In 2022, ROSATOM’s reputation score (an indicator whose calculation takes into account the results of opinion polls) stood at 3.7 (2021: 3.5).

According to an independent opinion poll carried out by ZIRCON Research Group in December 2022, 77% of the Russian population supported the use of nuclear power (66% in 2021, 53% in 2020). Over the past few years, the figure has remained consistently high.

On the whole, do you approve or disapprove of the use of nuclear (atomic) energy as a way to provide power supply for the country? (% of the total sample)



Nuclear Energy Information Centres. Educational projects

The objective of Nuclear Energy Information Centres (NEICs) is to raise awareness among local communities about the operation of the nuclear industry and prospects for the development of nuclear power and radiation technologies, make professions in the industry more prestigious, promote science, innovative technologies and technical education, and cooperate with the professional scientific community in promoting science. The NEIC network comprises 20 centres in Russia, including the Atomarium in Sochi, as well as centres in Belarus (Minsk). In February 2023, a Nuclear Technology Information Centre was opened in Myanmar; this is a joint project of ROSATOM and the Ministry of Science and Technology of Myanmar.

In 2022, almost 300,000 people participated in NEIC OPEN programmes and the Atomic Workshop series of activities, attended lectures, workshops, intellectual games and science festivals. 480 teams competed in the BrainShaker intellectual tournament launched in 2022: more than 2,000 people gathered at NEIC venues every month in order to answer quiz questions and questions from experts. More than 37,000 spectators took part in 670 NEIC OPEN programmes run in 18 regions of Russia. The Energy of Science Federal Project enabled local residents in the regions hosting the NEIC network to engage with federal-level researchers and science communicators.

In 2022, the KSTATI (‘By the Way’) Science Festival was held in Vladimir, Voronezh, Novosibirsk and Chelyabinsk. The festival in Ekaterinburg became the largest event (5,600 participants). In December 2022, the Atom+ festival of teaching practices was held for the first time in five regions.

Highlights of the year included the IN.Borg Engineering Festival of Cultural Design held by the NEIC network jointly with ROSATOM’s Engineering Division (JSC ASE) in Vyborg. Several thousand spectators immersed themselves in the art of engineering in a gamified format.

Online shows and video lectures on the YouTube channel of the NEIC network garnered more than 1.5 million views, while broadcasts and recordings of regional events posted on social media pages of the centres had more than 420,000 views. Overall, throughout 2022, projects and events run by the NEIC network received coverage in the regional media and new media more than 8,000 times.

The Icebreaker of Discovery is an educational expedition to the North Pole organised by ROSATOM and the Autonomous Non-Profit Organisation Bolshaya Peremena. In 2022, 70 high school students who had won the Big Break Competition took part in the voyage to the Arctic on the *50 Let Pobedy* nuclear icebreaker. The participants of the expedition were accompanied by ROSATOM’s leading experts in the field of nuclear physics, new technologies, entrepreneurship, design and construction. The project supervisor, ROSATOM’s Corporate Academy, prepared an educational programme for the participants of the expedition; the programme consisted of three tracks: Discovering Technology, Discovering the Arctic, and Discovering Oneself. The experts helped the young travellers to master useful skills, held workshops and training sessions.

Exhibitions in the Russian Federation

In 2022, ROSATOM participated in 13 Russian exhibitions, including the 17th GOSZAKAZ Annual National Forum and Exhibition, the St. Petersburg International Economic Forum, the ‘Arctic: Territory of Dialogue’ International Arctic Forum, the INNOPROM 2022 International Industrial Trade Fair, the ARMY International Military and Technical Forum, the Congress ‘Diversification of the Russian Defence Industry. Transformation of Production Capabilities’, the Eastern Economic Forum, the Moscow Financial Forum, the Russian Energy Week, the Russian Occupational Safety Week, etc.

A major international forum, ATOMEXPO 2022, was held in Sochi on 21 and 22 November 2022. This event has clearly demonstrated that nuclear technology unites participants from around the world, regardless of the geopolitical context. The main topic of the forum was ‘Nuclear Spring: Creating a Sustainable Future’. The plenary session was focused on the development prospects of the global nuclear power industry. The Forum was attended by about 3,000 people from 65 countries worldwide. It confirmed ROSATOM’s leading role in shaping the development agenda of the global nuclear industry and enabled the Corporation to demonstrate to the international community that it is committed to open cooperation with international partners in expanding the application of nuclear technology for the benefit of humanity. During the Forum, ROSATOM signed 41 documents with partners in order to expand the scope of its operations on the Russian and foreign markets.

In December 2022, the Mayak Academy (Nizhny Novgorod) hosted the third Global Impact Conference. Live broadcasts of the conference were viewed by more than 1 million people in 15 countries; more than 30 experts from 20 countries participated as speakers. The event featured representatives of academia from India, China, Russia, Turkey, the UAE, Oman, Armenia, Kazakhstan, South Africa, Brazil, Vietnam, Egypt, Latin America and Africa. The experts discussed challenges, trends and new opportunities in the sphere of education in the coming years.

Communication activities abroad

In 2022, ROSATOM participated in 59 overseas exhibitions, conferences and workshops.

As part of the EXPO 2020 International Exhibition held between 1 October 2021 and 31 March 2022 in Dubai (UAE), the Corporation held the ROSATOM Week showcasing state-of-the-art Russian technologies.

The Corporation participated in the 27th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP27; Sharm El Sheikh, Egypt, 6–18 November 2022), the ‘INNOPROM. Big Industrial Week in Uzbekistan’ International Industrial Trade Fair (Uzbekistan, 25–27 April), the 66th IAEA General Conference (Austria, 26–30 September), the 26th Belarusian Energy and Industrial Forum (Belarus, 11–14 October) and other overseas events.

On World Science Day on 10 November, an international educational initiative titled ‘Global Atomic Quiz’ was launched in order to raise public awareness of nuclear technology. The event was held in 11 languages (Russian, English, Turkish, Vietnamese, Hungarian, Spanish, Portuguese, Bengali, Uzbek, Armenian and Kazakh) on the website at quiz.atomforyou.com. The online initiative attracted over 7,000 people from more than 35 countries worldwide, including Bangladesh, Belarus, Vietnam, India, Turkey and Uzbekistan.

In order to demonstrate Russian nuclear technologies to the international community, in 2022, the Corporation organised 15 media tours for foreign media representatives across a number of focus areas:

Topics of press tours	Description
Power generation	Media tours of ROSATOM’s facilities in Russia (Leningrad NPP) and the construction site of a Russian-design NPP in Turkey (Akkuyu NPP), as well as the world’s first NPP connected to the power grid (Obninsk NPP)
Nuclear medicine	A visit to the Nuclear Research and Technology Centre (NRTC) in Bolivia by representatives of Latin American media outlets and a visit to JSC NIITFA by representatives of Belarusian media outlets
Front end of the nuclear fuel cycle (NFC)	A media tour of a factory of JSC TVEL Fuel Company in Elektrostal for representatives of Hungarian media outlets
Irradiation centres	A visit to the Axenter multipurpose radiation processing centre by media representatives from Ghana, Kenya, Nigeria, Tanzania and Zambia
Uranium mining	A visit by Namibian media representatives to uranium mining enterprises of JSC Dalur specialising in in-situ leaching
Education	A visit to NRNU MEPhI and Tomsk Polytechnic University by representatives of Latin American media outlets

In addition, as part of major conferences and exhibitions, ROSATOM organised virtual technical tours of its key facilities.

Coverage of the 15th anniversary of the establishment of ROSATOM

On 1 December 2007, the President of the Russian Federation signed an order to establish ROSATOM. As part of celebrations to mark the 15th anniversary of its establishment, the Corporation launched a large-scale communications campaign, which included publications in print and online media, TV and radio coverage, videos, publications and interviews on social media. The total reach of media coverage and events exceeded 700 million people.

1.12.9. Public reporting system

Dialogues with stakeholders

In order to improve transparency and accountability in the Corporation, representatives of key stakeholders are engaged in the preparation of ROSATOM’s public report (hereinafter referred to as the Report) through participation in the discussion of socially important aspects of the Corporation’s business and their reflection in the upcoming Report. In addition, stakeholder representatives participate in public consultations on the draft Report and public assurance of the Report.

Stakeholder engagement is one of the key requirements of international standards, such as the AA1000 Stakeholder Engagement Standard (2015), the Global Reporting Initiative Sustainability Reporting Standards (GRI 2021) and the International Integrated Reporting Framework (International <IR> Framework). When preparing the previous Report, ROSATOM took on a number of commitments that were later fulfilled in the 2022 Report (see the subsection ‘Incorporation of Stakeholders’ Proposals’).

In 2022, the Corporation and its Divisions held dialogues with stakeholders (by correspondence and directly) in order to discuss the public report for 2021. During these events, stakeholder representatives voiced their requests, provided recommendations as to what information should be disclosed in the Report, and put forward proposals for developing the public reporting system.

In 2023, the Corporation held a foresight dialogue to prioritise its material impacts to be disclosed in the 2022 Report, as well as public consultations on the draft public annual report for 2022, where ROSATOM’s representatives presented the concept and the draft Report, while stakeholders, experts and users of information voiced their recommendations and comments on ways to improve the Report (see the subsection ‘Incorporation of Stakeholders’ Proposals’).

Public reports of ROSATOM and its Divisions are available on the public reporting portal (<https://report.rosatom.ru>).

For details on our materiality process, see Appendix 1 ‘Report Profile’.

Outcomes of the 2022 reporting campaign

ROSATOM’s Report won in the Best Annual Report category in the federal competition of annual reports held by the RAEX rating agency (RAEX-Analytics) for the third year in a row. The results of the competition can be viewed on the RAEX website (<https://raex-a.ru>). ROSATOM’s Report was also awarded 5 stars (the highest score) for quality in the 2021 ranking of reports compiled by RAEX¹.

ROSATOM’s Report for 2021 was rated A in the ESG Ranking of Sustainable Corporate Governance compiled jointly by the University of Perugia (Italy) and the Da-Strategiya Agency for Corporate Development. The ranking included reports of 230 Russian companies. In the ranking, ROSATOM is described as a company that has adopted a strategic approach to ESG management, fully manages ESG risks and has a governing body with a wide range of competences. In addition, according to the compilers of the ranking, a company rated A actively engages stakeholders in governance, has a high level of transparency and a well-developed corporate culture.

Incorporation of stakeholders’ proposals

Proposals and comments concerning ROSATOM’s Public Report for 2022²

Commitments taken on during the discussion of the 2021 public report (in 2022)

No.	Stakeholders’ proposals/recommendations	Incorporation of proposals
1	To make descriptions of cases in the Report on the Development of Nuclear Towns and Cities less formal, to enliven dry figures.	The proposal has been incorporated in the 2022 Report (see chapter 4). The proposal has been partially incorporated in the 2021 Report.
2	To use some of the phrases from public speeches by ROSATOM’s Director General Alexey Likhachev (‘quantum leap’) in the Report in order to make it more readable.	The proposal has been taken into account.
3	To focus more on disclosing information for the reporting year and not only plans for the next year.	The proper balance has been achieved in the 2021 and 2022 reports.
4	To revise the list of risks for 2022 in the next report.	The proposal has been taken into account (see section 1.12.2).

1. Full information on the ranking is available at: https://raex-a.ru/files/diplom/KGO2022_Analytica_1.pdf
2. Based on the outcomes of public consultations on ROSATOM’s draft public report for 2021 and 2022 and a foresight dialogue on the materiality of topics covered in ROSATOM’s public report for 2022.

5	To disclose information on the development of host towns and cities more comprehensively, to shift the focus from the performance of government functions by ROSATOM to the management of development of these towns and cities.	The proposal has been taken into account (see chapter 4 of the 2022 report).
6	To clarify the difference between civil society and environmental organisations in the stakeholder map.	The proposal has been taken into account. In accordance with the GRI 2021 Standard, stakeholders have been divided into groups, including experts (professional ecologists) and affected stakeholders (grassroots environmentalists).
7	To raise the status of the regional dialogue forum on the environmental agenda of development of nuclear towns and cities to the level of a federal forum.	The request has been forwarded to the responsible department. The advisability of the proposal will be assessed in the medium term.
8	To reflect the conclusion of an agreement with local stakeholders in Novouralsk on the implementation of an educational platform for personnel training and technological leadership in the Report.	The proposal has been taken into account. See section 4.5.
9	To highlight ROSATOM’s innovative role in ensuring the country’s technological sovereignty.	The proposal has been taken into account. The prioritised topic of the 2022 Report is ‘ROSATOM’s Contribution to the Technological Sovereignty of the Russian Federation’.
10	To place added emphasis in the Report on the fact that the Corporation efficiently fulfils its responsibilities for the safe use of ROSATOM’s nuclear technologies and products not only in Russia but also worldwide.	The proposal has been taken into account. See the Safety Report.
11	To present the rich and interesting information on the development of nuclear towns and cities in a way that links it to the towns and cities themselves, which will increase the value of the reports.	The proposal has been taken into account (see section 4.3 on priority development areas).
12	To disclose information separately for each nuclear town and city.	The proposal has been considered; it has been decided to disclose information in a way that links nuclear towns and cities to specific projects and activities.
13	To provide all necessary explanations of events after the reporting period (in this case, the events of 2022) in the introductory statement of the senior executive to the Report, which should also reflect ROSATOM’s commitment to the principles and objectives of sustainable development.	The proposal has been incorporated in the 2021 and 2022 reports.
14	To make sure that the Report reflects the variety of ROSATOM’s nuclear towns and cities, which necessitates different approaches to their development and regional priorities.	The proposal has been incorporated by reflecting development priorities, participation of the towns and cities in projects and their development plans (see chapter 4).
15	To consider holding round-table discussions with representatives of municipal governments and the expert community on the topic of the Smart City.	The request has been forwarded to the responsible department.
16	To add more cases and specific examples of ROSATOM’s activities, including engagement with nuclear towns and cities, to the text of the Report.	The proposal has been taken into account (see chapter 4).
17	To revise the list of risks for 2022 in the next Report.	The proposal has been taken into account (see section 1.12.2).

18	To revise the list of ESG risks in the next reporting cycle and specify new risks; to include risks related to digitisation (cybersecurity) and personal data security.	Cybersecurity risks are taken into account in the course of operations; however, access to the relevant information is restricted. Personal data security risks are taken into account in the course of operations, but the relevant information is not disclosed, as these are not key risks for the Corporation.
19	To provide more detailed information on the competences of ROSATOM's Supervisory Board, potentially duplicating information provided on the corporate website.	The proposal has been taken into account (see section 1.12.1).
20	To provide information on changes in the total number of instances of corruption, the number of cases handed over to the prosecutor's office and the number of administrative decisions taken over three years.	The summarisation and analysis of the required information and the decision on its publication fall within the exclusive competence of competent government authorities, including law enforcement agencies and judicial authorities, as it affects the rights and legitimate interests of those organisations with which the persons held liable are affiliated.
21	To publish separate analytical reports on ROSATOM's engagement with nuclear towns and cities in order to demonstrate ROSATOM's best practices to other regional organisations and local governments, which would facilitate the sharing of experience and knowledge.	The matter has been considered. The proposal has been forwarded to the Department for Liaison with Regions.
22	To expand the range of stakeholders participating in public consultations on ROSATOM's Public Annual Report by adding overseas representatives and to adjust the format of public consultations accordingly.	The proposal has been considered. At present, it is inadvisable to expand the list of stakeholders by including overseas representatives.
23	To add more cases and specific examples of ROSATOM's activities, including engagement with nuclear towns and cities, to the text of the Report.	The proposal has been taken into account.

Statement of Public Assurance of ROSATOM's Public Report for 2022

Background

State Atomic Energy Corporation Rosatom has suggested that we assess its Public Report for 2022, which comprises five reporting modules (the Strategic Report, the Business Development Report, the Social Report, the Report on the Development of Nuclear Towns and Cities and the Safety Report) as well as the Sustainability Report and reports on the performance of the Mining, Engineering, Mechanical Engineering, Fuel, Power Engineering, and Sales and Trading Divisions of ROSATOM, which are included as appendices hereto (hereinafter referred to as the Report).

Our analysis and evaluation during the public assurance process focused on the materiality of information disclosed in the Report, completeness of disclosures on the Corporation's impacts, involvement of the Corporation's stakeholders in the reporting and assurance process, and the Corporation's responsiveness to stakeholders' requests and proposals. Our opinion is based on an analysis of the Report, additional materials provided to us (minutes of stakeholder engagement events and tables reflecting the incorporation of stakeholders' proposals) and the feedback provided by ROSATOM's employees.

We received no remuneration from ROSATOM for our participation in the public assurance procedure.

Assessments, comments and recommendations

We are unanimous in the opinion that the 2022 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 and involves a wide range of stakeholders in this process. 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 modular approach to public reporting used by the Corporation during the preparation of the 2022 Report has enabled it to provide information to stakeholders in a more targeted way while continuing to offer a deep and comprehensive insight into the operation of the nuclear industry. Through a detailed examination of the Corporation's business model, the Report clearly presents the comprehensive nature of its value chain. The Report provides information on ROSATOM's governance system, strategic goals and management approaches, social, environmental and economic impacts, challenges and plans for the medium and long term. We also support the selection of 'Contribution to the Technological Sovereignty of the Russian Federation', which is a highly relevant topic, as the prioritised topic of the Report. Information on the topic provided in the Report is well structured and representative.

We would like to highlight and express our full support for the Corporation's decision to reflect its progress in the implementation of the UN Global Contact Principles in the Report in the form of a standalone appendix, namely the Sustainability Report. This enables the readers of the Report to obtain a comprehensive picture of ROSATOM's activities, including socially significant aspects of its business that concern human rights.

An indisputable advantage of the Report is the use of Russian and international corporate reporting standards during its preparation. These are, first and foremost, the updated Global Reporting Initiative Sustainability Reporting Standards (GRI 2021). In addition, during the preparation of the Report, the Corporation traditionally used the International Integrated Reporting Framework (International <IR> Framework), the AccountAbility Principles as set out in the AA1000SES Standard, the Basic Performance Indicators of the Russian Union of Industrialists and Entrepreneurs (RSPP), as well as the Uniform Industry-Wide Public Reporting Policy and the Public Reporting Standard of ROSATOM. It is also important to highlight the Corporation's initiative to include the climate agenda and climate risk management issues (with a forward-looking focus on adopting the TCFD Recommendations) in the scope of topics to be covered in public reports.

Materiality of information

To incorporate stakeholders' requests as fully as possible, ROSATOM and its Divisions held dialogues with stakeholders, experts and users of information, both directly (online) and/or by correspondence (in the form of questionnaire surveys), in order to identify material topics for disclosure in the Report in accordance with the updated GRI Standards (2021). We highly appreciate this initiative and recommend that in the future ROSATOM should continue its cooperation on the matter with reference representatives of 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.

Stakeholder involvement

We believe that in the course of stakeholder engagement events as part of the Report preparation process, the Corporation involved a wide range of stakeholders, with every participant offered an opportunity to freely make comments on the Report, suggest improvements and to put forward recommendations concerning the Corporation's sustainability initiatives.

Response to stakeholders’ requests and proposals

At the request of stakeholder representatives, corrections were made and additional information was included in the final version of the Report (or substantiated explanations were provided as to why the requested information could not be disclosed or will be disclosed in future reporting cycles).

The Corporation took into account key proposals put forward by stakeholders during the preparation of ROSATOM’s previous Report in the form of recommendations on the draft Report for 2022, during the foresight dialogue aimed at identifying material topics to be disclosed in the 2022 Report and during the collection of written comments and recommendations on the draft Report for 2022. For details on events held by ROSATOM, see the Appendix ‘Report Profile’ and the section ‘Strategic Communications’ of Chapter 1 ‘Strategic Report’.

We took part in determining material topics to be disclosed in the 2022 Report and in the reports of ROSATOM’s Divisions (which are included as appendices to the Report).

We are willing to take part in future activities focused on public reporting and the development of ROSATOM’s public reporting system.

To summarise, we would like to point out that in recent years ROSATOM has made significant progress in public reporting, representing the best transparency and accountability practices among Russian companies, which enables it to continuously improve confidence in its business. In turn, the high level of maturity of public reporting is reflected by the fact that ROSATOM won the federal competition of annual reports held by the RAEX-Analytics agency for the last three years (2020-2022) and has won the Russian Business Leaders: Dynamics, Responsibility and Sustainability – 2022 National Competition held by the Russian Union of Industrialists and Entrepreneurs (RSPP) in the High Quality of Sustainability/ESG Reporting category.

The modular approach to public reporting used by ROSATOM in 2022 has enabled it to make information disclosure more specific and target it at the relevant stakeholders. We consider it advisable to continue to use this approach to public reporting at ROSATOM in the future.

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 in its public reports.

Persons who took part in the public assurance of ROSATOM’s public annual report for 2022

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 Organisation Green Cross

Pavel Belousov
Head of the Innovation and Technology Centre of Obninsk Institute for Nuclear Power Engineering of NRNU MEPhI, Associate Professor

Vladimir Gorchakov
Head of the Sustainability Risk Group of the ACRA Rating Agency

Natalia Davydova
Director of the Environmental Projects Consulting Institute (Autonomous Non-Profit Organisation), member of ROSATOM’s Public Council

Konstantin Dolgov
Deputy Chairman of the Committee on Economic Policy of the Federation Council of the Federal Assembly of Russia

Elena Dubovitskaya
Director of the Centre for Sustainable Development of SKOLKOVO Moscow School of Management

Natalia Nazarova
Deputy Chair of the State Duma Committee on Energy

Vladimir Ognev,
Chairman of the Interregional Public Movement of Nuclear Industry and Power Veterans

Gennady Sklyar
Deputy Chairman of the State Duma Committee on Industry and Trade

Elena Feoktistova
Managing Director for Corporate Responsibility, Sustainable Development and Social Entrepreneurship of the Russian Union of Industrialists and Entrepreneurs (RSPP)

Vladimir Kuznetsov
Chairman of the Russian Trade Union of Nuclear Power and Industry Workers

Andrey Khitrov
Director General of the Russian Union of Employers in the Nuclear Industry, Power and Science

Elena Sharoikina
Member of ROSATOM’s Public Council, Chairwoman of the Commission for Ecology and Nature Protection of the Public Chamber of the Russian Federation, Director of ANO Association of Genetic Security Analysts (ANO AGSA)