TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1. Strategic Report</td>
<td></td>
</tr>
<tr>
<td>Statement of the Director General</td>
<td>24</td>
</tr>
<tr>
<td>Key Results in 2021</td>
<td>26</td>
</tr>
<tr>
<td>Key Events in 2021</td>
<td>26</td>
</tr>
<tr>
<td>1.1. Business Strategy</td>
<td>29</td>
</tr>
<tr>
<td>1.1.1. Business context</td>
<td>29</td>
</tr>
<tr>
<td>1.1.2. Long-term strategic goals</td>
<td>31</td>
</tr>
<tr>
<td>1.2. Sustainable Development Management</td>
<td>34</td>
</tr>
<tr>
<td>1.2.1. Key sustainable development results</td>
<td>34</td>
</tr>
<tr>
<td>1.2.2. Contribution to climate action</td>
<td>35</td>
</tr>
<tr>
<td>1.2.3. Sustainable operations</td>
<td>36</td>
</tr>
<tr>
<td>1.2.4. Sustainable products</td>
<td>37</td>
</tr>
<tr>
<td>1.3. Value Creation and Business Model</td>
<td>38</td>
</tr>
<tr>
<td>1.4. Markets Served by ROSATOM</td>
<td>44</td>
</tr>
<tr>
<td>1.5. International Cooperation</td>
<td>61</td>
</tr>
<tr>
<td>1.5.1. Strengthening the international legal framework for cooperation</td>
<td>62</td>
</tr>
<tr>
<td>1.5.2. Support for long-term projects as part of infrastructure development for international cooperation</td>
<td>63</td>
</tr>
<tr>
<td>1.5.3. Cooperation with international organisations</td>
<td>67</td>
</tr>
<tr>
<td>1.5.4. Strengthening the nuclear non-proliferation regime and export control</td>
<td>70</td>
</tr>
<tr>
<td>1.5.5. Developing the network of ROSATOM’s representative offices affiliated with embassies and trade missions abroad</td>
<td>71</td>
</tr>
<tr>
<td>1.5.6. Challenges in the reporting period and mechanisms for addressing them</td>
<td>71</td>
</tr>
<tr>
<td>1.5.7. Plans for 2022 and beyond</td>
<td>72</td>
</tr>
<tr>
<td>1.6. Performance of Government Functions</td>
<td>73</td>
</tr>
<tr>
<td>1.6.1. Performance of the Nuclear Weapons Division</td>
<td>73</td>
</tr>
<tr>
<td>1.6.2. Law drafting</td>
<td>75</td>
</tr>
<tr>
<td>1.6.3. Government programme ‘Development of the Nuclear Power and Industry Complex’</td>
<td>79</td>
</tr>
<tr>
<td>1.6.4. Implementation of federal target programmes</td>
<td>80</td>
</tr>
<tr>
<td>1.6.5. State property management and restructuring of non-core assets</td>
<td>80</td>
</tr>
<tr>
<td>1.7. Development of the Northern Sea Route</td>
<td>84</td>
</tr>
<tr>
<td>1.7.1. ROSATOM’s powers related to development and operation in the Arctic</td>
<td>84</td>
</tr>
<tr>
<td>1.7.2. Escorting vessels and handling cargo traffic along the Northern Sea Route</td>
<td>85</td>
</tr>
<tr>
<td>1.7.3. Construction of new icebreakers</td>
<td>86</td>
</tr>
<tr>
<td>1.7.4. Activities of FSUE Hydrographic Enterprise</td>
<td>88</td>
</tr>
<tr>
<td>1.7.5 New business areas</td>
<td>90</td>
</tr>
<tr>
<td>1.7.6. Plans for 2022 and for the medium term</td>
<td>93</td>
</tr>
<tr>
<td>1.8. Implementation of the Ecology National Project</td>
<td>94</td>
</tr>
<tr>
<td>1.8.1. Implementation of the Infrastructure for the Management of Hazard Class 1 and 2 Waste Federal Project</td>
<td>94</td>
</tr>
<tr>
<td>1.8.2. Implementation of the Clean Country Federal Project</td>
<td>95</td>
</tr>
<tr>
<td>1.8.3. Implementation of the Preservation of Lake Baikal Federal Project</td>
<td>98</td>
</tr>
<tr>
<td>1.9. Digital Transformation</td>
<td>99</td>
</tr>
<tr>
<td>1.9.1. Uniform Digital Strategy</td>
<td>99</td>
</tr>
<tr>
<td>1.9.2. Participation in digitisation in Russia</td>
<td>100</td>
</tr>
<tr>
<td>1.9.3. End-to-end digital technologies and data management</td>
<td>103</td>
</tr>
<tr>
<td>1.9.4. Digital products</td>
<td>105</td>
</tr>
<tr>
<td>1.10. Research and Innovations</td>
<td>108</td>
</tr>
<tr>
<td>1.10.1. Implementation of ROSATOM’s Innovative Development and Technological Modernisation Programme</td>
<td>108</td>
</tr>
<tr>
<td>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’</td>
<td>112</td>
</tr>
<tr>
<td>1.10.3. Proryv (Breakthrough) Project aimed at closing the nuclear fuel cycle</td>
<td>113</td>
</tr>
<tr>
<td>1.10.4. International projects. Development of unique ‘mega science’ research facilities</td>
<td>115</td>
</tr>
<tr>
<td>1.10.5. Plan of R&amp;D Topics of ROSATOM</td>
<td>117</td>
</tr>
<tr>
<td>1.10.6. Cooperation on scientific research with research institutions and universities</td>
<td>118</td>
</tr>
<tr>
<td>1.10.7. Science competitions</td>
<td>119</td>
</tr>
<tr>
<td>1.10.8. Knowledge management system</td>
<td>120</td>
</tr>
<tr>
<td>1.10.9. Intellectual property management</td>
<td>122</td>
</tr>
<tr>
<td>1.10.10. Long-term priorities in the sphere of scientific development</td>
<td>124</td>
</tr>
<tr>
<td>1.10.11. Performance of JSC Science and Innovations in 2021</td>
<td>126</td>
</tr>
<tr>
<td>1.11. Performance of Divisions</td>
<td>130</td>
</tr>
<tr>
<td>1.11.1. Mining Division</td>
<td>130</td>
</tr>
<tr>
<td>1.11.2. Fuel Division</td>
<td>133</td>
</tr>
<tr>
<td>1.11.3. Mechanical Engineering Division</td>
<td>136</td>
</tr>
<tr>
<td>1.11.4. Engineering Division</td>
<td>139</td>
</tr>
<tr>
<td>1.11.5. Power Engineering Division</td>
<td>142</td>
</tr>
</tbody>
</table>
1.12.1. Corporate governance
1.12.2. Risk management
1.12.3. Internal control system
1.12.4. Prevention of corruption and other offences
1.12.5. Financial management
1.12.6. Investment management
1.12.7. Procurement management
1.12.8. Strategic communications
1.12.9. Public reporting system

Chapter 2. Business Development Report

2.1. Business Diversification
2.1.1. Management system
2.1.2. Results in 2021

2.2. International Business Development
2.2.1. Promoting ROSATOM's technologies on foreign markets
2.2.2. Changes in foreign revenue and the portfolio of overseas orders
2.2.3. NPP construction abroad
2.2.4. NPP servicing abroad
2.2.5. Export of uranium products and natural uranium enrichment services
2.2.6. Nuclear fuel export
2.2.7. New products for international markets
2.2.8. Plans for 2022

2.3. Energy Efficiency
2.3.1. Energy efficiency management system. Implementation of energy efficiency management and energy management systems
2.3.2. Results in 2021
2.3.3. Plans for 2022 and for the medium term

2.4. Business Efficiency
2.4.1. ROSATOM Production System
2.4.2. Results in 2021
2.4.3. Plans for 2022

Chapter 3. Social Report

Statement of the Deputy Director General for HR
3.1. Response to the Pandemic
3.2. HR Policy
3.2.1. HR policy approaches and principles
3.2.2. Key personnel characteristics
3.2.3. Personnel costs and remuneration system
3.2.4. Executive succession pool
3.2.5. Successor assessment
3.2.6. Career counselling
3.2.7. Employee training
3.2.8. International cooperation in education
3.2.9. Employees' participation in external and industry-wide professional competitions
3.2.10. Employee engagement

3.3. Occupational Safety and Health; Human Rights
3.3.1. Occupational health and safety
3.3.2. Human rights

3.4. Social Policy
3.4.1. Social policy approaches and principles
3.4.2. Social programmes
3.4.3. Support for industry veterans
3.4.4. Social partnership in the nuclear industry
3.4.5. Cooperation with universities and recruitment of young professionals

3.5. Corporate Volunteering
3.5.1. ROSATOM’s approaches and principles of volunteering
3.5.2. Prioritised areas of volunteer activity
3.5.3. Volunteer training
3.5.4. Key projects implemented in ROSATOM
3.5.5. Anatoly Alexandrov Corporate Social Responsibility and Volunteering Competition

3.6. Long-Term Projects in the Sphere of HR and Social Policy
Chapter 4. Report on the Development of Nuclear Towns and Cities 326

4.1. Development Priorities 333
4.2. Contribution to the Implementation of National Projects 334
4.3. Contribution to the Economy 340
4.3.1. Improving the management of nuclear towns and cities 340
4.3.2. PSEDA development in CATFs in the nuclear industry. PSEDA status in 2021. Development prospects 343
4.3.3. ROSATOM's impact on other areas of development in nuclear towns and cities 347
4.4. Social Development 349
4.5. Work of ROSATOM's Public Council and Community Relations 361

Chapter 5. Safety Report 366

5.1. Nuclear and Radiation Safety 370
5.1.1. Nuclear and radiation safety management system 371
5.1.2. Nuclear and radiation safety at nuclear facilities 371
5.1.3. Physical protection of nuclear facilities 374
5.1.4. Emergency preparedness 376
5.1.5. Industry-Wide Radiation Monitoring System 377
5.1.6. Industrial safety 378
5.1.7. Fire safety 380
5.1.8. Radiation exposure of employees 380
5.1.9. Functioning of systems for technical regulation, standardisation, compliance assessment, and ensuring the uniformity of measurement 385
Summary of measures supporting the functioning of the system for ensuring the uniformity of measurements 390
5.1.10. Plans for 2022 393
5.2. RAW and SNF Management and Decommissioning of Facilities Posing Nuclear and Radiation Hazards 394
5.2.1. Outcomes of the Federal Target Programme on Nuclear and Radiation Safety for the period from 2016 through 2020 and for the period until 2030 394
5.2.2. Development of the integrated national system for radioactive waste management 395
5.2.3. SNF management 396
5.2.4. Developing a system for the decommissioning of facilities posing nuclear and radiation hazards and addressing the "nuclear legacy" 397
5.2.5. Decommissioning and dismantling of facilities posing nuclear and radiation hazards 398
5.2.6. Dismantling of nuclear submarines 398
5.2.7. International technical assistance received in the reporting year 399
5.3. Environmental Safety 400
5.3.1. Environmental safety and environmental protection management 400
5.3.2. Financing of environmental measures 402
5.3.3. Environmental charges and fines 403
5.3.4. Pollutant emissions into the atmosphere 405
5.3.5. Greenhouse gas emissions 407
5.3.6. Water use 412
5.3.7. Industrial and consumer waste management 416
5.3.8. Impact on local flora and fauna 418
5.3.9. Rehabilitation of disturbed areas 420
5.3.10. Emissions and discharges of radioisotopes 422
5.3.11. Radiation impact on the population and the environment 424
5.3.12. Forecast for the environmental impact of ROSATOM and its organisations; plans to reduce the impact and ensure environmental safety in 2022 and in the medium term 426
5.4. Key Projects in the Field of Nuclear and Radiation Safety and Environmental Protection 427

Appendices 430

Appendix 1. GRI Index 430
Appendix 2. Total number of ROSATOM's employees as at 31 December 2021 454
Glossary, Abbreviations and Acronyms 462
Contact Details and Useful Links 469
Feedback Form 470
The Public Annual Report of State Atomic Energy Corporation Rosatom (hereinafter referred to as the Corporation or ROSATOM) for 2021 (the Report) has been prepared on a voluntary basis and is intended for a broad range of ROSATOM’s stakeholders.

The Report has been prepared in an integrated format and provides a comprehensive picture of the following:

— The implementation of ROSATOM’s strategy, including contribution to the sustainability of the Corporation’s business, as well as short-, medium- and long-term plans;
— Significant financial, economic and operating results of the Corporation’s core businesses;
— Results achieved in the sphere of nuclear and radiation safety, environmental protection, contribution to the development of nuclear towns and cities, implementation of social policy and other aspects of sustainable development;
— The economic, environmental and social impact on the external and internal environment;
— ROSATOM’s management approaches to various aspects of its business.

Given a large target audience, this Report has been prepared in a modular format: it consists of several chapters:

— A Strategic Report;
— A Business Development Report;
— A Social Report;
— A Report on the Development of Nuclear Towns and Cities;
— A Safety Report.

In addition to the Report, the following standalone reports have been prepared:

— The Sustainability Report;
— Reports of ROSATOM’s Divisions.

The Report has been prepared in accordance with the following documents:

— The Uniform Industry-Wide Public Reporting Policy of ROSATOM;
— The Uniform Industry-Wide Methodological Guidelines (Standard) on Public Reporting of ROSATOM and Its Organisations;
— The Principles of the United Nations (UN) Global Compact;
— The Global Reporting Initiative Sustainability Reporting Standards (GRI SRS, Core option);
— The AccountAbility Principles (AA1000 AP (2018));

ROSATOM’s internal regulations stipulate an annual reporting cycle.

The Report covers the Corporation’s operations during the period from 1 January 2021 through 31 December 2021.

The Report contains information on the operations of ROSATOM and its organisations in Russia and abroad. Given the special characteristics of ROSATOM’s operations, the scope of information disclosure on certain aspects of its business is restricted.

The Report covers several scopes of consolidation. Key performance indicators (performance indicators approved by ROSATOM’s Supervisory Board) and information on personnel training are disclosed within the scope of budget consolidation as at 31 December 2021. GRI disclosures that belong to the Social category are reported within the scope of budget consolidation; GRI disclosures that belong to the Environmental Category are reported for all significant organisations within ROSATOM which provide information on their environmental performance using corporate reporting forms (126 organisations). Financial and economic indicators in the section ‘Financial and Economic Performance’ are disclosed for organisations included in ROSATOM’s consolidated IFRS financial statements.

1 Except for information on engagement with ROSATOM’s regions of operation abroad.
2 Hereinafter, not including State Atomic Energy Corporation Rosatom.
Process for determining the Report content

The 2021 Report has been prepared in accordance with international reporting standards: the Global Reporting Initiative Sustainability Reporting Standards (GRI SRS) and the International Integrated Reporting Framework (International <IR> Framework).

Both standards require that material topics to be disclosed in the Report should be determined.

The materiality of information was determined through the following process:

— The Communications Department, with assistance from experts on non-financial reporting, corporate social responsibility and sustainable development, compiled a list of material topics related to ROSATOM’s operations;
— The materiality of the topics was assessed taking into account the materiality of ROSATOM’s impacts and its influence on stakeholders’ opinions and decisions; the assessment was carried out in the form of a questionnaire survey among the Corporation’s management and representatives of major stakeholder groups;
— Following the ‘filtering’, a list of material topics to be disclosed in the Report was compiled;
— The final list of material topics to be disclosed in the Report was discussed with stakeholder representatives and the Corporation’s management in the form of an online dialogue (a foresight dialogue on materiality), amended and prioritised.

34 people were involved in the prioritisation of material topics, including 14 managers of the Corporation and 20 external stakeholders (6 representatives of the nuclear industry, 1 representative of environmental organisations, 7 representatives of the business and expert community and 6 persons who took part in the public assurance of the Report).

Out of the 34 topics proposed for assessment, 26 topics were included in the scope of material topics. As part of the discussion during the foresight dialogue, the participants decided to expand the list of material topics by adding another two topics that had not received a sufficient number of votes in the questionnaire survey but had been recognised by the participants of the dialogue as material topics, namely:

— 10. Business development and diversification, including diversification of the MIC;

In addition, four new topics were proposed during the online questionnaire survey conducted as part of the foresight dialogue. These topics had not been included in the original list but were listed by the participants of the questionnaire survey in the “new topics” column. The participants of the foresight dialogue approved the inclusion of the following four topics in the list of material topics:

— 35. Respect for human rights;
— 36. Quality management;
— 37. Continuity and maintaining the talent pipeline in the industry;
— 38. Youth and education policy, cooperation with universities.

In addition, the topic “15. Innovation and scientific and technological advancement” was renamed “Scientific and technological advancement and innovation”.

As a result of the materiality assessment procedure, 32 material topics to be disclosed in the Report were identified. The decision to include various GRI SRS performance indicators and performance indicators stipulated in ROSATOM’s Public Reporting Standard was based on the materiality of the topics to which the indicators are related. The boundaries of information disclosure on various aspects were determined by the Corporation.
Industry-specific topics and governance
1. Implementation of ROSATOM’s strategy
2. Nuclear and radiation safety
3. Prospects for the development of the nuclear power industry
4. RAW and SNF management and addressing ‘nuclear legacy’ issues
5. Development of the Arctic
6. Emergency preparedness
7. ROSATOM’s knowledge management system and protection of intellectual property
8. Corporate governance
9. Performance of the ROSATOM Production System (RPS)
10. Development of ROSATOM’s new businesses, including diversification of the MIC

Economic impacts
11. Development of international business and international cooperation
12. Tax policy
13. Traditional and new markets
14. Financial and economic performance
15. Scientific and technological advancement and innovation
16. Business risks and opportunities
17. Digital products and contribution to the digitisation of the Russian economy
18. Performance of ROSATOM’s Divisions
19. Combating corruption
20. Procurement and supply chain management

Social impacts
21. Developing the regions where nuclear facilities are located
22. Social and economic impacts
23. Provision of access to energy
24. Occupational health and safety
25. Work of ROSATOM’s Public Council
26. Response to the pandemic (business continuity, personnel, external stakeholders)

Environmental impacts
27. Radiation impact on the environment
28. Development of technologies improving the quality of people’s lives and/or reducing the environmental footprint
29. Emissions into the atmosphere
30. Management of effluents and waste
31. Compliance with environmental and technical standards
32. Energy efficiency
33. Management of disturbed and contaminated areas
34. Climate action and climate risks
35. Respect for human rights
36. Quality management
37. Continuity and maintaining the talent pipeline in the industry
38. Youth and education policy; cooperation with universities

New topics:
35. Respect for human rights
36. Quality management
37. Continuity and maintaining the talent pipeline in the industry
38. Youth and education policy; cooperation with universities
Changes in the list of material topics covered in ROSATOM’s Report for 2021 compared to 2020:

- Six material topics covered in the 2020 Report were not considered material in the 2021 Report;
- Two new topics were recognised as material in the 2021 Report;
- Six material topics covered in the 2020 Report were merged into three material topics in the 2021 Report;
- Eight material topics covered in the 2020 Report were reworded, revised and expanded in the 2021 Report.

### Material topics for 2020 that were revised in 2021

<table>
<thead>
<tr>
<th>Topics no longer considered material in the 2021 Report (6 topics)</th>
<th>New/revised material topics in 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>8. Performance of government functions</td>
<td>The topic was not considered material</td>
</tr>
<tr>
<td>11. Corporate governance</td>
<td>The topic was not considered material</td>
</tr>
<tr>
<td>21. Procurement and supply chain management</td>
<td>The topic was not considered material</td>
</tr>
<tr>
<td>34. Response to the pandemic (business continuity, personnel, external stakeholders)</td>
<td>The topic was not considered material</td>
</tr>
<tr>
<td>37. Environmental protection and environmental performance</td>
<td>The topic was not considered material</td>
</tr>
<tr>
<td>43. Development of hard immunity against COVID-19</td>
<td>The topic was not considered material</td>
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### New material topics covered in the 2021 Report (2 topics)

- The topic had not been covered before. New topic: 17. Digital products and contribution to the digitalisation of the Russian economy
- The topic had not been covered before. New topic: 36. Quality management

### Material topics merged together in the 2021 Report (6 topics)

- 9. Performance of the Nuclear Weapons Division
- 16. Business diversification
- 28. Personnel management, social policy and corporate culture
- 44. Volunteering
- 46. Personnel management, planning, training, retraining and knowledge transfer; mentoring
- 47. Personnel education

The topics were included in the following topics:

- ‘10. Business development and diversification, including diversification of the MIC’
- ‘24. Personnel management, social policy, corporate culture and volunteering’
- ‘37. Continuity and maintaining the talent pipeline in the industry’

### Material topics covered in the 2020 Report that were reworded, revised and expanded in the 2021 Report (8 topics)

- 5. Development of the Northern Sea Route
- 24. Social and economic impact on the regions of operation (including CATFs) and local communities
- 27. Cooperation with universities and recruitment of young professionals
- 30. Respect and exercise of human rights
- 36. Development of technologies reducing the environmental footprint
- 38. Emissions and discharges
- 39. Waste management
- 45. Adaptation to climate change and greenhouse gas emissions

The material topics were reworded as follows:

- ‘5. Development of the Arctic’
- ‘21. Developing the regions where nuclear facilities are located. Social and economic impacts’
- ‘38. Youth and education policy; cooperation with universities’
- ‘35. Respect for human rights’
- ‘28. Development of technologies improving the quality of people’s lives and/or reducing the environmental footprint’
- ‘29. Emissions into the atmosphere’
- ‘30. Management of effluents and waste’
- ‘34. Climate action and climate risks’

### List of topics

#### Material topics (28 topics + 4 additional topics)

1. Implementation of ROSATOM’s strategy
2. Nuclear and radiation safety
3. Prospects for the development of the nuclear power industry
4. RAW and SNF management and addressing ‘nuclear legacy’ issues
5. Development of the Arctic
6. Emergency preparedness
7. ROSATOM’s knowledge management system and protection of intellectual property
8. Corporate governance
9. Performance of the ROSATOM Production System (RPS)
10. Business development and diversification, including diversification of the MIC
11. Development of international business and international cooperation
12. Tax policy
13. Traditional and new markets
14. Financial and economic performance
15. Scientific and technological advancement and innovation
16. Business risks and opportunities
17. Digital products and contribution to the digitalisation of the Russian economy
Material topics (28 topics + 4 additional topics)

18. Performance of ROSATOM’s Divisions
19. Combating corruption
21. Developing the regions where nuclear facilities are located. Social and economic impacts
22. Provision of access to energy
23. Occupational health and safety
24. Personnel management, social policy, corporate culture and volunteering
25. Work of ROSATOM’s Public Council
27. Radiation impact on the environment
28. Development of technologies improving the quality of people's lives and/or reducing the environmental footprint
29. Emissions into the atmosphere
30. Management of effluents and waste
31. Compliance with environmental and technical standards
32. Energy efficiency
33. Management of disturbed and contaminated areas
34. Climate action and climate risks
35. Respect for human rights
36. Quality management
37. Continuity and maintaining the talent pipeline in the industry
38. Youth and education policy, cooperation with universities

Stakeholder engagement as part of the Report preparation process

To improve transparency and accountability and to determine the materiality of information to be disclosed, the Report was prepared in cooperation with stakeholders in accordance with the AccountAbility Principles as set out in the AA1000APS Standard (2018), sustainability reporting standards (GRI SRS) and the International Integrated Reporting Framework (International <IR> Framework). The Corporation conducted surveys to identify material topics to be disclosed in the Report and held dialogues with stakeholders (in an online format), including public consultations with ROSATOM’s stakeholders on the draft Report for 2021. The Report incorporates key recommendations and requests made by stakeholder representatives.

For more details on stakeholder engagement, see the section ‘Strategic Communications’.

Verification of reporting information

Reporting information was certified as accurate and reliable by:

— An independent auditor which certifies IFRS financial statements;
— An independent auditor which confirmed the Report’s compliance with the Global Reporting Initiative Sustainability Reporting Standards (GRI SRS, the Core option) and the International Integrated Reporting Framework (the International <IR> Framework), as well as ROSATOM’s compliance with the AccountAbility Principles as set out in the AA1000APS Standard (2018) (for details, see Appendix 4 ‘Independent Auditor’s Report on Non-Financial Statements of State Atomic Energy Corporation Rosatom’).

ROSATOM’s Internal Audit Department conducted an internal audit of the business process ‘Public Reporting Procedure in ROSATOM’ (for details, see Appendix 3 ‘Report of the Internal Audit Department of State Atomic Energy Corporation Rosatom’).

Representatives of key stakeholders provided public assurance of the Report in accordance with the AA1000SES Standard (2015), which confirmed the materiality and completeness of information disclosed in the Report and the Corporation’s responsiveness to stakeholders’ requests when preparing the Report (for details, see the section ‘Statement of Public Assurance’).

Disclaimer

The Report contains information about ROSATOM’s medium- and long-term objectives and initiatives. The objectives are forward-looking, and their actual achievement depends, among other things, on a number of economic, political and legal factors beyond ROSATOM’s control (the global financial, economic and political environment; the pandemic and measures aimed at containing it; the situation on the key markets; amendments to the tax, customs and environmental legislation, etc.). Therefore, actual performance in the future years may differ from the forward-looking statements contained herein.
ABOUT ROSATOM

ROSATOM is a diversified corporation owning assets and possessing competencies at all stages of the nuclear production chain: uranium exploration and mining, uranium conversion and enrichment, nuclear fuel fabrication, NPP design and construction, mechanical engineering, power generation, decommissioning of nuclear facilities, spent nuclear fuel and radioactive waste management.

The Corporation comprises over 360 organisations, including research institutes, the nuclear weapons division and the world’s only nuclear-powered icebreaker fleet. ROSATOM is tasked with implementing a uniform government policy on nuclear power and fulfilling Russia’s international commitments related to the peaceful use of nuclear energy and maintaining the non-proliferation regime.

ROSATOM is Russia’s largest power generation company and a leading player on global markets for nuclear technologies (NPP construction, uranium enrichment services, nuclear fuel fabrication, decommissioning, etc.). ROSATOM carries out numerous large-scale international projects and generates substantial overseas revenue.

The scope of ROSATOM’s business also includes the production of innovative nuclear and non-nuclear products, scientific research, development of the Northern Sea Route and environmental projects, including the creation of environmental technology parks and a state system for hazardous industrial waste management. ROSATOM is also developing new businesses. These include wind power, nuclear medicine, advanced materials and technologies, digital products, infrastructure solutions, additive manufacturing and energy storage systems, process control systems and electrical engineering, environmental solutions, etc.

The Corporation’s research activities are aimed at developing new solutions for the power industry and innovative technologies that will improve the quality of people’s lives. ROSATOM’s key project in the sphere of nuclear power is the Proryv (Breakthrough) Project, which is aimed at demonstrating the possibility of closing the nuclear fuel cycle using fast neutron reactors and developing the relevant technologies. A closed nuclear fuel cycle will significantly improve the efficiency of usage of natural uranium and will help solve the problem of nuclear waste accumulation and provide humankind with a reliable long-term source of clean energy.

ROSATOM today

No. 1 in the world in terms of the overseas NPP construction project portfolio (35 power units)

No. 1 in the world in terms of uranium enrichment (38% of the global market)

No. 2 in the world in terms of uranium production (15% of the global market)

No. 2 in the world on the global nuclear fuel market (17% of the global market)

No. 3 in the world share of NPPs in electricity generation in the Russian Federation

362 organizations within the Corporation

RUB 443.78 billion total personnel costs in 2021

RUB 21.1 billion expenditure on environmental protection in 2021

288,500 employees

The world’s only nuclear-powered icebreaker fleet

* According to data in the Automated Property Management System of ROSATOM.

The life cycle of a nuclear power plant spans approximately 100 years:

- NPP construction: 5 to 7 years;
- NPP operation: 60 years;
- NPP decommissioning: 20 to 45 years.

The Corporation's research activities are aimed at developing new solutions for the power industry and innovative technologies that will improve the quality of people's lives. ROSATOM's key project in the sphere of nuclear power is the Proryv (Breakthrough) Project, which is aimed at demonstrating the possibility of closing the nuclear fuel cycle using fast neutron reactors and developing the relevant technologies. A closed nuclear fuel cycle will significantly improve the efficiency of usage of natural uranium and will help solve the problem of nuclear waste accumulation and provide humankind with a reliable long-term source of clean energy.
Dear colleagues,

In 2021, the Russian nuclear industry successfully accomplished all tasks set by the government. Performance indicators in most key areas of business reached a record high, the state defence order was fulfilled in full.

Major achievements in the civilian sector include the commissioning of two new-generation power units: the second power unit of Leningrad NPP-2 and the first power unit of the Belarusian NPP. In 2021, electricity output at Russian nuclear power plants once again reached a new record high, with their share in Russia's power generation mix remaining at around 20%. ROSATOM successfully continues to build new nuclear power units in Russia and abroad.

As the infrastructure operator of the Northern Sea Route, ROSATOM is responsible for the implementation of the federal project focused on cargo transportation along this route. In 2021, cargo traffic reached 34.9 million tonnes, exceeding the target set for the federal project by 3.9 million tonnes. Highlights of the year also included the expansion of the nuclear-powered icebreaker fleet: the first follow-on multipurpose nuclear icebreaker, Sibir, was accepted into service.

ROSATOM remains active on the renewable energy market: five new modern wind power plants have been put into operation in the south of Russia, with 2/3 of their equipment and components manufactured locally.

In 2021, ROSATOM paid RUB 249.3 billion in taxes to budgets of various levels. This is 1.8 times the amount of budget allocations received by the nuclear industry in 2021.

Despite emerging economic and geopolitical challenges, ROSATOM fulfils 100% of tasks set by the government, increases the share of new businesses and promotes import substitution in various industries.

I would like to thank all employees, partners, suppliers and contractors of nuclear organisations for their concerted efforts and their contribution to the achievement of objectives set by the government.

Sergey Kirienko
Chairman of the Supervisory Board of ROSATOM

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### Key financial results, RUB billion

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2020/2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>1,151.9</td>
<td>1,207.4</td>
<td>1,447.6</td>
<td>+19.9%</td>
</tr>
<tr>
<td>Assets</td>
<td>4,295.6</td>
<td>4,722.4</td>
<td>5,219.6</td>
<td>+10.5%</td>
</tr>
<tr>
<td>Intangible assets</td>
<td>170.9</td>
<td>199.6</td>
<td>199.6</td>
<td>-0.1%</td>
</tr>
</tbody>
</table>

A 19.9% increase in revenue compared to 2020 was driven mainly by an increase in revenue from NPP construction projects, revenue from electricity and heat generation and capacity, as well as a rise in sales of uranium products and enrichment services.

**Profitability ratios, %**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return on sales (ROS)</td>
<td>11.55</td>
<td>13.00</td>
<td>13.39</td>
</tr>
<tr>
<td>Return on assets (ROA)</td>
<td>3.10</td>
<td>3.32</td>
<td>3.71</td>
</tr>
<tr>
<td>Return on equity (ROE)</td>
<td>5.10</td>
<td>5.58</td>
<td>6.34</td>
</tr>
</tbody>
</table>

Profitability ratios increased in 2021, primarily due to a year-on-year increase in profit in the reporting period.

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* Data have been provided on the part of the scope of IFRS consolidation of ROSATOM for which information is publicly available.
Like previous years, the reporting year was eventful for ROSATOM. It was full of achievements and successes, despite a difficult operating environment and major challenges facing the entire world.

The pandemic continued to make a significant impact on the operation of our organisations both in Russia and abroad. However, like in 2020, measures taken to prevent the spread of the coronavirus among our employees and local residents in the towns and cities where nuclear facilities are located produced results, and the impact of the pandemic on our production processes was negligible.

In the reporting period, performance against ROSATOM’s key performance targets set by the Supervisory Board stood at 107.7%.

One of ROSATOM’s strategic goals is to increase the share of its products and services on global markets. We operate at 25 sites in 10 countries. Foreign revenue is growing steadily. In 2021, it increased by 20%, with total revenue approaching USD 9 billion.

Speaking of major operational successes in 2021, I would like to point out that nuclear power generation reached a new record high of 222.4 billion kWh. The share of nuclear power in the country’s power generation mix totals about 20%.

Highlights of the year included the commissioning of power unit No. 2 at Leningrad NPP-2, and the first power unit of the Belarusian NPP, as well as the start of the first criticality procedure at the second power unit of the Belarusian NPP. The construction of new power units was started at NPPs in China, India and Turkey. In 2021, ROSATOM commissioned five new wind power plants, with the capacity of the Corporation’s wind farms totalling 720 MW at year end.

The Corporation designed upgraded floating power units and signed a contract for the supply of four floating power units for the Baimsky Mining and Processing Plant in Chukotka. ROSATOM designed an onshore small nuclear power plant, with the first NPP of this kind intended to be built in Yakutia. In 2021, the first Russian follow-on nuclear icebreaker, Sibir, was accepted into service; it will help to support cargo transportation along the Northern Sea Route. Despite the current challenges, we fulfil all existing commitments to our partners and customers.

In the sphere of composite materials, the Corporation has established an integrated domestic process chain covering all stages, from raw materials to finished products.

People are our strategic capital. Accordingly, we believe that one of ROSATOM’s key tasks is to promote the systematic development of nuclear towns and cities and the local communities at the national level. In 2021, total funding for national projects in 25 of ROSATOM’s host towns and cities exceeded RUB 45 billion. 22 projects and initiatives were underway, ranging from national projects and initiatives to create a comfortable environment for communications and educational initiatives. More than 200,000 people in these towns and cities are involved in projects being implemented in the industry. ROSATOM spent more than RUB 2.6 billion on COVID response; these funds were used to support hospitals and healthcare institutions. We continue to cooperate with the FMBA of Russia to improve the reliability and quality of healthcare services. People’s health is invariably our top priority.

ROSATOM’s Business Strategy until 2030 states that contribution to the achievement of the UN Sustainable Development Goals is one of the Corporation’s top priorities. ROSATOM has joined the UN Global Compact Network, which unites sustainable businesses across the globe. Starting from 2020, JSC Atomenergopro, one of ROSATOM’s key subsidiaries, has been assigned an independent sustainability rating. In 2021, Vigeo Eiris, an international rating agency, rated the company’s sustainability performance ‘Robust’ and assigned it a score of 56/100, which is considerably (12 points) higher than the 2020 assessment.

The world continues to face serious challenges. Today, we are fully aware that the Corporation will have to operate in a completely new and challenging environment and to fulfil all its obligations, both in business and in the sphere of sustainable development and corporate social responsibility. In the short term, our duty is to ensure the smooth and steady operation of all our organisations and to accomplish all tasks set for the Corporation. The government continues to rely on ROSATOM in important matters such as power generation, safety and security, the fulfilment of the state defence order, addressing environmental issues, implementing projects to develop the Arctic, scientific research and numerous other matters. We continue to focus on nuclear towns and cities and civil society organisations; we have supported and will continue to support them as required.

I would like to thank all of ROSATOM’s employees for their dedication and commitment to their work in a challenging epidemiological situation and geopolitical environment. We have achieved impressive results, which have been made possible primarily due to the efforts of our large team of highly skilled professionals. I am sure that focus on employees, maintaining the human capital and unconditional fulfilment of all social commitments will always be the top priority for senior executives in the industry and executives of ROSATOM’s Divisions and organisations.

Alexey Likhachev
Director General of ROSATOM

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Alexey Likhachev
Director General of ROSATOM
KEY RESULTS IN 2021

Key performance indicators set by the Supervisory Board

<table>
<thead>
<tr>
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<th>2020</th>
<th>2021</th>
<th>2021/2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusted free cash flow of ROSATOM, RUB billion</td>
<td>328.7</td>
<td>335.0</td>
<td>338.0</td>
<td>+0.9%</td>
</tr>
<tr>
<td>Consolidated labour productivity, RUB million/person*</td>
<td>–</td>
<td>–</td>
<td>3.78</td>
<td>–</td>
</tr>
<tr>
<td>Unit semi-fixed costs (as a percentage of revenue), %</td>
<td>25.3</td>
<td>26.9</td>
<td>24.8</td>
<td>-7.8%</td>
</tr>
<tr>
<td>Power generation in the Russian Federation7, billion kWh</td>
<td>208.8</td>
<td>215.7</td>
<td>222.4</td>
<td>+3.1%</td>
</tr>
<tr>
<td>Performance against the targets of JSC Rosenergoatom's investment programme, %</td>
<td>104.3</td>
<td>103</td>
<td>105.5</td>
<td>+2.4%</td>
</tr>
<tr>
<td>Portfolio of overseas orders covering the entire life cycle, RUB billion</td>
<td>203.3</td>
<td>204.0</td>
<td>205.4</td>
<td>+0.7%</td>
</tr>
<tr>
<td>10-year portfolio of orders for new products (outside the scope of the Corporation), RUB billion</td>
<td>1,169.1</td>
<td>1,602.1</td>
<td>1,974.1</td>
<td>+23.2%</td>
</tr>
<tr>
<td>Revenue from new products (outside the scope of the Corporation), RUB billion</td>
<td>227.9</td>
<td>261.7</td>
<td>329.1</td>
<td>+25.8%</td>
</tr>
<tr>
<td>Fulfilment of government orders, %</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>–</td>
</tr>
<tr>
<td>Absence of events rated above level 2 on the INES scale in the industry</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>–</td>
</tr>
</tbody>
</table>

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

1. In 2019 and 2020, this indicator was calculated as a KPI in accordance with a methodology different from the one used in 2021.
2. Nuclear power generation, not including wind power plants.

NPP construction abroad

— Power unit No. 1 of the Belarusian NPP was put into operation.
— The loading of nuclear fuel into the reactor (the first criticality procedure) was started at power unit No. 2 of the Belarusian NPP.
— Construction of power units No. 5 and 6 of Kudankulam NPP in India was launched (concreting was started).
— Concreting of the nuclear island was started at power unit No. 7 of Tianwan NPP and power unit No. 3 of Xudabao NPP in China. Licences were obtained for the construction of the nuclear island of power unit No. 8 of Tianwan NPP and power unit No. 4 of Xudabao NPP.
— A licence was obtained for the construction of power unit No. 4 of Akkuyu NPP in Turkey.

Development of science

— Construction of an innovative BREST-OH-300 lead-cooled fast neutron reactor was started in Seversk.
— The fit-up assembly of the multipurpose fast neutron research reactor (MBIR) was completed.
— Two projects to build small NPPs were launched: an onshore NPP in Yakutia and four floating power units for the Baimsky Mining and Processing Plant in Chukotka.
— Moscow State University opened a branch in Sarov, which will form part of the National Centre for Physics and Mathematics.

Participation in the implementation of national projects

Environmental protection

— A federal state information system for the management of hazard class 1 and 2 waste was launched.
— The reclamation of the Chelyabinsk municipal landfill was completed.
— Prioritised measures aimed at lowering the water level above the sludge layer were completed at the site of the Baykalisk Pulp and Paper Mill.
— Prioritised remediation activities were completed at the industrial site of Ucolyekhimprom.

KEY EVENTS IN 2021

Electric power industry: nuclear power plants and wind power plants

— Electricity output at Russian NPPs reached a record high of 222.4 billion kWh.
— Power unit No. 2 of Leningrad NPP-2 with a new-generation VVER-1200 reactor was put into operation.
— Five wind power plants were put into operation in the Rostov Region and the Stavropol Territory. The capacity of ROSATOM’s WPPs totals 720 MW, with electricity output totalling 1.2 billion kWh.

NPP construction abroad

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— Prioritised remediation activities were completed at the industrial site of Ucolyekhimprom.
Digitisation

— Logos Platform, a digital platform for solving complex engineering problems and conducting multidisciplinary research, was developed.
— A prototype of a four-qubit trapped ion quantum processor was created.

Northern Sea Route

— A new nuclear icebreaker, Sibir, was accepted into service.
— Cargo traffic along the Northern Sea Route reached a record high of 34.9 million tonnes, including transit cargo traffic totalling 2 million tonnes.
— A project was launched to create the Greater Northern Sea Route spanning from the Norwegian coast of the Barents Sea to the Korean Peninsula.

New materials and substances

— The Corporation commissioned a plant producing PAN precursor (which is used as feedstock for the manufacture of carbon fibre)
— Two laboratories specialising in composite materials and additive manufacturing were opened at the Sirius Educational Centre.

Sustainability progress

— JSC Atomenergoprom (a subsidiary of ROSATOM) placed the first issue of “green” bonds worth RUB 10 billion.
— JSC Atomenergoprom’s sustainability performance was rated as “Robust”, with a score of 56/100, which is 12 points higher than in 2020.
— In 2021, ROSATOM prepared its first sustainability report for 2020, which was published on the website of the UN Global Compact, the report has been rated “Active”.
— As part of its supply chain sustainability management practices, ROSATOM approved a Supplier Code of Conduct.
— The nuclear power industry was included in the national Taxonomy of Green Projects (Decree No. 1587 of the Government of the Russian Federation dated 21 September 2021 on Approving Criteria for Sustainable (Green) Development Projects in the Russian Federation).

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, including:

— Global population growth from 7.9 billion people in 2021 to 8.5 billion people by 2030 and an increase in the share of urban population from 57% to 60%;
— Global GDP growth by up to 3% per year;
— Growth of global electricity output and consumption. Global electricity generation is expected to increase by 25% compared to 2021 and reach 34 TWh as early as in 2030, with the Asia Pacific region accounting for two thirds of the growth;
— Accelerating greenhouse gas accumulation. The global energy sector accounts for more than 60% of man-made emissions; between 2015 and 2021, it generated about 34-36 billion tonnes of carbon dioxide per year.

The COVID-19 pandemic resulted in a 5.2% decrease in emissions from the energy sector in 2020, however, as early as in 2021, emissions increased by 6.1% (+0.6% compared to 2019). The increase in emissions was driven by economic recovery (in 2021, global GDP grew by 5.9%) and by the impact of the energy crisis on the actual energy mix (weather conditions in some regions of the world were unfavourable for renewable energy generation; combined with soaring gas prices, this led to an increase in coal-fired generation).

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 generation market have become a key driver of global trends in the energy industry. The introduction of new technologies and a shift towards the deployment of renewable energy sources is a prerequisite for reducing carbon dioxide emissions. In recent years, a number of new technologies have emerged that are expected to play a key role in the energy sector of the future.

The COVID-19 pandemic has also had a significant impact on the energy sector. The pandemic has led to a decrease in energy demand, which has in turn led to a reduction in greenhouse gas emissions. The pandemic has also led to a shift towards more sustainable energy solutions. The pandemic has also had a significant impact on the energy sector. The pandemic has led to a decrease in energy demand, which has in turn led to a reduction in greenhouse gas emissions. The pandemic has also led to a shift towards more sustainable energy solutions.

ROSATOM has identified two groups of factors that have the most significant impact on the Corporation’s global operations:
1. 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, given persisting political pressure and a general trend towards growing protectionism.
2. The technological landscape. Global technology trends form a separate set of challenges for the development of the industry. New technologies are evolving rapidly; global markets are increasingly shaped by trends that started to emerge as recently as five to ten years ago, such as the rapid development of renewable energy generation, exponential growth of the scale of digital transformation in manufacturing, growing markets for new materials and manufacturing solutions (for instance, additive manufacturing). The rate of innovation is also accelerating, and, as a result, technological solutions become obsolescent increasingly fast. ROSATOM’s strategy takes into account both the current set of global technology trends and the level of their development.
The levelised cost of energy (LCOE) is the net present value of the unit cost of electrical energy over the life cycle of a power plant. Data from BNEF LCOE 2H 2021 (global benchmarks). This estimate does not take into account the spike in fuel prices in late 2021 and early 2022.

IEA World Energy Outlook 2021 (STEPS), WNA 'The Nuclear Fuel Report: Global Scenarios for Demand and Supply Availability 2021-2040' (Reference), UxC 'Nuclear Power Outlook'.

The LCOE for offshore wind power plants totals USD 80-90 per megawatt-hour. Due to these factors, nuclear power will remain in demand in the long term. Leading global think tanks predict an increase in installed capacity in the nuclear power industry from the current level of 389.5 GW to 439-447 GW by 2030, according to different estimates.

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-modernised power reactors (VVERs) have proved their reliability over one thousand reactor-years of fail-free operation. In 2021, ROSATOM was the largest global market player in terms of the portfolio of overseas NPP construction projects (35 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 enrichment services, nuclear fuel fabrication, etc.).

ROSATOM’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.

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

ROSATOM’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, ROSATOM intends to increase its revenue to RUB 4 trillion, with the share of new products in revenue expected to reach 40%; the Corporation also intends to expand its overseas footprint, with at least 50% of revenue to be generated by the overseas business.

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 ROSATOM 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.

ROSATOM 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, ROSATOM 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, ROSATOM 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, ROSATOM plans to increase the share of new businesses in revenue significantly by 2030;

— To achieve global leadership in state-of-the-art technology. ROSATOM 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, ROSATOM 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 section ‘International Business’.

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 ROSATOM’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).

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

The COVID-19 pandemic was a major external factor in 2021; moreover, its impact will continue to be felt in the longer term. ROSATOM views long-term impacts of the pandemic as providing opportunities for development due to:

— Heightened public interest in a number of product areas within ROSATOM’s sphere of competence;
— Growing demand for and accelerated adoption of effective digital solutions for a variety of applications;
— Heightened interest in the global environmental agenda and sustainability initiatives.

ROSATOM’s strategy provides it with sufficient flexibility in its development to enable it to leverage the opportunities arising in the industry.
1.2. SUSTAINABLE DEVELOPMENT MANAGEMENT

1.2.1. Key sustainable development results

In the course of its operations, ROSATOM is guided by global sustainable development priorities and adheres to the 10 principles of the UN Global Compact. ROSATOM contributes to the achievement of the UN Sustainable Development Goals (SDGs) through its product line, its financial and economic performance and its efforts to ensure the sustainability of internal environmental, social and governance processes.

Since 2020, ROSATOM has been a member of the UN Global Compact and the UN Global Compact Network Russia (the Association ‘National Network of the Global Compact’). As part of the relevant commitments, in 2021, ROSATOM prepared its first public sustainability report, which was published on the website of the UN Global Compact at https://www.unglobalcompact.org. The report presents key achievements in the sphere of environmental safety, human rights, labour relations and business ethics. The report has been rated ‘Active’, which means that the Corporation not only monitors key ESG indicators but is also committed to improving its ESG performance and focuses on contributing to the achievement of the 17 UN Sustainable Development Goals.

Starting from 2020, JSC Atomenergoprom, an organisation that consolidates ROSATOM’s civilian assets, has been assigned an independent sustainability rating. In 2021, Vigeo Eiris, an international rating agency, rated the company’s sustainability performance ‘Robust’ and assigned it a score of 56/100, which is 12 points higher than the 2020 assessment. This was achieved due to JSC Atomenergoprom’s focused efforts to enhance its ESG maturity in 2020 and 2021.

ESG progress of JSC Atomenergoprom in 2020 and 2021, as rated by Vigeo Eiris

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2021 saw the placement of the first ‘green’ bond issue in the industry with a par value of RUB 10 billion. The bond issue is compliant with international standards developed by ICMA. The bonds have been listed on the Moscow Exchange. They were more than eight times oversubscribed. This is the first placement of exchange-traded bonds by a Russian issuer to finance renewable energy sources. Eight Russian banks acted as underwriters for the bond issue, with the ExpertRA rating agency acting as an independent verifier.

1.2.2. Contribution to climate action

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

In 2021, Russia developed and approved a new 2050 Strategy of Social and Economic Development with Low Greenhouse Gas Emissions, which views nuclear power as a tool for achieving carbon neutrality.

A major highlight of 2021 was the inclusion of the nuclear power industry in the national Taxonomy of Green Projects approved by Decree No. 1587 of the Government of the Russian Federation dated 21 September 2021 on Approving Criteria for Sustainable (Green) Development Projects in the Russian Federation and Requirements for the Verification System for Sustainable (Green) Development Projects in the Russian Federation.

Greenhouse gas emissions*

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>2021 Emissions (g CO₂e/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>751</td>
</tr>
<tr>
<td>Gas</td>
<td>403</td>
</tr>
<tr>
<td>Solar</td>
<td>8</td>
</tr>
<tr>
<td>Wind</td>
<td>7.8</td>
</tr>
<tr>
<td>Hydro</td>
<td>1.6</td>
</tr>
<tr>
<td>Nuclear</td>
<td>5.5</td>
</tr>
</tbody>
</table>

* Minimum values over the life cycle (g CO₂e/kWh); the average value is shown for nuclear power.
In October 2021, the United Nations Economic Commission for Europe (UNECE) published a study showing that nuclear power plants produce the smallest amount of emissions over their life cycle compared to other power generation options (averaging 5.5 g CO₂e/kWh, while minimum emissions from hydropower and wind power plants total 6 g and 7.8 g CO₂e/kWh respectively)\(^1\).

In addition, in 2021, ROSATOM actively assisted in preparing and hosting the 26th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP26) in Glasgow (UK). The conference was attended by more than 40,000 participants, including national leaders and global companies. The programme of the Russian pavilion included a special one-day event focused on nuclear power, the Clean Nuclear Energy Day. The COP26 conference included a number of events focused on the role of the nuclear industry in climate action. For the first time in the history of the conference, nuclear power was high on its agenda.

For details, see the Appendix ‘Sustainability Report’.

1.2.3. Sustainable operations

The Corporation adheres to the Unified Industry Policy on Sustainable Development, which sets out the position of ROSATOM and its organisations on sustainable development matters, including the goals, objectives and key principles of their efforts 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 the Uniform Industry-Wide Methodological Guidelines on the Management of Sustainability Initiatives.

The Corporation is committed to sustainable development leadership both in Russia and abroad (in the countries in which it operates). It adheres to sustainable development principles, assesses its ESG performance and sets ESG targets. The Corporation also promotes cooperation to achieve the UN SDGs and engages in open dialogue with stakeholders on sustainable development.

ROSATOM’s sustainable development initiatives involve continuous process improvement, implementation of health, safety and environmental projects, corporate social responsibility initiatives and volunteering, development of a supply chain management system, as well as personnel management and development of the talent pool.

Environmental aspect (E). ROSATOM seeks to align its operations with the ‘Do No Significant Harm’ principle, which involves minimising environmental pollution, the negative impact on ecosystems and risks to human health.

The Social aspect (S) is another major aspect of sustainability of the Corporation’s business. It includes ensuring occupational and process safety, protecting the life and health of employees in the industry and developing human potential.

As part of the Governance aspect (G), the Corporation is building an integrated system of industry regulation and sustainable development standards and ensures the transparency of its business by disclosing as much information as possible.

Major achievements of 2021 include the approval of ROSATOM’s Supplier Code of Conduct (Order No. 1/1538-P of ROSATOM dated 26 November 2021); this step is aimed at improving maturity in the sphere of supply chain sustainability management. The document sets out ROSATOM’s priorities in the sphere of sustainable development which suppliers are required to adhere to, including priorities in the sphere of environmental safety, occupational safety and health, social policy, labour rights and business transparency. The decision on commitment to the Code is made by each supplier on a voluntary basis; this involves sending the relevant notification and conducting a self-assessment of the level of maturity of the supplier with a focus on environmental and social aspects of sustainable development.

For details, see the Appendix ‘Sustainability Report’.

1.2.4. Sustainable products

ROSATOM’s product portfolio comprises more than 80 existing and future-oriented high-technology products and services. All of these products are aimed at improving the quality of people’s lives and contribute to the achievement of the UN Sustainable Development Goals, each in their own way.

As part of product line development in the industry, special emphasis is placed on environmental and climate performance of products and projects. In this context, ROSATOM’s strategic priority is to develop products and implement projects to support an efficient energy transition both in Russia and abroad. In addition to nuclear power technology, 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.

As part of its focus on contributing to the achievement of the UN Sustainable Development Goals and climate action, ROSATOM gives priority to increasing the share of ‘green’ products in its product line. To accomplish this objective, in 2021, ROSATOM developed an internal product sustainability certification methodology and conducted a sustainability review of the first group of products in the industry, which involved producing recommendations for improving sustainability. In 2022, product sustainability certification will be continued.

For details, see the Appendix ‘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.
Value creation in core businesses

### First core
- NWD
- Atomflot
- NRS

### Second core
- Uranium mining
- Conversion and enrichment
- Nuclear fuel fabrication
- SNF processing
- NPP construction
- Mechanical engineering
- R&D
- NPP operation and power generation
- NPP decommissioning

### Third core
- Radiation technologies
- New businesses in Divisions

Key products (results in 2021)

- **Revenue under IFRS**
  - RUB 1,447.6 billion

- **Nuclear power generation in Russia**
  - 222.4 billion kWh

- **Nuclear fuel production**
  - >1,030 tonnes of heavy metal (tHM)

- **Uranium production**
  - 7,100 tonnes

- **Commissioning**
  - 2 power units

- **Cargo traffic along the NSR**
  - 34.9 million tonnes

 Capitals available as at 31 December 2020
- **Financial capital**
- **Manufactured capital**
- **Intellectual capital**
- **Human capital**
- **Social and relationship capital**
- **Natural capital**

 Capitals available as at 31 December 2021
- **Financial capital**
- **Manufactured capital**
- **Intellectual capital**
- **Human capital**
- **Social and relationship capital**
- **Natural capital**
### Value creation results

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2021/2020, %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Financial capital</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted free cash flow, RUB billion</td>
<td>328.7</td>
<td>335.0</td>
<td>338.0</td>
<td>+0.9%</td>
</tr>
<tr>
<td>Revenue under IFRS, RUB billion</td>
<td>1,151.9</td>
<td>1,207.4</td>
<td>1,447.6</td>
<td>+19.9%</td>
</tr>
<tr>
<td><strong>Manufactured capital</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of power units in operation during the year, pcs.</td>
<td>36</td>
<td>36</td>
<td>36*</td>
<td>-</td>
</tr>
<tr>
<td>Capacity factor of Russian NPPs, %</td>
<td>80.4</td>
<td>81.07</td>
<td>83.18</td>
<td>+3%</td>
</tr>
<tr>
<td><strong>Intangible assets under IFRS, RUB billion</strong></td>
<td>170.9</td>
<td>199.6</td>
<td>199.4</td>
<td>-0.1%</td>
</tr>
<tr>
<td><strong>Share of innovative products in revenue</strong>, %</td>
<td>20.6</td>
<td>25.0</td>
<td>25.7</td>
<td>+3%</td>
</tr>
<tr>
<td>Number of foreign patents obtained by ROSATOM, applications for foreign patents submitted and registered under the established procedures, registered trade secrets (know-hows), pcs.</td>
<td>1,778</td>
<td>2,562</td>
<td>2,906</td>
<td>+13%</td>
</tr>
<tr>
<td><strong>Human capital</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average headcount, '000 people</td>
<td>264.4</td>
<td>276.1</td>
<td>288.5</td>
<td>+4%</td>
</tr>
<tr>
<td>Personnel turnover rate, %</td>
<td>13.2</td>
<td>12.0</td>
<td>10.0</td>
<td>-17%</td>
</tr>
</tbody>
</table>

### Benefits provided to stakeholders in 2021

#### Government level
- Tax payments to budgets of all levels: RUB 249,253 million
- Number of agreements with regional governments in Russia: New agreements (with the governments of the Tver Region, the Ulyanovsk Region and the Chukotka Autonomous District) and 6 protocols on the implementation of agreements (with the governments of the Voronezh, Murmansk, Rostov, Sverdlovsk, Smolensk and Kursk Regions)

#### Corporate level
- Nuclear power generation in Russia: 222.4 billion kWh
- Number of events rated at level 1 or higher on the INES scale: 0
- Expenditure on scientific research: RUB 45.6 billion
- Procurement from SMEs: RUB 282.0 billion
- Average monthly salary: RUB 96,200 per month
- Expenditure on corporate social programmes for employees: RUB 11.5 billion
- Total number of students studying at universities under arrangements with nuclear organisations: 1,534 people
- Social level: Jobs created, 7,223

#### Social level
- The Smart City platform is being rolled out in 36 towns and cities
- Expenditure on environmental protection: RUB 21.1 billion
- Energy cost savings: RUB 353.4 million
- Gross greenhouse gas emissions: 6,785.57 tonnes
- Waste processed by ROSATOM’s enterprises: 27,663,000 tonnes

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**Note:**
- ROSATOM’s stakeholder groups are listed in the section ‘Strategic Communications’.
- 35 power units of NPPs and the floating thermal nuclear power plant (FTNPP).
1.4. MARKETS SERVED BY ROSATOM

In 2021, ROSATOM ranked:
— First in the world in terms of the number of NPP power units in the portfolio of foreign projects (35 power units);
— First on the global uranium enrichment market (38%);
— Second in the world in terms of uranium production (15% 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).

Markets served by ROSATOM and value chains

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Forecast for changes in uranium demand by 2030

After 2011, there was a significant drop in prices on the nuclear fuel cycle front-end markets, including a long-term decline in quotations for natural uranium. Between 2017 and 2019, a number of key market players reduced uranium production amid an oversupply that was not matched by short-term demand. In 2020, major competitors announced suspension or curtailment of production due to the COVID-19 pandemic, which resulted in a significant decrease in global uranium production and a rise in spot prices.

2021 saw a significant increase in volatility on the uranium market. At the beginning of the year, spot prices declined amid a lack of stable demand, but starting from the end of the first quarter of 2021, prices resumed growth amid buying interest in uranium from financial investors and producers. In the second half of the year, spot prices soared, driven by aggressive uranium buying by the Sprott Physical Uranium Trust (SPUT).

In the reporting year, spot market quotations averaged USD 34.92/lb of U3O8, up by 18% year on year.
In 2021, global reactor demand for uranium totalled 61,800 tonnes\(^{20}\). At the same time, global demand taking into account commercial and strategic stockpiling not intended for current consumption is estimated at 81,800 tonnes.

The uranium market fundamentals remain favourable. In the medium and long term, demand for natural uranium is expected to increase due to the commissioning of new power units at NPPs in China, India and other countries. According to the base case forecast of the World Nuclear Association (WNA), global reactor demand for uranium will increase to 66,500 tonnes by 2025 and to 79,400 tonnes by 2030.

**Natural uranium market overview**

In 2021, global uranium production remained flat year on year and totalled 47,400 tonnes. The lifting of COVID-19 restrictions enabled most competitors, including NAC Kazatomprom, Cameco and Orano, to boost production. China’s CNNC and CGN increased uranium production by ramping up mining at the Husab mine in Namibia and acquiring a 49% stake in Mining Company Ortalyk LLP from NAC Kazatomprom in July 2021. At the same time, uranium mining at the Ranger mine in Australia (Rio Tinto) and the Akouta mine in Niger (Orano) ended in 2021 due to the depletion of reserves.

Supplies from secondary sources (inventories of energy companies and some states, reprocessing of depleted uranium hexafluoride, reprocessed uranium, etc.) in 2021 were estimated at 34,000 tonnes of natural uranium equivalent.

A stable group of leaders has emerged on the natural uranium market. The seven largest market players account for 84% of the total uranium output.

According to the UxC forecast, in 2022, global uranium production will total 52,200 tonnes, while supply from secondary sources will total about 25,000 tonnes. Global production of natural uranium is expected to increase by 2030 due to rising demand. Supply from secondary sources will total about 8,000 tonnes of natural uranium equivalent in 2030.

**Uranium conversion and enrichment market**

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

**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 totalled about 59,600 tonnes.

In 2021, average annual spot quotations on the North American and European markets dropped by 11% and 10% respectively, while average annual long-term quotations on both markets increased by 1%. This was caused by announcements about plans to restart a uranium conversion plant in the US, as well as a rise in natural uranium prices, which encouraged the release of additional volumes of feedstock convertible to uranium hexafluoride from secondary sources on the market.
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 will grow to 64,000 tonnes by 2024 and 76,000 tonnes by 2030.

Forecast for changes in demand for uranium enrichment services by 2030

According to the World Nuclear Association, in 2021, global reactor demand for enrichment totalled about 49 million separative work units (SWU). In 2021, average annual spot market quotations rose by 12% amid a decrease in supply from stockpiles, while long-term quotations increased by 14% as energy companies were actively concluding contracts for uranium enrichment services in order to lock in prices under contracts with delivery after 2030.

Uranium conversion and enrichment market overview

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

The development of nuclear power generation until 2030 will have a positive impact on the market for natural uranium enrichment services. According to the base case scenario of the World Nuclear Association, global demand for enrichment will grow to 52 million SWU by 2024 and 63 million SWU by 2030.

Uranium conversion and enrichment market overview

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Uranium conversion and enrichment market overview

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

The main players on the global market for uranium enrichment services include ROSATOM (38% of the global market), URENCO (UK, Germany, Netherlands; 31%), Orano (France; 14%) and Chinese companies (13%). 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 2021, the global nuclear fuel market capacity totalled about 11,000 tonnes of heavy metal (tHM), with fuel for light-water reactors requiring uranium enrichment accounting for approximately 7,000 tHM (including over 1,000 tHM of fuel for water-cooled water-moderated power reactors (VVERs)) and fuel for heavy-water reactors accounting for approximately 3,600 tHM.

As the reactor fleet will be expanding, the demand for fabrication services may increase to 13,000 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 20%), ROSATOM (17%) and Global Nuclear Fuel (8%).

In the reporting year, Russian nuclear fuel fully met the demand of Russia, the Czech Republic, Slovakia, Hungary, Bulgaria and Armenia for reactor fuel. The Corporation also partially met the demand of Ukraine, Finland, India and China for reactor fuel. ROSATOM, in cooperation with Framatome, also supplies fuel and components from reprocessed uranium to Western European NPPs.

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

<table>
<thead>
<tr>
<th>Year</th>
<th>North American</th>
<th>European</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>7.6</td>
<td>8.9</td>
</tr>
<tr>
<td>2015</td>
<td>7.4</td>
<td>8.6</td>
</tr>
<tr>
<td>2016</td>
<td>6.4</td>
<td>9.3</td>
</tr>
<tr>
<td>2017</td>
<td>5.3</td>
<td>10.3</td>
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<tr>
<td>2018</td>
<td>10.8</td>
<td>11.1</td>
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<tr>
<td>2019</td>
<td>19.4</td>
<td>21.1</td>
</tr>
<tr>
<td>2020</td>
<td>19.4</td>
<td>22.1</td>
</tr>
<tr>
<td>2021</td>
<td>21.9</td>
<td>22.3</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Year</th>
<th>North American</th>
<th>European</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>102</td>
<td>18.1</td>
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<tr>
<td>2015</td>
<td>70</td>
<td>18.3</td>
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<td>19.3</td>
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<td>2019</td>
<td>49</td>
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<tr>
<td>2020</td>
<td>55</td>
<td>19.4</td>
</tr>
<tr>
<td>2021</td>
<td>55</td>
<td>21.1</td>
</tr>
</tbody>
</table>

*Report by the World Nuclear Association, 2021 (at tails assay of 0.22%). ROSATOM estimates the 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%).
Entering new nuclear fuel markets

In 2021, 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 2021, fuel assemblies with MOX fuel for the tenth reloading of the BN-800 reactor core were produced and underwent acceptance testing.

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 2021, concreting of the foundation slab for the BREST-OD-300 innovative fast neutron reactor was completed; it significantly outperforms slabs used in standard reactors in terms of strength. An engineering design of a fuel element based on uranium-plutonium nitride fuel (MNUP fuel) was developed for the BREST-OD-300 reactor.

For details, see the section ‘Research and Innovations’.

Power machine engineering market

Power machine engineering is one of the most high-technology industries in the world. Power engineering projects are capital-intensive and time-consuming. The key objectives in the power machine engineering industry are to improve energy efficiency, reduce the environmental footprint and promote economic growth by commissioning new power generation capacities.

The energy transition has had a significant impact on market players. Most global power machine engineering leaders are exiting the business segment focused on the construction of coal-fired power plants and the manufacture of the relevant equipment; instead, they are refocusing their operations on equipment for other industries. At the same time, there have been structural changes in the strategies and business approaches of global power machine engineering companies. Key competitive advantages of the Mechanical Engineering Division include a combination of safe reference technologies, the ability to provide the package supply of NPP equipment, extensive in-house manufacturing capabilities and the development of new business areas.

In 2021, the Russian power generation equipment market recorded a mixed performance. In the steam turbine equipment segment, output declined by 67%, while the production of gas turbines increased by 60%. At the same time, the production of steam generation equipment, including nuclear reactors, surged by 207%. This was driven by the implementation of the DPM-2 programme and projects to build new NPP power units.

The Mechanical Engineering Division of ROSATOM maintained its share in terms of revenue on the Russian market at 42%. On the international market, the Mechanical Engineering Division is a major manufacturer and supplier of key equipment for power units under construction. The development of new businesses will enable the Division to further strengthen its foothold both on the Russian market and globally. The Division produces all main equipment for Russian-design VVER reactors; it also participates in designing and producing equipment for research reactors and small-scale nuclear power plants and is expanding its capabilities in order to enter the market for equipment for Western-design reactors. To enable ROSATOM to remain a leader on the Russian power machine engineering market, in addition to its core business, the Division is also expanding its non-nuclear business segments and sets ambitious goals in terms of expanding into new markets.

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 447 GW, which reflects steady growth of nuclear power generation.

In 2021, the nuclear power industry met more than 10% of global electricity demand. 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%), Ukraine (55%), Slovakia (52%) and Belgium (51%).

According to data from the IAEA, as at 31 December 2021, 437 power reactors with a total capacity of 389.5 GW were in operation (including the suspended Japanese reactors). Another 56 reactors were under construction. In 2021, 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 2021, 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 data from the IAEA, new nuclear power generation capacities connected to the grid globally in 2021 totalled 5.2 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.

### 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 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 ROSATOM comprised 49 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, Orano).

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.

In 2021, CJSC Belatomservice, a subsidiary of JSC Rusatom Service in the Republic of Belarus, was incorporated and started to operate. In 2021, it concluded maintenance and equipment supply contracts for the Belarusian NPP and started to carry them out.

ROSATOM is also considering diversifying into the Western-design NPP servicing segment by 2030. For details, see the chapter ‘Business Development Report’.

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24 IEA World Energy Outlook 2021 (Stated Policies Scenario).
25 Power Reactor Information System (PRIS) developed by the IAEA (https://pris.iaea.org).

Leading countries by the number of operating NPP power units between 2019 and 2021, at year end

<table>
<thead>
<tr>
<th>Country</th>
<th>2019</th>
<th>2020</th>
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<td>Japan</td>
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* Excluding the floating thermal nuclear power plant.

Key countries by the number of operating NPP power units between 2019 and 2021, at year end:

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* Excluding the floating thermal nuclear power plant.

Temporarily shut down

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* Excluding the floating thermal nuclear power plant.
Market for RAW and SNF management, processing and disposal

By the end of 2021, the volume of spent nuclear fuel (SNF) accumulated globally totalled about 400,000 tonnes of heavy metal (HM). 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 HM of SNF is produced globally, of which less than 2,000 HM 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, 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 increasing the SNF processing capacity at the site of FSUE Mining and Chemical Plant. 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 an 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

By the end of 2021, about 200 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 total market size is estimated at more than USD 200 billion.

A growing number of countries are adopting the ‘immediate dismantling’ strategy, as its total cost is lower compared to ‘deferred dismantling’. For instance, the US, Germany and Sweden are already decommissioning some of their NPPs; some countries (e.g. Belgium and the UK) are also making statements about ‘accelerated decommissioning’. Other countries are considering a range of options, including the ‘deferred dismantling’ of the reactor island, where most radioactive materials are concentrated.

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

In Russia, ROSATOM is preparing to decommission 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 NPP; power unit No. 1 of Biblis 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 2021, ROSATOM represented by JSC TVEL accelerated its efforts aimed at promoting cooperation in the back-end segment among the CIS countries, which involves, among other things, laying additional groundwork for addressing decommissioning tasks in the CIS countries.

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

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. 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.

Between 2010 and 2019, electricity consumption in Russia grew at a moderate rate of about 0.6% per year. In 2020, electricity consumption in Russia decreased by 2.3% amid the coronavirus pandemic and totalled 1,050.4 billion kWh.

In 2021, the country’s economy partially recovered, which resulted in a 5.4% increase in total electricity consumption in Russia to 1,107.1 billion kWh. Electricity output in Russia totalled 1,131.2 billion kWh in 2021, up by 6.3% year on year. Nuclear power plants maintained their role in terms of meeting base load demand, with nuclear power generation reaching a new all-time high of 322.4 billion kWh in 2021. The increase was driven mainly by the commissioning of a new 1,200 MW power unit No. 2 at Leningrad NPP-2 and the reduction of the duration of maintenance and repairs by 107 days. 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 total electricity output in Russia amounting to 19.7% (20.3% in 2020, 19.0% in 2019).

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 the country’s energy mix.
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 2024 will total 1.2 GW. In 2021, electricity output from ROSATOM’s WPPs totalled 1.2 billion kWh.

In addition to NPP and WPP construction and 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). JSC Atom Energy Trade and LLC REC provide services to 56,800 enterprises and more than 2 million individual consumers in Russia.

In 2021, retail electricity sales by the branches and standalone divisions of JSC Atom Energy Trade and LLC REC totalled 16.0 billion kWh, up by 7% compared to 2020 (14.9 billion kWh).

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

Wind power market

The global wind power market is actively developing; installed capacity of wind power plants (WPPs) is expected to increase significantly, from 0.83 TW in 2021 to about 1.19 TW and 1.71 TW in 2025 and 2030 respectively. The market is highly competitive and consolidated, with the top five turbine manufacturers accounting for 57% of the total capacity of onshore and offshore WPPs commissioned in 2021.

As at May 2021, the capacity of onshore and offshore WPPs commissioned by the top 25 developers totalled about 0.33 TW, or about 45% of total installed capacity worldwide.

Onshore WPPs with a total capacity of 3.4 GW are expected to be commissioned in Russia by the end of 2024 under renewable energy capacity supply agreements on the wholesale market, with the existing competitive selection mechanism to be used with regard to investment projects for the construction of power plants. According to the Corporation’s estimates, by 2024, the total installed capacity of onshore WPPs might reach 3.6 GW, with annual turnover totalling about RUB 70 billion.

By the end of 2024, the portfolio of wind power plants to be built by ROSATOM will total 1.2 GW, or more than 30% of the Russian wind power market.

For details, see the chapter ‘Business Development Report’.

Composite materials market

According to a study by JEC Group, in 2019, the volume of the global market for composite materials and products totalled 11.7 million tonnes (in 2020, the market slumped by 14% to 10.0 million tonnes due to the impact of the COVID-19 pandemic on key end-use sectors: aviation, transportation and construction), with the value of finished composite products totalling USD 86 billion (USD 78 billion in 2020). At the same time, some industries demonstrated strong growth during the period. These included wind power generation (+22.5%) and electronics (+3.5%).

According to an independent research company INFOMINE Research Group LLC, the Russian market for polymer composite materials (PCMs) has proved to be one of the most resilient to the impacts of the COVID-19 pandemic. In 2020, its volume totalled RUB 73.1 billion (USD 1.0 billion), up by ≥7% compared to 2019 (RUB 68.1 billion). Experts predict that the Russian PCM market will continue to grow and will reach about RUB 80 billion in 2022. This is largely due to the active adoption of PCMs in strategic industries (aerospace, energy, the military industry, etc.).

The global PCM market is expected to expand by 4% per year until 2030, with carbon-fibre-reinforced plastics (CFRPs) as the fastest growing segment with a CAGR of 4-10% in physical terms. In the fibreglass segment, as well as for other PCMs, the annual growth rate will total about 2%.

A further increase in the global use of composite materials is expected due to replacement of conventional materials and expansion of the areas of application. The following five high-technology industries make up about 80% of demand for carbon fibre, with consumption expected to grow exponentially by 2030:
- Wind power generation;
- The aerospace industry;
- The sports goods industry;
- The automotive industry;
- Construction.

Key drivers of development of the global PCM market include the fact that carbon fibre supports key global trends (new energy, fuel efficiency, environmentally friendly vehicles, etc.), development of technologies for the manufacturing and processing of carbon fibre products, a decrease in the cost of carbon fibre and its wider use in mass market products, digital modelling of products, materials and production processes.

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26 Source: BNEF, Bloomberg, Capacity & Generation.
27 Source: BNEF, Bloomberg, “Wind Turbine Market Shares”.
29 In carbon-fibre-reinforced plastics.
Key characteristics of the market include the following:

- Composite fabrics and semi-processed materials account for 75% of demand from manufacturers of finished products;
- The maximum profitability of composite products is achieved in the final processing stages (finished products).

The following companies are the world's largest carbon fibre producers (in terms of production capacity):

- Toray (Japan): ~54,800 tonnes;
- Mitsubishi Chemical (Japan): ~16,000 tonnes;
- Hexcel (US): ~16,000 tonnes;
- Teijin (Japan): ~13,000 tonnes;
- SGL Carbon (Germany): ~13,000 tonnes.

They account for ~70% of the global carbon fibre production capacity.

Alliances and partnerships with manufacturers of finished products, the establishment of implementation centres in the industry, and the development/acquisition of production facilities in target markets are an integral part of the strategy of the leading players on the global PCM market. Between 2017 and 2020, most M&A deals were concentrated in the segment focused on finished products and the relevant production technology.

ROSATOM is the key Russian manufacturer of carbon fibre with a production capacity of ~1,200 tonnes.

Successful implementation of the road map for developing the Technology for New Materials and Substances high-technology area (including the Polymer Composite Materials product area) may make an important contribution to the development of the Russian PCM market. Key outcomes of implementation of the road map include the following:

- A new PAN fibre plant with a capacity of up to 5,000 tonnes per year was commissioned in the Alabuga Special Economic Zone (Republic of Tatarstan) on 22 November 2021. As a result, a unique integrated modern CFRP production chain has been established in Russia, it comprises all stages, from crude oil, through PAN, carbon fibre, fabrics and pre-pregs to finished products;
- A high-modulus carbon fibre production line with a capacity of up to 45 tonnes per year has been put into operation;
- Technology has been developed for the production of medium-modulus carbon fibre (5.5 GPa) for application in prioritised sectors of the Russian industry.

For details, see the chapter ‘Business Development Report’.

Nuclear medicine market

In the reporting year, the global nuclear medicine market totalled USD 10.2 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 106 billion, and the market is expected to grow steadily until 2030 (according to ROSATOM’s forecasts, the growth rate will total 6–7% per year), despite difficulties with covering the cost of publicly funded health care through compulsory health insurance. 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.

The global market for isotope products for nuclear medicine is expected to grow from USD 5 billion in 2021 to USD 10 billion in 2030.

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, 18 MeV linear particle accelerators, cyclotron and radiochemistry facilities, SPECT scanners and brachytherapy equipment.

For details, see the chapter ‘Business Development Report’.
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 34.9 million tonnes in 2021 to 80 million tonnes in 2024 and 110 million tonnes in 2030.

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

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’.

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; furthermore, experts predict that by 2030, hazard class 1 and 2 generation will reach 413,000 tonnes. At the time of the launch of this project, only 1.5% of all waste was treated and recycled in an environmentally safe manner by operators that have licences for the relevant operations and the required capacities.

In December of the reporting year, a federal state information system for the tracking of hazard class 1 and 2 waste and monitoring its management became operational. The digital platform of the system will be used by almost 50,000 participants: waste-generating enterprises from different industries, transportation and waste processing companies. It will become a ‘one-stop-shop’ solution enabling waste tracking and monitoring over its entire life cycle, from waste generation to disposal. It will also help to forecast capacity utilisation and optimise logistics.

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.

By 2025, seven modern high-technology environmental technology parks will be put into operation. They will treat and recycle hazard class 1 and 2 waste.

For details, see the Business Development Report and the Safety Report.

1.5. INTERNATIONAL COOPERATION

Key results in 2021:

— During the pandemic, employee rotation and vaccination at the overseas sites were organised.
— A ceremony was held to mark the launch of construction of four new power units based on Russian technologies at Tianwan NPP and Xudabao NPP; the ceremony was attended by the Russian President Vladimir Putin and the President of the People’s Republic of China Xi Jinping.
— An agreement was reached with the President of Serbia Aleksandar Vučić on the phased implementation of the project to build the Centre for Nuclear Science, Technology and Innovation in Serbia. As a follow-up, a general framework agreement was signed on the construction of a radiopharmaceutical facility during the first stage, a nuclear medicine centre during the second stage, and a Russian-design research reactor during the third stage.
— The Union State Programme on Nuclear Energy Development was approved by Decree No. 6 of the Supreme State Council of the Union State of Russia and Belarus on 4 November 2021.

ROSATOM’s international activities are aimed at creating a favourable international legal and political environment to promote Russian nuclear technologies on the global market, strengthen the nuclear safety and nuclear non-proliferation regimes and actively engage with international organisations and specialised forums and platforms.
**Strategic Report**

### GRI 102-2

**Cooperation with key partners in strengthening the international legal framework**

- **Belarus**: In accordance with the Union State Programme on Nuclear Energy Development approved by the Decree of the Supreme State Council of the Union State of Russia and Belarus setting forth the Guidelines for Implementing the Provisions of the Treaty Establishing the Union State between 2021 and 2023, Russia and Belarus signed an IGA on cooperation in the transportation of nuclear materials.

- **Uzbekistan**: In order to improve the legal framework for bilateral cooperation with Uzbekistan, an IGA was signed on early notification of nuclear accidents and exchange of information on nuclear and radiation safety.

- **France**: Cooperation continued in order to meet the demand for Russian uranium products for French reactors. An IGA on cooperation in the supply of enriched uranium for French research reactors was signed and came into force.

- **CERN**: An IGA on the repatriation of depleted uranium in the L3 hadron calorimeter modules to the Russian Federation was signed with the European Organisation for Nuclear Research (CERN) and came into force. It will ensure that the Russian Federation fulfills its obligation to remove the materials and executes the relevant order of the Russian Government.

- **PARLACEN**

- **Nicaragua**: ROSATOM is cooperating with Latin American countries to create an international legal framework for establishing and expanding collaboration in the peaceful use of nuclear energy. During the visit of the President of the Central American Parliament (PARLACEN) Fanny Salinas to Russia, a framework memorandum of understanding was signed with this organisation. PARLACEN is an influential advisory body in the Central American region. Work was begun with a group of Central American countries that have lately expressed interest in the use of nuclear energy for non-energy applications.

- **Burundi**

- **Zimbabwe**: Further steps were taken to consistently enhance and expand Russia’s presence in the nuclear sector in Africa. This included the signing of framework memoranda of understanding with Burundi and Zimbabwe, as well as memoranda of cooperation with Ethiopia on personnel training and shaping a positive public opinion on nuclear energy. These documents lay the groundwork for launching practical initiatives focused on the use of nuclear energy for non-energy applications and personnel training.

- **Japan**: The Memorandum of Cooperation in the peaceful use of atomic energy dated 16 December 2016 between ROSATOM, the Ministry of Economy, Trade and Industry of Japan and the Ministry of Education, Culture, Sports, Science and Technology of Japan was extended.

### GRI 103-2

**1.5.2. Support for long-term projects as part of infrastructure development for international cooperation**

- **Cooperation with China**

- **Cooperation with India**

- **As for specific overseas projects, the following steps were taken:**

- **Cooperation with China**

- **As part of political support for major overseas projects, in May 2021, ROSATOM assisted in holding a ceremony to mark the start of construction of new power units based on Russian technologies at Tianwan and Xudabao NPPs. The Russian President Vladimir Putin and the President of the People’s Republic of China Xi Jinping participated in the event via video-conferencing.**

- **The strategic package for Russian–Chinese cooperation continued to be implemented, 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.**

- **An expansion of the nuclear cooperation agenda is being discussed, with a focus on large-scale, long-term and innovation initiatives underpinned by the principles of mutual benefit and a balance between the parties’ interests.**

- **Cooperation with India**

- **The third phase of the Kudankulam NPP construction project in India was officially launched in June 2021.**

- **The Joint Statement titled ‘Partnership for Peace, Progress and Prosperity’ issued following the 21st Russia–India Annual Summit held on 6 December 2021 in New Delhi included phrases emphasising the importance of further
discussions on the allocation of a new site in India for the construction of a Russian-design NPP and a statement that the Indian party would make efforts to ensure that the new site is officially allocated in accordance with the previous agreements; the relevant wording was proposed by ROSATOM.

Cooperation with Bangladesh

In July 2021, amid a significant deterioration of the epidemiological situation in the People’s Republic of Bangladesh, a local coronavirus outbreak was reported at the Rooppur NPP construction site. To stabilise the situation, an action plan was promptly devised; its implementation helped to drastically reduce the number of infection cases and stabilise the situation at the construction site by mid-August 2021.

Furthermore, a Russian vaccine, Sputnik V, was supplied for the multinational project team in Bangladesh, with about half of almost 10,000 two-component kits intended for the immunisation of the key local personnel.

In October 2021, ROSATOM’s representatives participated in the organisation of a ceremony to mark the completion of the installation of the reactor vessel at power unit No. 1 of Rooppur NPP in Bangladesh, which was attended by Prime Minister Sheikh Hasina. During the event, she endorsed the allocation of a new site in the south of the country for the construction of a nuclear power plant based on Russian technologies after the construction of Rooppur NPP is completed.

A dialogue was begun on the establishment of a Nuclear Research and Technology Centre based on a Russian research reactor in Bangladesh.

Akkuyu NPP construction project (Turkey)

In March 2021, ROSATOM assisted in organising a ceremony to mark the start of construction of power unit No. 3; the event was attended by the Russian President Vladimir Putin and the President of the Republic of Turkey Recep Tayyip Erdogan. In September 2021, ROSATOM’s Director General Alexey Likhachev visited the Akkuyu NPP construction site; during his visit, he briefed the Turkish President on the progress of work on the main facilities.

El Dabaa NPP construction project (Egypt)

In Egypt, in addition to the work at the site itself, ROSATOM communicated on an ongoing basis with Egyptian partners to ensure that the El Dabaa NPP construction licence was issued within the agreed time frame. For example, in July 2021, ROSATOM’s Director General Alexey Likhachev held an extended meeting at the NPP construction site to check the work progress; in August 2021, the Egyptian Minister of Electricity and Renewable Energy Mohamed Shaker visited the Russian enterprises which produce equipment for this project.

Belarusian NPP construction project

Despite a challenging epidemiological situation, the Belarusian NPP construction project is being implemented in accordance with the agreed schedules.

On 10 June 2021, power unit No. 1 was commissioned.

On 22 December 2021, first criticality was achieved at power unit No. 2.

Cooperation with Vietnam

During the official visit of the Vietnamese President Nguyen Xuan Phuc to Russia in early December 2021, a request for tender for the feasibility study of the project to build a Nuclear Research and Technology Centre in Vietnam based on a Russian-design research reactor was submitted to the Russian contractor.

The Joint Statement on the Vision for the Development of a Comprehensive Strategic Partnership between the Russian Federation and the Socialist Republic of Vietnam until 2030 adopted by the Russian President Vladimir Putin and the President of the Socialist Republic of Vietnam Nguyen Xuan Phuc following the talks in Moscow on 30 November 2021 included the wording proposed by ROSATOM which stipulates that if Vietnam returns to its plans to build a national nuclear power industry, Russia would be viewed as a priority partner in this field.

Project to build a Centre for Nuclear Science, Technology and Innovation in Serbia

In order to implement a three-phase CNSTI project in Serbia, a master framework agreement on its construction and an agreement on the establishment of a joint venture in Serbia were signed. The CNSTI is expected to become one of the largest centres of this kind in Europe; it will comprise medical facilities for the production of radiopharmaceuticals, a nuclear medicine centre with a cyclotron complex, and a Russian-design nuclear research reactor for a wide range of fundamental and applied research projects.

Cooperation with Armenia

In 2021, the modernisation of the safety systems of the Armenian NPP and the annealing of the reactor vessel were completed. This helped to restore the performance characteristics of the reactor vessel material to 80-85% of its original condition, which makes it possible to operate the Armenian NPP even after 2026. A proposal was formulated for Armenian partners to begin consultations on the possibility of building new large and small NPP units at the site of the Armenian NPP, as well as on cooperation in the use of nuclear technologies for non-energy applications.

Cooperation with India

In 2021, discussions on the allocation of a new site in India for the construction of a Russian-design NPP and a statement that the Indian party would make efforts to ensure that the new site is officially allocated in accordance with the previous agreements; the relevant wording was proposed by ROSATOM.
Cooperation with Kyrgyzstan

ROSATOM supported Kyrgyzstan’s initiative to supplement the current cooperation agenda with a number of innovative projects, including the construction of nuclear power plants based on small reactors and the digitisation of local communities.

Cooperation with the USA

As part of legal procedures for terminating the agreements and arrangements made to implement the US–Russian IGA dated 18 February 1993 on the use of highly enriched uranium extracted from nuclear weapons, the Government of the Russian Federation issued an order on terminating the Agreement between the Ministry of Atomic Energy of Russia and the United States Department of Energy dated 24 March 1999 Concerning the Transfer of Source Material to the Russian Federation, and the relevant diplomatic note was sent to the American party by the Ministry of Foreign Affairs of Russia.

In coordination with the Russian Ministry of Foreign Affairs, procedures were developed to resume verification activities (suspended in 2020 because of the pandemic) under the US–Russian IGA on cooperation regarding plutonium-producing reactors.

Cooperation with Germany

Despite Germany’s decision to abandon nuclear power, a regular dialogue was maintained with officials from key ministries and the business community on topics of mutual interest.

Together with the German Federal Ministry for Economic Affairs and Climate Action, a regular meeting of the joint Russian–German expert working group on reactor safety, SNF management and the permanent isolation of radioactive waste was held.

ROSATOM participated in the work of the Russian–German Steering Committee on Nuclear Science Cooperation. A joint research project on long-term storage and reprocessing of high-level radioactive waste was launched. The management of spent nuclear fuel and radioactive waste accumulated in Germany was discussed. Potential cooperation with the German party to promote the Proryv Project in Europe was discussed.

Cooperation with France

ROSATOM gives priority to the development of cooperation with France, including in the field of science. During the World Nuclear Exhibition 2021, the Declaration of Intent on R&D collaboration to demonstrate recyclability of spent MOX fuel was signed on behalf of the management of ROSATOM, the French Alternative Energies and Atomic Energy Commission and EDF. Successful implementation of the project will provide important evidence of a responsible approach to addressing the nuclear fuel cycle back-end issues in the context of an active debate about the sustainability of nuclear power.

Cooperation in Africa

Support was provided to enable a timely submission of the Russian application to the Ghana Atomic Energy Commission (GAEC) to participate in the pre-bid request for information for the construction of a nuclear power plant in Ghana.

ROSATOM took part in organising and holding the Second Youth Forum ‘Russia – Africa: Nuclear Education for Sustainable Development’ in November 2021 at the Peoples’ Friendship University of Russia (RUDN University). Representatives from more than 50 African states, including Burundi, Egypt, Ethiopia, Zambia and Zimbabwe, participated in the event.

Humanitarian aid to Syria

The Corporation provided humanitarian aid worth a total of RUB 10 million to Syria. The funds were used to purchase 40 ventilators and other medical equipment. As part of a project titled ‘Palmyra in Time and Space’, two high-technology scanners were purchased to create a 3D model of Palmyra’s architectural sites.

See also the chapter ‘Business Development Report’.

1.5.3. Cooperation with international organisations

ROSATOM continued to actively participate in international organisations and forums in order to contribute to developing international rules and standards on nuclear power.

ROSATOM participated in all specialised international conferences and meetings held by the IAEA and the OECD NEA. Over 2,000 Russian experts participated in more than 600 events held by international organisations (due to the pandemic, some of them were held online). 48 events under the auspices of the IAEA and the OECD NEA were held in Russia (including in the online format).

Commitments to pay contributions to the IAEA and the OECD NEA were met in full within the scope of ROSATOM’s competences.
Implementation of the industry-wide programme to train Russian personnel for international organisations continued. In 2021, in addition to the Human Resources Division of the IAEA, the Human Resources Team of the OECD NEA and the Human Resources Department of the ITER Organisation, WANO officials participated in the programme.

The participation (in the online format) of the IAEA Director General Rafael Mariano Grossi and the OECD NEA Director General William D. Magwood in the ceremony to mark the start of concreting of the foundation of the BREST-OD-300 reactor in Seversk in June 2021 was organised.

ROSATOM’s delegation took part in the 26th UN Climate Change Conference (November 2021, Glasgow), which was attended by over 40,000 participants, including national leaders and global companies.

The former and current Executive Secretaries of the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Treaty Organisation (CTBTO Preparatory Commission) Lassina Zerbo and Robert Floyd visited Russia.

As part of regular meetings between deputy heads of ROSATOM and Rostekhnadzor, a single interdepartmental action plan was developed to promote Russian interests in the field of international regulation of the safe use of nuclear energy.

Russia’s presence in specialised international organisations was expanded. In 2021, six Russian specialists from the pool of experts formed by ROSATOM were posted to work in international organisations.

**International Atomic Energy Agency (IAEA)**

ROSATOM played a key role in the events of the 65th session of the IAEA General Conference. Resolutions adopted following the conference fully accommodate the interests of the Russian nuclear industry.

In his speech, the head of the Russian delegation put forward a proposal to hold the first IAEA International Ministerial Conference on Small Modular Reactor Technologies in Russia.

During the 65th session of the IAEA General Conference, the first meeting of the Group of Vienna under the IAEA Director General was held involving key players in the global nuclear market. It resulted in a statement from the participants recognising the nuclear industry’s contribution to the achievement of global climate targets.

The Government of the Russian Federation issued an order to increase the target contribution to the IAEA Technical Co-operation Fund in 2022 and 2023.

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

Agreements were concluded on the participation of ROSATOM and other Russian organisations in three international projects under the auspices of the OECD NEA.

Arrangements were made for Russian participation in seven international projects and three OECD NEA programmes aimed at improving NPP safety, developing education and personnel training in the nuclear industry, addressing matters related to nuclear science and designing innovative new-generation nuclear reactors.

**Commission of the CIS Member States on the Peaceful Use of Nuclear Energy**

As part of the implementation of the CIS Intergovernmental Target Programme (ITP) for Remediation, assistance was provided to the Kyrgyz and Tajik parties in ensuring the safety of former uranium mining facilities. At the meeting of the Council of Heads of State of the CIS on 12 November 2021, ROSATOM’s report on programme implementation was approved. The meeting adopted a resolution approving the report on the implementation of the ITP in 2020 and determining the amount of funding for 2022. In Kyrgyzstan, the construction of transportation and logistics infrastructure required for the decommissioning of one of the most hazardous tailings facilities, Tuyuk Suu, is nearing completion. In Tajikistan, the winners of the tender for work under the ITP were announced. Contracts will be signed and practical work will begin in the first quarter of 2022. Work under the ITP is scheduled to be completed by the end of 2023.

ROSATOM drafted a number of resolutions of the CIS Economic Council:

1. **The resolution dated 12 March 2021 on the approval of the Programme for the Joint Use of the KTM Tokamak from 2021 through 2023;**
2. **The resolution dated 18 June 2021 on granting JSC TVEL the status of the Basic Organisation of the CIS States for SNF and RAW Management and the Decommissioning of Facilities Posing Nuclear and Radiation Hazards.**

In 2021, funding totalling RUB 40 million was provided in the form of a grant from the Ministry of Science and Higher Education as part of the Russian Government Programme titled “Scientific and Technological Development of the Russian Federation” to finance activities carried out by Russian organisations as part of the KTM Research Programme between 2021 and 2023. Separate R&D Cooperation Agreements were signed between the National Nuclear Centre of the Republic of Kazakhstan and the principal contractors under the Research Programme: NRC Kurchatov Institute and JSC Red Star, in accordance with the terms and conditions of the grant.

In order to accomplish the objectives of the ATOM – CIS Cooperation Framework Programme for Cooperation between the CIS Member States in the Peaceful Use of Nuclear Energy until 2030, ROSATOM provided support for the work of the Basic Organisation for Personnel Training (NRNU MEPhI) and the Basic Organisation for the Safety of Nuclear Research Facilities (SSC RIAR).
European Union (EU)

Consistent efforts were made to ensure that nuclear energy is recognised as ‘sustainable’. To achieve this goal, a dialogue was maintained with the EU Delegation to the Russian Federation. In May 2021, ROSATOM participated in a meeting of the EU–Russia Dialogue on the European Green Deal. In October 2021, EU ambassadors visited JSC Angarsk Electrolysis Chemical Plant to obtain an overview of environmental projects being implemented by ROSATOM in the Irkutsk Region.

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

In May 2021, the visit of the IAEA Deputy Director General Massimo Aparo to Russia (Moscow, Obninsk) was organised. This visit resulted in the signing of practical arrangements between the IAEA and ROSATOM’s Technical Academy on cooperation in safeguards capacity building for IAEA Member States.

In order to optimise the process for ensuring compliance with export control legislation during NPP construction abroad, a Reference Book for the Identification of Equipment for NPPs with VVER Reactors during Identification Examination for Export Control Purposes (a Reference Book on the KKS System for NPPs) was prepared, approved by the FSTEC of Russia and submitted to the Federal Customs Service of Russia for use at customs posts. For the sake of convenience, the Reference Book was digitised and uploaded to the Integrated Industry-Wide Regulatory Reference System. As a result, in 2021, ROSATOM’s organisations began to work in a common information space when carrying out export control and preparing identification reports.

On the initiative of ROSATOM’s International Business Unit, the Federal Customs Service of Russia established a joint working group with ROSATOM and the FSTEC of Russia to improve customs formalities regarding equipment supplied for NPP construction under intergovernmental agreements.

A Memorandum of Cooperation in enforcing export control procedures for products supplied to NPPs as part of projects carried out under intergovernmental agreements was prepared and signed by the Federal Customs Service and ROSATOM during the International Customs Forum on 22 October 2021.

In addition, amendments were made to ROSATOM’s executive documents governing export control matters. More specifically, an industry-wide identification centre was established at JSC State Scientific Centre of the Russian Federation – Lepyunksi Institute for Physics and Power Engineering and was granted the relevant special licence by the FSTEC of Russia.

These measures made it possible to create an organisational and regulatory framework for the digitisation of the export control process in the industry and to streamline communication with federal government agencies when supplying products for foreign NPPs in the future.

467 draft 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.

Proposals were prepared to amend the List of Dual-Use Goods and Technologies That Can Be Used to Create Weapons and Military Equipment and Are Subject to Export Control, as approved by Decree No. 1661 of the President of the Russian Federation dated 17 December 2011.

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.

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

ROSATOM’s representatives in embassies and trade missions of the Russian Federation, as well as under the Permanent Mission of the Russian Federation to International Organisations in Vienna (Austria) and the Permanent Mission of the Russian Federation to the European Union in Brussels (Belgium) continued their work.

In 2021, overseas representatives operated in 15 countries worldwide and supported ROSATOM’s overseas projects, even in the special circumstances of the pandemic. The representatives assisted in obtaining authorisations from local governments to import a Russian vaccine, Sputnik V, into the countries where ROSATOM is implementing its key projects and to use it to immunise personnel working at NPP and NRTC construction sites.

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

In 2021, ROSATOM worked to promote Russian nuclear energy technologies on the global markets in an international environment that had deteriorated considerably.
Efforts to create a favourable international environment for the development of the Russian nuclear power industry are made in close cooperation with the relevant ministries and agencies of the Russian Federation. ROSATOM helps to maintain the credibility of the Russian nuclear industry in the international arena through unconditional fulfilment of its obligations, including the supply of fuel, equipment and services, regardless of the current political situation.

1.5.7. PLANS FOR 2022 AND BEYOND

ROSATOM will continue to provide political support for major overseas projects in accordance with the agreed schedules and 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. ROSATOM will take the relevant steps in the context of unprecedented massive sanctions imposed by the United States and the European Union on the Russian Federation.

The Corporation will expand cooperation in personnel training for international organisations, with the Human Resources Department of WANO to be engaged in the initiative along with the IAEA and the ITER Organisation.

ROSATOM plans to intensify cooperation in making nuclear power more acceptable for society and fostering public demand for it.

To achieve its objectives, the Corporation will continue bilateral cooperation and work with specialised international organisations and institutions, as extensive international cooperation is a necessary prerequisite for the long-term, sustainable and safe development of nuclear power.

1.6. PERFORMANCE OF GOVERNMENT FUNCTIONS

Key results in 2021:

— Government orders were 100% fulfilled.
— ROSATOM participated in the consideration of approximately 450 bills.
— Consolidated revenue from other products of NWD organisations totalled RUB 92.0 billion.
— Overall performance against the targets set in the government programme of the Russian Federation ‘Development of the Nuclear Power and Industry Complex’ in 2021 was assessed at 100.98%.

1.6.1. Performance of the Nuclear Weapons Division

Fulfilment of the state defence order

The Corporation supports the implementation of government policy on the development of the nuclear industry and ensures the completion of tasks set in the state armament programme and the state defence order (hereinafter referred to as SDO). The NWO operations are managed by ROSATOM’s Nuclear Weapons Directorate.

ROSATOM and its NWD organisations fulfilled the SDO for 2021 in full.

In addition, the Interdepartmental Distributed Centre for Radiation Testing of Basic Electronic Components (hereinafter referred to as the IDCRT) is being established in collaboration with the Russian Ministry of Defence, the Russian Ministry of Industry and Trade, the Russian Ministry of Education and Science, State Corporation ROSCOSMOS and the National Research Centre Kurchatov Institute. The Regulations on the IDCRT have been approved by the Board of the Military-Industrial Commission, and the provisions on the IDCRT Coordination Council and its composition have also been approved.

In 2021, ROSATOM traditionally participated in the ARMY 2021 International Military and Technical Forum. Exhibition displays arranged jointly by ROSATOM and the Russian Ministry of Defence received praise from top government officials and forum organisers.

Operations in the civilian sector

To promote the growth of output of high-technology civilian products in the Nuclear Weapons Division, in 2021, the Development and Globalisation Board approved strategies for the following five new business areas: Applied Superconductivity, Power Electronics, New Materials for Electrical Engineering, Special Medical Equipment, and...
Large Electrical Machines. Furthermore, the growth targets set for high-technology civilian products of the NWD and the pipeline of projects aimed at developing and promoting new high-technology products and services, developing new businesses and utilising the production capacities of NWD organisations were approved in the updated industry-wide programme to diversify manufacturing operations of ROSATOM’s organisations included in the consolidated register of organisations forming part of Russia’s military-industrial complex.

The Special Medical Equipment Strategy involves developing a number of innovative devices that are unparalleled in the world, are capable of replacing imported analogues and outperform foreign competitors in terms of several key characteristics, and introducing them into medical practice.

One example is the TIANOX device, which uses a unique gas discharge technology for synthesising nitric oxide from air; the device is designed for treating all forms of pulmonary hypertension. Another example is a diode-pumped laser lithotripter with microsecond pulse duration; this is a device designed for kidney stone fragmentation during the treatment of urolithiasis.

Taken together, products manufactured by NWD organisations as part of the Special Medical Equipment Strategy will enable the medical community to provide more effective therapy and rehabilitation to patients with various diseases, thereby contributing to the achievement of targets set for the Healthcare National Project.

Measures to improve the performance of NWD organisations, including R&D for military, special and dual-use applications

In order to streamline ROSATOM’s NWD and improve its performance, with federal nuclear organisations acting as the centres of integration of R&D, production and technological capabilities, the reorganisation of FSUE Mars Moscow Experimental Design Bureau through a merger with FSUE VNIIA was completed on 29 December 2021 pursuant to Decree No. 204 of the President of the Russian Federation dated 23 March 2020.

In accordance with instructions No. Pr-1992 to Pr-1996 of the President of the Russian Federation dated 28 November 2020, starting from 2020, ROSATOM has been working to establish the National Centre for Physics and Mathematics (NCPM) in order to obtain new world-class R&D results, train highly qualified researchers, expand the talent pool of ROSATOM’s Nuclear Weapons Division and key research institutions in Russia, and make Russian science more attractive to young researchers. All scheduled project activities were completed on time in 2021.

The project to establish the National Centre for Physics and Mathematics has been declared a federal project included in the government programme of the Russian Federation ‘Development of the Nuclear Power and Industry Complex’.

The project’s outcomes contribute to the achievement of Russia’s national development goals of supporting decent and productive work and successful entrepreneurship and providing opportunities for self-fulfilment and the unlocking of talent.

In 2021, 286 R&D results were recorded in the single national register of R&D results for military, special and dual-use applications. Furthermore, 239 resolutions were adopted on legal protection of intellectual property (IP) generated as a result of R&D under government contracts, including 177 inventions, 38 computer software programs, 19 utility models, three items of know-how, one integrated circuit layout and one industrial design.

In 2021, intangible assets related to IP for military, special and dual-use applications contributed more than RUB 1,200 million to the capitalisation of the NWD.

As part of the efforts to improve the performance of NWD organisations, steps were taken to facilitate the development and sustainable operation of shared research facilities and industry-wide technology centres. In 2021, the centres’ consolidated revenue totalled RUB 5,800 million.

As part of innovative cooperation and development initiatives, in 2021, ROSATOM cooperated with the ERA Military Innovation Technopolis in Anapa (hereinafter referred to as the ERA Technopolis) on the development of clusters within the competence of ROSATOM, the activities of the ERA Technopolis Council and the granting of the Technopolis Member status to the interested enterprises and organisations.

In 2021, ROSATOM participated in law drafting in accordance with the Law Drafting Plan of ROSATOM for 2021 approved by Order No. 1/1679-P of ROSATOM dated 30 December 2020, which was implemented in full, and in accordance with instructions from the President of the Russian Federation and the Government of the Russian Federation.

1.6.2. Law drafting

In 2021, ROSATOM participated in law drafting in accordance with the Law Drafting Plan of ROSATOM for 2021 approved by Order No. 1/1679-P of ROSATOM dated 30 December 2020, which was implemented in full, and in accordance with instructions from the President of the Russian Federation and the Government of the Russian Federation.
As part of the exercise of its regulatory powers, in 2021, ROSATOM launched and supported the adoption of critical legislative initiatives addressing prioritised strategic tasks and promoting the development of various areas of operation 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.

**Legislative initiatives on radioactive waste management**

In the sphere of RAW management, in order to ensure the implementation of activities included in Sub-Programme No. 4 ‘Development of Production of Traditional and New Materials’ forming part of the government programme of the Russian Federation to develop industry and make it more competitive, with a focus on the extraction and processing of minerals with high radionuclide content, ROSATOM supported the development of Federal Law No. 421-FZ of 21 December 2021 on Amending Article 28 of the Federal Law on the Management of Radioactive Waste and on Amending Certain Laws of the Russian Federation.

This Federal Law allows the disposal of waste from the proposed hydrometallurgical plant that will process ores from the Tomtor rare-earth metal deposit at the existing special radioactive waste disposal site of PJSC Priargunsk Mining and Chemical Production Association, which will enable the use of existing infrastructure instead of building new RAW storage facilities.

**Legislative initiatives for the expansion of shipping along the Northern Sea Route**

In the reporting year, ROSATOM took steps for the adoption of Federal Law No. 94-FZ of 20 April 2021 on Amending Article 5.1 of the Merchant Shipping Code of the Russian Federation, which makes it possible to introduce a mechanism for concluding long-term contracts whereby nuclear icebreakers will escort vessels along the Northern Sea Route on a regular basis.

**Legislative initiatives in the sphere of supervision and control**

To maintain the existing mechanism of legal regulation of control and supervision of the use of nuclear energy, including with regard to federal nuclear organisations, in 2021, ROSATOM ensured that the following provisions were incorporated into Federal Law No. 170-FZ of 11 June 2021 on Amending Certain Laws of the Russian Federation due to the Adoption of the Federal Law on Government Control (Supervision) and Municipal Control in the Russian Federation:

- Excluding government control over the safe and secure transportation of nuclear materials, radioactive substances and products made from them from the scope of Federal Law No. 248-FZ of 31 July 2020 on Government Control (Supervision) and Municipal Control in the Russian Federation (hereinafter referred to as Federal Law No. 248-FZ);
- Establishing the authority of the Government of the Russian Federation to approve regulations on licensing control of the operations of organisations that use nuclear materials and radioactive substances as part of the use of nuclear energy for defence purposes;
- Establishing the authority of the Government of the Russian Federation to approve the procedure for developing federal standards and rules governing the safety and security of nuclear weapons and military nuclear power installations;
- Establishing the special features of the pre-trial appeal procedure regarding control (supervision) activities if the investigation of a complaint involves the use of information and documents constituting state secret or other secrets protected by the law.

In order to align the provisions of Federal Law No. 248-FZ and the Urban Development Code of the Russian Federation with respect to the authority of regulatory bodies to approve the procedure for federal state construction supervision at the facilities of federal nuclear organisations, ROSATOM drafted the relevant amendments and took steps to ensure that they are incorporated in Federal Law No. 408-FZ of 6 December 2021 on Amending Certain Laws of the Russian Federation.

In parallel with the reform in the sphere of control and supervision, the Corporation, along with government agencies and leading legal institutions, continued to participate in the drafting of new versions of the Code on Administrative Offences and the Procedural Code of the Russian Federation.

**Legislative initiatives on hazard class 1 and 2 waste management**

In order to improve the mechanism for tariff regulation of operations of the federal operator responsible for hazard class 1 and 2 waste management and to develop the federal framework for the management of hazard class 1 and 2 waste, the Corporation, jointly with the Ministry of Natural Resources and Environment of Russia, drafted Federal Law No. 356-FZ of 2 July 2021 on Amending Certain Laws of the Russian Federation.
Legislative initiatives on engagement with government institutions and the business community

Participation in initiatives to improve industry-wide and cross-industry legislation and effective cooperation with various governmental institutions and the business community are a vital prerequisite for the sustainable development of ROSATOM and its organisations.

For instance, in the reporting year, the Corporation implemented legislative initiatives not only in the field of nuclear power but also in the fields of administrative, environmental and social legislation; legislation on the contracting system in procurement for government and municipal needs; and urban planning legislation.

These initiatives included passing the following federal laws:

— Federal Law No. 133-FZ of 30 April 2021 on Amending the Federal Law on the State Defence Order;
— Federal Law No. 66-FZ of 5 April 2021 on Amending the Federal Law on the State Defence Order;
— Federal Law No. 360-FZ of 2 July 2021 on Amending Certain Laws of the Russian Federation, which is aimed at comprehensive improvement of legislation on the contracting system, including the procedure for selecting suppliers (contractors), the relevant selection methods and applying the relevant procedures;
— Federal Law No. 270-FZ of 1 July 2021 on Amending the Federal Law on the Procedure for Departure from and Entry into the Russian Federation and Article 5 of the Federal Law on the Legal Status of Foreign Nationals in the Russian Federation, which details the mechanism for obtaining and extending visas for foreign nationals studying in ROSATOM’s educational institutions under academic programmes focused on the use of nuclear energy;
— Federal Law No. 477-FZ of 30 December 2021 on Amending Certain Laws of the Russian Federation, which is aimed at improving the legal regulation of matters related to the establishment and functioning of priority social and economic development areas;
— Federal Law No. 296-FZ of 2 July 2021 on Limiting Greenhouse Gas Emissions, which establishes a framework governing relations in the sphere of economic and other activities generating greenhouse gas emissions and defines a set of measures to limit greenhouse gas emissions, including state accounting and implementation of climate projects;
— Federal Law No. 414-FZ of 21 December 2021 on the Public Authority Framework in the Constituent Entities of the Russian Federation, which preserves the special features of the exercise of powers by the governments of constituent entities of the Russian Federation in closed administrative and territorial formations, science towns and priority social and economic development areas;
— Federal Law No. 426-FZ of 21 December 2021 on Amending Article 28.1 of the Code on Administrative Offences of the Russian Federation, which clarifies the grounds for instituting administrative proceedings in the sphere of the state defence order.

As part of the exercise of its regulatory and legislative powers, in 2021, ROSATOM reviewed a total of about 450 legislative initiatives, more than half of which directly or indirectly affected the interests of the Corporation.

Plans for 2022

Plans for 2022 and beyond in the sphere of law drafting include the following:

— Improving legislation on hazard class 1 and 2 waste management;
— Updating the powers and functions of the Corporation in the sphere of government control of the development and sustainable operation of the Northern Sea Route, including the powers and functions under the Greater Northern Sea Route Project;
— Improving the legal regulation of special use areas and simplifying the procedure for establishing, transforming and abolishing such areas;
— Aligning the Corporation’s powers with the provisions of budget legislation;
— Improving administrative legislation as part of the drafting of a new version of the Code on Administrative Offences;
— 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 the reporting year, the government programme of the Russian Federation ‘Development of the Nuclear Power and Industry Complex’ was being implemented.

Overall performance under the government programme ‘Development of the Nuclear Power and Industry Complex’ was assessed at 100.98%. This assessment reflects progress on measures scheduled and the achievement of targets set for 2021, as well as the amount of budgetary and extra-budgetary financing used for implementing the measures stipulated in the government programme.
In 2021, activities 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 100% implemented.

The implementation of the programme is aimed at supporting the achievement of national development goals set by the President of the Russian Federation for the coming decade; it is aligned with the principles and provisions applied to national projects.

**1.6.4. Implementation of federal target programmes**

In 2021, ROSATOM’s organisations implemented measures forming part of two federal target programmes (FTPs).

Funding allocated for the implementation of the FTPs (for the part of their scope on which information is publicly available) totalled RUB 33,967,624,500, including RUB 18,560,755,200 from the federal budget and RUB 15,406,869,300 from extra-budgetary sources.

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

Summary of property of ROSATOM, its organisations and enterprises under its jurisdiction

As at 31 December 2021, ROSATOM kept centralised 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 and enterprises under its jurisdiction is recorded in the Automated Property Management System of ROSATOM (APMS).

As at 31 December 2021, centralised records of real property of nuclear organisations in the APMS covered 362 organisations, including 13 federal state unitary enterprises with an authorised capital totalling RUB 267,188.12 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.

The Corporation 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;

**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 ROSATOM 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.

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Property of enterprises under ROSATOM's jurisdiction

As at 31 December 2021, there were 13 federal state unitary enterprises under ROSATOM's jurisdiction.

In 2021, ROSATOM took the following steps:

— FSUE LUCH Research and Production Association, Research and Development Institute was transformed into a joint-stock company pursuant to Decree No. 571 of the President of the Russian Federation dated 25 November 2019 on the Federal State Unitary Enterprise LUCH Research and Production Association, Research and Development Institute. Record No. 1215000075971 was made in the Unified State Register of Legal Entities on 26 July 2021 regarding the establishment of a legal entity through reorganisation in the form of transformation;

— FSUE Mars Moscow Experimental Design Bureau was merged with FSUE Dukhov Automatics Research Institute (VNIIA) pursuant to Decree No. 204 of the President of the Russian Federation dated 23 March 2020 on the Reorganisation of the Federal State Unitary Enterprise Dukhov Automatics Research Institute. Record No. 2217712075271 was made in the Unified State Register of Legal Entities on 29 December 2021 regarding the reorganisation of FSUE VNIIA through a merger with FSUE Mars Moscow Experimental Design Bureau.

To enable effective use of real property and protect the rights and legitimate interests of owners and holders of these rights, in 2021, 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 2021 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 2021, the Russian Federation registered its title to 96 items of real property (buildings and structures).

As at 31 December 2021, enterprises under ROSATOM's jurisdiction concluded a total of 299 agreements granting a lease of real property with a total floor space of 408,970 m².

According to reports of enterprises under ROSATOM's jurisdiction, as at 31 December 2021:

— A total of 13,205 items of real property was under the economic management of these enterprises;

— The floor space of the items of real property under the economic management of the enterprises totalled 34,438,610 m²;

— The initial book value of the items of real property under the economic management of the enterprises totalled RUB 268,667,251,920;

— The residual book value of the items of real property under the economic management of the enterprises totalled RUB 225,313,159,330;

— The number of land plots used by the enterprises totalled 89,561.04 hectares;

— The cadastral value of the land plots totalled RUB 242,979,979,620;

— The authorised capital of the federal state unitary enterprises totalled RUB 267,198.12 million.

Property of ROSATOM's organisations

21 non-core assets owned by joint-stock companies in which ROSATOM has a shareholding exceeding 25% were restructured in 2021.

More specifically:

— 18 assets were sold;

— 1 asset was transferred free of charge to municipalities;

— 2 assets were liquidated (written off).

Proceeds from the sale of these non-core assets totalled RUB 132.3 million.

59 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 2021.

More specifically:

— 17 assets were sold;

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

— 15 assets were liquidated (written off).

Proceeds from the sale totalled RUB 39 million.

As at 31 December 2021, ROSATOM’s organisations concluded a total of 2,694 agreements granting a lease of real property with a total floor space of 2,667,460 m².
According to reports of ROSATOM’s organisations, as at 31 December 2021:

A total of real property owned by these organisations, items 22,398
Total floor space of the items of real property on the balance sheet of the organisations, '000 m² 49,983.60
Initial book value of the items of real property, RUB '000 878,198,343.74
Residual book value of the items of real property, RUB '000 692,020,687.89
Total number of land plots used by the organisations, pcs. 3,525
Total area of land plots used by the organisations, hectares 86,495.42
Cadastral value of the land plots, RUB '000 140,435,776.53

1.7. DEVELOPMENT OF THE NORTHERN SEA ROUTE

Key results in 2021:
— Cargo traffic totalled about 35 million tonnes (against a target of 31 million tonnes).
— The first follow-on multipurpose nuclear icebreaker, Sibir, was accepted into service.
— A seafloor topography survey was conducted along the Northern Sea Route covering 83,600 adjusted kilometres.
— The design of the Integrated Platform for Digital Services Provided along the NSR was started.
— A programme was launched to build modernised floating power units to supply power to the Baimsky Mining and Processing Plant.

1.7.1. ROSATOM’s powers related to development and operation in the Arctic

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 Federal Project, which forms part of the Comprehensive Plan for Upgrading and Expanding Core Infrastructure until 202432, 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. ROSATOM has also prepared the NSR Infrastructure Development Plan until 2035 approved by the Russian Government and participates in its implementation.

Starting from 2020, navigation along the NSR is managed by the Marine Operations Headquarters of FSUE Atomflot, which provides icebreaker support and escorts vessels along the NSR in accordance with amendments to the Rules of Navigation along the NSR approved by a decree of the Government of the Russian Federation.

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.

Icebreakers and onshore infrastructure are operated by FSUE Atomflot, an organisation of ROSATOM which has the status of a federal nuclear organisation.

As at 31 December 2021, the nuclear-powered icebreaker fleet included:
— Two Project 22220 nuclear icebreakers equipped with a RITM-200 integral reactor unit whose power exceeds 80,000 h.p.: Arktika and Sibir, which was put into service in 2021;
— 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 Vyborg;
— Severnaya, a nuclear-powered LASH carrier with a 40,000 h.p. one-reactor nuclear propulsion unit;
— Imandro and Lotto floating maintenance bases;
— Sevyazyanka, 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 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 110 million tonnes per year. In 2021, an additional target was set for the Federal Project, namely the total capacity of seaports situated along the NSR: by 2024, it should total 83 million tonnes per year, and by 2030 it is expected to reach 115 million tonnes per year.

In the reporting year, the targets set for the Federal Project were met ahead of schedule, with cargo traffic totalling 34.9 million tonnes (against a target of 31 million tonnes), including 25.9 million tonnes transported by vessels escorted by nuclear icebreakers.

In February 2021, the 50 Let Pobedy nuclear icebreaker (operated by FSUE Atomflot) escorted the Christophe de Margerie LNG carrier (operated by PJSC Sovcomflot). For the first time in the history of Arctic navigation during this season, a nuclear icebreaker escorted a vessel from Cape Dzhenev along the entire Northern Sea Route. The ships covered a distance of 2,449 nautical miles. The fact that a Yamalmax gas tanker has been successfully escorted along the NSR demonstrates that the nuclear-powered icebreaker fleet is ready for a significant extension of the navigation season along the Northern Sea Route.

In early December, FSUE Atomflot completed a unique operation to retrieve more than 20 vessels that were unable to navigate independently along the NSR because of adverse ice conditions.

Between July 2021 and March 2022, ROSATOM, jointly with the Marine Research Centre of Lomonosov Moscow State University, conducted pilot studies focused on environmental monitoring of the Northern Sea Route with assistance from leading Russian and foreign experts in this area. The findings of field studies conducted at 50 offshore monitoring stations in Arctic seas indicate that currently, Arctic shipping does not make any significant negative impact on the environment along the NSR. The scale of man-made impacts on the environment in the region does not exceed the long-term average level. In order to develop a comprehensive environmental monitoring programme for the NSR to ensure that the development of Arctic shipping is sustainable and to continuously monitor the status of marine ecosystems in the Arctic, it was decided to extend the project for another year and invite leading international environmental experts to participate in it.

1.7.3. Construction of new icebreakers

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 first follow-on Project 22220 multipurpose nuclear icebreaker, Sibir, was accepted into service; it is equipped with a RITM-200 integral reactor unit whose power exceeds 80,000 h.p.

By year-end 2021, three more Project 22220 multipurpose nuclear icebreakers, Ural, Chukotka and Yakutia, were under construction, they are scheduled to be commissioned in 2022, 2024 and 2026 respectively.

In the Far East, the construction of a unique Project 10510 (Lider-class) 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.

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

A contract was concluded in July 2021 to create a fleet of port vessels to provide towing services at the offshore liquefied natural gas (LNG) transshipment facility.

Extending the service life of icebreakers

In April 2021, work was completed to extend the service life of the reactor units of the Taimyr and Voygoch nuclear icebreakers to 235,000 hours and to extend their operational life to 36 years.

As a result, the company will be able to prevent the risk of unavailability of icebreakers and to start operating Project 22220 multipurpose nuclear icebreakers according to plan. Shipping traffic along the NSR is growing year by year. Service life extension measures enable FSUE Atomflot to properly 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 2021, 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 caissons of the Lepse floating maintenance base were moved to a special storage site of FSUE Atomflot.
In 2021, FSUE Hydrographic Enterprise set a new record in the history of modern Russia in terms of the scope of surveys along the NSR. During the 2021 summer/autumn navigation season, seafloor topography surveys by FSUE Hydrographic Enterprise covered a total of 83,600 adjusted kilometres (which is equivalent to 41,500 linear kilometres). Thus, the scope of surveys along the NSR almost doubled (in 2020, the surveys covered 46,600 adjusted kilometres). Although the hydrometeorological situation and ice conditions posed significant challenges to navigation in 2021, performance against the targets set for hydrographic operations in the Navigational and Hydrographic Support Plan (NHSP) stood at 102.5%.

In accordance with the NHSP, in 2021, the enterprise also installed standalone power sources on 17 light beacons, installed and removed 96 sea buoys and carried out maintenance of 193 onshore aids to navigation. In the future, surveys will continue at a rapid pace in order to increase the number of recommended routes along the Northern Sea Route. Between 2011 and 2020, the scope of surveys along the NSR totalled 377,000 adjusted kilometres, whereas between 2021 and 2025, surveys are expected to cover 430,000 adjusted kilometres.

In 2021, new buoys were installed on the Sea Canal (the navigable approach canal in the Gulf of Ob, Kara Sea). Buoys equipped with Automatic Identification System (AIS) stations were installed for the first time to enable safe navigation. The new buoys were installed as part of the renovation of the Sea Canal after a new turning area was created in its northern section.

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

A programme to upgrade three research vessels was launched in the reporting year, and the construction of two Ice3 class Project 83.6 hydrographic survey boats and the two Ice3 class Project 83.03 buoy tenders was continued. These vessels are designed to operate in ports situated along the NSR, enable safe navigation and develop port infrastructure, as well as to position, service and deliver navigation and radio equipment and specialists to onshore facilities.

In September 2021, FSUE Hydrographic Enterprise completed dredging work in the approach canal and the basin of the Uternniy terminal for liquefied natural gas and stable gas condensate in the seaport of Sabetta. A total of more than 24 million m³ of material was excavated over three years. As a result of the dredging work in the approach canal and in the basin of the Uternniy terminal, the bottom elevation of navigable routes has reached minus 15 metres according to the 1977 Baltic Height System (BHS), whereas at the beginning of the work in some areas the natural depth did not exceed 2 to 3 metres.
The current dimensions of the approach canal and the basin of the terminal make it possible to accommodate the largest design vessel: a Yamalmax LNG carrier, which is 299 metres long and 50 metres wide and has a draft of up to 12 metres.

Construction of ice protection structures for the basin of the Utrenniy terminal continued. In order to build the ice protection structures, 3,873 piles were driven by the end of 2021.

Dredging work was completed as part of the first stage of the renovation of the Sea Canal (the navigable approach canal in the Gulf of Ob, Kara Sea). Between 2020 and 2021, more than 47 million m³ were dredged (32.5 million m³ in 2020 and 15.1 million m³ in 2021).

During the first stage of the renovation, the Sea Canal was widened from 295 metres to 475 metres; an additional turning area with a width of 573 metres was created, and a second bend with a width of 475 metres was built. The canal is 51.6 kilometres long, with a design bottom elevation of minus 15.1 metres according to the BHS. In addition, to ensure navigation safety, 32 buoys were installed along the canal.

In 2021, the enterprise also completed remediation measures aimed at replenishing aquatic wildlife in order to repair environmental damage from construction and operation in the reporting year. Between July and September 2021, 3.3 million juvenile Siberian sturgeon, 25.6 million juvenile whitefish (muksun) and 3 million juvenile broad whitefish were released into water bodies forming part of the Ob and Irtysh basin. Construction work at the sites was accompanied by industrial environmental monitoring and the tracking of changes in all components of the ecosystem.

For details on ROSATOM’s impact on biodiversity, see the section “Impact on Local Flora and Fauna” in the chapter “Safety Report”.

1.7.5. New business areas

Integrated NSR Digital Service Platform

In 2021, ROSATOM finalised the concept of the Integrated Platform for Digital Services Provided along the Northern Sea Route. The concept involves integrating various digital services and databases designed to ensure safe navigation and dispatch the fleet along the NSR, servicing up to 1,500 unique users, who will be offered 27 digital products grouped into 9 clusters: safe navigation; navigation management; navigational and hydrographic support; hydrometeorological support and ice conditions; analytics on safety, NSR performance and development; NSR infrastructure management; information support for cargo transportation; the register of services provided along the NSR, environmental monitoring along the NSR. Plans also include providing a ‘one-stop-shop’ function for user convenience.

The Integrated NSR Digital Service Platform is being developed as part 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[^1], with ROSATOM appointed as responsible contractor.

Digitisation in FSUE Atomflot

ROSATOM started to modernise the Automated Control System for the Navigation Management Centre of the Marine Operations Headquarters of FSUE Atomflot. The software package of the Automated Control System for the Marine Operations Headquarters enables navigation management, the monitoring of ice conditions and the navigation situation, hydrometeorological data collection and analysis.

The IT project to modernise the Automated Control System for the Marine Operations Headquarters will help to accomplish an important objective of digitising the enforcement by the Marine Operations Headquarters of the Rules of Navigation along the Northern Sea Route approved by Decree No. 1487 of the Government of the Russian Federation dated 18 September 2020. The Rules govern the piloting of vessels along the Northern Sea Route, providing the captains of vessels with detailed information on ice conditions and advising on routes for the vessels, taking into account areas that are potentially hazardous for navigation.

The modernisation of the Automated Control System for the Marine Operations Headquarters is supported by the IT project focused on developing the Integrated Digital Service Platform. It is expected to result in the development of a major IT platform not only for the digitisation of industry-specific business processes but also for providing competitive digital services to external customers.

Power generation fleet based on optimised floating nuclear power plants

The implementation of a comprehensive plan for an investment project to develop the Baimakaya Ore Zone prepared by the Ministry for the Development of the Russian Far East and Arctic has started. ROSATOM will supply four modernised floating power units (MFPUs) based on RITM-200 reactor units with installed capacity totalling at least 106 MW each.

As part of the implementation of the programme to build modernised floating power units to supply power to the Baimsky Mining and Processing Plant, a new company, JSC Chukotatomenergo, was established in December 2021; it will be the project operator. The design and construction of the power units have begun.

**Digitisation in FSUE Hydrographic Enterprise**

FSUE Hydrographic Enterprise is the only organisation in the Russian Federation that creates digital reference datasets (DRDSs) covering seaport areas and approaches to them with a controlling depth and provides these DRDSs to mariners, in accordance with Annex A to IHO Publication S-65, High Density ENCs, adopted by the International Hydrographic Organisation (IHO) in 2020.

Efficient and timely performance of the tasks assigned to FSUE Hydrographic Enterprise 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 organisation has been provided with modern automated hydrographic systems based on multibeam echo sounders, which are used for seafloor topography mapping along the NSR. Seafloor topography data are collected and processed and reports are prepared using state-of-the-art licensed software that makes it possible to conduct hydrographic surveys along the NSR, process the relevant data and prepare reports in accordance with the requirements of Publication S-44 of the International Hydrographic Organisation (IHO), Standards for Hydrographic Surveys.

Innovative activities of FSUE Hydrographic Enterprise include creating and updating departmental electronic navigational charts (ENCs) and digital reference datasets (DRDSs) covering the NSR that are compliant with applicable IHO standards. FSUE Hydrographic Enterprise has been registered with the International Hydrographic Organisation and has been assigned its own ENC producer code, R1.

In 2021, 259 ENCs covering the entire NSR were updated; 76 new DRDSs were created, and all of the organisation’s DRDSs comprising a total of 292 cells were kept up-to-date.

The ENCs and DRDSs created by the organisation are provided to mariners and updated in accordance with the requirements of IHO Publication S-57, IHO Transfer Standard for Digital Hydrographic Data. All ENCs and DRDSs provided by the organisation are protected against unauthorised access, copying and distribution in accordance with the requirements of IHO Publication S-63, IHO Data Protection Scheme.

In 2021, a total of 38 large-capacity vessels, primarily LNG tankers and nuclear icebreakers, as well as the Marine Operations Headquarters of FSUE Atomflot, were provided with updated ENCs and DRDSs.

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**1.7.6. Plans for 2022 and for the medium term**

- To meet the targets set under the Northern Sea Route 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 nuclear icebreaker;
- To accept the second follow-on Project 22220 icebreaker, Ural, into service in 2022;
- To continue the construction of a floating dock for Project 22220 multipurpose nuclear icebreakers;
- To commission five Arc4 ice-class tugboats;
- To commission two Ice3 class hydrographic survey vessels and two Ice3 class buoy tenders;
- To develop and implement automated vessel routing algorithms as part of development of the Automated Control System for the Navigation Management Centre of the Marine Operations Headquarters of FSUE Atomflot;
- To develop the Integrated NSR Digital Service Platform;
- To organise seafloor topography surveys along the NSR, in the Yenisei Gulf and the Yenisei and Kolyma Rivers;
- To organise maintenance, operation and infrastructure development of GLOMASS/GPS monitoring and correction stations in the Arctic;
- To organise the construction of facilities forming part of the Global Maritime Distress and Safety System;
- To develop the NSR port infrastructure, including completing the construction of ice protection structures for the basin of the Utrenny terminal in 2022;
- To commission the first two MFPUs in the area of Cape Nagloynyn by early 2027, with the third and fourth units to be commissioned by early 2028 and early 2031 respectively.
1.8. IMPLEMENTATION OF THE ECOLOGY NATIONAL PROJECT

The Ecology National Project is one of the national projects of the Russian Federation scheduled for implementation between 2019 and 2024; it is aimed at improving the environment in the country.

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, which form part of the Ecology National Project.

FSUE Federal Environmental Operator (FSUE FEO), an organisation of ROSATOM, has been appointed as federal operator responsible for the management of hazard class 1 and 2 waste in Russia; it also participates in the implementation of measures to repair historical environmental damage.

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

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.

As the federal operator responsible for the management of hazard class 1 and 2 waste in the Russian Federation, FSUE FEO has been authorised to create a secure integrated system covering the entire hazard class 1 and 2 waste management process chain, from waste generation to waste processing into recycled products.

In December of the reporting year, a federal state information system for tracking hazard class 1 and 2 waste and monitoring its management became operational. The digital platform of the system will become a ‘one-stop-shop’ solution enabling waste tracking and monitoring over its entire life cycle, from waste generation to disposal. It will also help to forecast capacity utilisation and optimise logistics.

The federal state information system is a kind of a marketplace for waste-generating enterprises, transportation and waste processing companies. 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 system can be accessed on any device (a phone, a tablet or a computer), which enables users to monitor all processes in real time.

The system will make 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.

A key focus area for ROSATOM as part of the Federal Project is the development of 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. Following state expert reviews and public reviews, positive opinions were obtained for the designs of the first four environmental technology parks to be built at former chemical weapons destruction sites in the Kirov, Kurgan and Saratov Regions and the Udmurt Republic. Building permits were issued for all four facilities, and construction was started at two of these sites.

In the reporting year, design documents were developed for three greenfield industrial facilities, and public discussions were held. Regional experts and representatives of the scientific community were engaged in the development of design documents. Following public environmental reviews and a state expert review, positive opinions were obtained for the facilities in the Irkutsk and Tomsk Regions.

Thus, by 2025, seven modern high-technology facilities will be put into operation and will process waste to a high standard.

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 Irkutsk, Chelyabinsk and Leningrad Regions.

Municipal landfill reclamation in Chelyabinsk

Municipal landfill reclamation in Chelyabinsk is a good example of a combination of ROSATOM’s competences in hazardous waste management and the use of state-of-the-art environmental technologies, including emission and leachate treatment technologies.
In the reporting year, ROSATOM completed the reclamation of the municipal landfill with an area of approximately 74.1 hectares situated near the centre of Chelyabinsk. A total of 17.5 million m³ of solid household waste was stored at the landfill. For the first time in Russia, a full range of measures has been implemented to remediate the country’s largest municipal landfill. The shaping of the landfill body has been fully completed. A total of 975,371 cubic metres of waste have been reshaped. A reinforced earth embankment with a total length of 1.4 kilometres has been built to separate the landfill from the municipal landfill. The shaping of the landfill body has been implemented to remediate the country’s largest municipal landfill. Principal work on the construction of leachate and landfill gas collection systems have been completed. The area of the landfill cap totals 533,590 square metres. A landfill leachate collection and treatment system has been built around the perimeter of the landfill; it comprises a reverse osmosis system and a 2,500 m³ leachate collection tank. A surface runoff collection and treatment system with a capacity of 11,850 m³ has been installed. State-of-the-art technology for landfill gas collection and recovery has been applied: 18,500 vertical drains (flexible plastic pipes) reaching a depth of up to 17 metres have been installed and connected by horizontal drains. The gas enters 28 gas distribution manifolds and is then sent to three flares with a capacity of 2,500 m³/h each, where it is burned off. The length of gas collection pipes on the surface of the landfill caps totals 12,975 metres. As part of the biological remediation stage, in 2021, grass seeds were planted across the entire remediated site, with the seeded area totalling 700,730 square metres. The Chelyabinsk municipal landfill with an area of approximately 74.1 hectares is situated near the centre of Chelyabinsk, it was put into operation in 1949. A total of 17.5 million m³ of solid household waste is stored at the landfill. Since 2018, waste is no longer accepted for disposal at the country’s largest municipal landfill, and work has been started to repair the environmental damage that it has caused. Harmful emissions into the atmosphere in the city have been reduced by 30%, and discharges of harmful leachate into the Miass River have ceased completely. The project has helped to improve the quality of life for more than 1 million people. The site is now completely safe and has been returned to the city for productive use. The project has already been recognised as a benchmark for managing legacy sites causing environmental damage. A unique experience has been gained, which should be replicated at other sites.

Krasny Bor landfill remediation

Following the collection, systematisation and analysis of input data for design in accordance with the concept developed by ROSATOM for repairing historical environmental damage at the Krasny Bor toxic waste landfill, the following list of stages of development of design documentation was compiled:

Stage 1. Construction of a multilayer cut-off wall surrounding the Krasny Bor landfill site; it is designed for groundwater diversion and prevents the seepage of contaminants to adjacent areas. The structure will be equipped with an automated control system.

Stage 2. Construction of infrastructure for the treatment (processing) of waste stored in open landfill cells and remediation of the Krasny Bor landfill site.

In the reporting year, public consultations were held and a positive opinion was obtained following state expert reviews of design documentation for Stage 1 and Stage 2 of the project to repair historical environmental damage at the Krasny Bor toxic waste landfill in the Leningrad Region.

In 2022, ROSATOM will start the construction of a multilayer cut-off wall surrounding the landfill and infrastructure for the processing of waste stored in open landfill cells, as well as remediation of the landfill site.

The site will become completely safe by 2025.

Industrial site rehabilitation in Usolye-Sibirskoye

ROSATOM is implementing an industrial site rehabilitation project in Usolye-Sibirskoye (Kultuk Region) in accordance with instructions from the President of the Russian Federation. As part of the project, in 2021, the Corporation implemented a set of urgent measures to clean up the most challenging facilities at the industrial site of a defunct enterprise: chemicals stored in 17 dilapidated tanks were moved into new tanks, 12 brine wells were cleaned up; an underground oil lens near the Angara River was contained; a mercury cell electrolysis workshop was dismantled, and contaminated soil from the site was placed into containers. ROSATOM is simultaneously developing a project to remediate the entire industrial site in Usolye-Sibirskoye. In 2022, the Corporation plans to obtain positive opinions from state expert review panels for design documentation and to start working to repair historical environmental damage.

By 2026, the site will be made safe and suitable for setting up new manufacturing operations. This will make it possible to attract investors and develop a ‘green chemical industry’ cluster.
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.

In late 2020, FSUE FEO was selected as the sole contractor responsible for preparing and implementing a project to repair environmental damage caused over the years by the operations of OJSC Baykalsk PPM.

The project involves work at three sites that pose a hazard to the ecosystem of Lake Baikal:

— The Solzansky landfill;
— The Babkhinsky landfill;
— The site of the former wastewater treatment facilities, including industrial spaces where black liquor is stored.

In the reporting year, top-priority measures were implemented at the BPPM site to lower the water level above the sludge layer. To do so, local wastewater treatment facilities were installed; utility networks were built for collecting water above the sludge layer from landfill sites and discharging treated water into the centralised sewerage system of the town of Baykalsk. These measures helped to prevent an overflow of sludge water and contamination of Lake Baikal with wastewater from OJSC BPPM.

In 2021, ROSATOM, jointly with the Federal Service for Supervision of Natural Resources (Rosprirodnadzor) and the Russian Academy of Sciences, selected technological solutions for repairing historical environmental damage at the Solzansky and Babkhinsky landfill sites and at the site of the former wastewater treatment facilities. Design documentation has been developed taking into account recommendations from experts and has been handed over to the customer.

In 2022, ROSATOM plans to obtain positive opinions from state expert review panels for design documentation for the Babkhinsky landfill and the former wastewater treatment facilities, including industrial spaces where black liquor is stored. The Corporation also plans to select the best technological solutions for the remediation of the Solzansky landfill and continue to take steps to lower the water level above the sludge layer.

1.9. DIGITAL TRANSFORMATION

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 the UDS in 2018. The UDS is updated on an annual basis taking into account changes in the internal and external environment.

Key stakeholders in the implementation of the Uniform Digital Strategy 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 the Corporation contribute to the digitisation of the nuclear industry.

In 2021, the Digitisation Unit continued to actively implement ROSATOM’s Uniform Digital Strategy. Its efforts are aimed at supporting the digitisation of the Russian economy, launching digital products developed in-house on the market, internal digitisation and development of end-to-end digital technologies.

Digitisation contributes to the achievement of ROSATOM’s strategic goals and is a driver of ROSATOM’s business efficiency. Based on ROSATOM’s 2030 Vision developed in 2021, a Digital Vision has been formulated, which involves updating the UDS in 2022.

Economic benefits

Digitisation is one of the most important tools for improving 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 2021, the uniform methodological framework for calculating benefits from the implementation of IT projects was expanded. In addition, a webinar and a video course on performance evaluation were prepared. To support the Divisions, information materials were developed, including a library of industry examples of calculating economic benefits from IT projects and a reference book of digital technology benchmarks.

In 2022, the Corporation plans to provide training in impact assessment for over 50% of project managers and to continue the audit of IT projects with a focus on evaluating their effectiveness.

Digital hierarchy

A pool of more than 70 chief digital officers (CDOs) managing digitisation initiatives in the Divisions and key organisations has been formed. To maintain a high professional level of digitisation managers in the industry, a CDO competence model and a methodology for assessing their professional and technical competences were developed in 2021. Plans for 2022 include pilot testing of the level of knowledge and skills of chief digital officers, with a CDO training programme to be prepared based on the testing results.

Digitisation programmes in the Divisions

18 digitisation programmes closely linked with the UDS have been developed and are being implemented in the Divisions. In 2021, the structure and content of the programmes were aligned with the Methodological Recommendations of the Ministry of Digital Development, Communications and Mass Media of the Russian Federation. Plans for 2022 include holding strategic sessions with CDOs of the Divisions on digitisation matters and approving the programme to be prepared based on the testing results.

1.9.2. Participation in digitisation in Russia

ROSTATOM actively participates in the implementation of the Digital Economy National Programme:

The Corporation is a founder of the Autonomous Non-Profit Organisation Digital Economy;

The Corporation is responsible for developing individual high-technology areas (Quantum Computing, New Production Technologies).

In addition, ROSTATOM’s representatives are members of working groups on federal projects forming part of the Digital Economy National Programme and industry-wide working groups under the Autonomous Non-Profit Organisation Digital Economy.

In 2021, ROSTATOM recorded a number of major achievements related to the performance of these functions.

Quantum Computing

In 2021, as part of the implementation of the road map for the development of the Quantum Computing high-technology area³⁶ (hereinafter referred to as the Road Map), the operation of a four-qubit trapped ion quantum processor and the performance of quantum operations on it using qudit states was demonstrated. For the first time in Russia, a four-qubit system was developed using a proprietary technology for scaling quantum processors based on multi-level data storage media, namely qudits (extended versions of qubits capable of simultaneously being in several states).

In 2021, as part of the development of a service providing access to a cloud-based platform for quantum computing in accordance with the Road Map, three modules of the cloud-based platform were developed; five quantum algorithms were implemented; more than 1,500 experiments were performed on the cloud-based platform for quantum computing.

In order to form a science and technology ecosystem in Russia, five partner universities⁴⁴ ran Master’s and postgraduate degree programmes in quantum computing in 2021. In the field of general education, 11 events (lectures, workshops, discussion groups, etc.) were held; they were attended by more than 700 people. Three continuing professional education programmes focused on quantum computing were developed, including at ROSTATOM’s Corporate Academy. 26 international and domestic events⁴⁵ focused on the establishment and development of professional communities were held, including the 6th International Conference on Quantum Technologies ICQT-2021.


₄⁴ The figure was revised following the review of a report on the outcomes of implementation of the Quantum Computing Road Map for 2021 at the expanded meeting of the Bureau of the Quantum Technology Research Board of the Russian Academy of Sciences on 12 May 2022. previously, the number of partner universities was estimated at 4.

₄⁵ The figure was revised following the review of a report on the outcomes of implementation of the Quantum Computing Road Map for 2021 at the expanded meeting of the Bureau of the Quantum Technology Research Board of the Russian Academy of Sciences on 12 May 2022. Previously, the number of international and domestic events was estimated at 21.
In order to provide the necessary facilities and equipment, high-technology laboratory equipment worth a total of RUB 3,369.0 million was purchased, with funding provided from the federal budget. This includes cleanroom equipment, which will enable the development and testing of prototype quantum processors under the Road Map in the future. In addition, extra-budgetary funding totalling RUB 2,725.4 million was allocated from ROSATOM’s own funds for the implementation of activities under the Road Map in 2021.

The key objectives for 2022 are to develop a prototype of a 16-qubit quantum processor based on one of the technological platforms, to implement the service providing access to the cloud-based platform for quantum computing, and to launch Master’s degree programmes in two more partner universities.

**New Production Technologies**

One of the key national objectives is to accelerate technological development, enable the Russian Federation to become a leader in the New Production Technologies high-technology area and replace imported industrial software.

To integrate and coordinate joint efforts aimed at addressing this task, on 27 August 2020, the Government of the Russian Federation and ROSATOM signed a letter of intent (LOI) pursuant to Order No. 1861-r of the Government of the Russian Federation dated 16 July 2020.

The LOI is aimed at reducing the current critical level of dependence of Russian organisations on imports of foreign industrial software. The main mechanism for its implementation is a road map for developing the New Production Technologies high-technology area (hereinafter referred to as the road map or RM NPT)\(^38\).

Sources of funding for the implementation of the Road Map include grants provided by the Russian Information Technology Development Foundation (RITDF) to support Russian projects aimed at developing and implementing industrial software\(^39\). An expert panel and the grant committee of the RITDF ensure that the projects are aligned with the goals and objectives of the RM NPT.

In 2021, the RITDF supported 36 projects under the Road Map.

Plans for 2022 include establishing a specialised NPT Competence Centre, updating the Road Map and securing government support for projects to develop industrial software through the RITDF.

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**Enhancing government financial support for projects to develop and implement IT solutions as part of the Digital Economy National Programme**

By securing government funding for digital projects in the industry, it is possible not only to considerably accelerate their development, but also to significantly reduce the financial burden on investment resources of companies implementing these projects. To increase the availability of government financial support for projects aimed at developing and implementing Russian IT solutions in which ROSATOM participates as a competence centre for the Digital Technology Federal Project forming part of the Digital Economy National Programme, amendments have been made to Russian government regulations establishing the procedure for providing such support.

To arrange the participation of nuclear organisations in competitive selection to obtain government funding for projects aimed at developing and implementing IT solutions, amendments have been made to the relevant uniform industry-wide methodological guidelines, and plans for securing government funding have been approved in ROSATOM’s Divisions.

Participation in the prioritisation of government support measures for digital projects has enabled ROSATOM to increase the amount of funding obtained from the government for projects focused on developing and using CAE systems. ROSATOM, with support from the Russian President and in accordance with his instructions, has launched a large-scale programme to replace imported CAE systems in nuclear organizations, including through the introduction of the LOGOS platform.

Support has been provided for ROSATOM’s participation in major government initiatives to develop the digital economy, including the drafting of a frontal strategy for social and economic development in the Russian Federation with a focus on digital transformation of various industries and sectors of the economy and updating the second government support package for the IT industry.

In 2022, ROSATOM plans to assist in scaling up government funding to support projects aimed at developing and implementing IT solutions and to continue to improve laws and regulations on government support measures.

**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.

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\(^{38}\) Approved by minutes No. 25 of the meeting of 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 dated 23 July 2021.

In 2021, the Corporation launched a transformation of the End-to-End Digital Technologies and Data Management subsidiary programme into an investment programme. As part of these efforts, performance indicators of various components of the programme were evaluated; a project selection methodology was developed; the programme charter was updated; funding limits were revised; investment indicators of the programme until 2030 were calculated and approved by the Steering Board of the Digital ROSATOM programme.

In 2021, R&D in the field of end-to-end digital technologies and data management was carried out in accordance with the approved road maps. A total of 54 projects and initiatives to introduce end-to-end digital technologies are being implemented in the industry.

In 2021, as part of the EDT & DM development programme:

- 50% of pilot projects were recognised as qualifying for further development;
- Solutions based on end-to-end digital technologies were put into operation in 18 of ROSATOM’s organisations.

The Corporation continued to take steps to consolidate the expertise of industry-wide EDT & DM competence centres. The most significant progress was achieved in artificial intelligence, virtual and augmented reality (VR/AR) technologies:

- Seven professional articles were published in scientific journals;
- More than 40 meetings were held to share experience in the sphere of end-to-end digital technologies and data management in the nuclear industry;
- A research team focused on the neuromorphic artificial intelligence system was formed;
- The Russian Academy of Sciences, Moscow State University and ROSATOM signed an agreement on cooperation in research into neuromorphic computing;
- An international conference on artificial intelligence was organised by the industry-wide EDT & DM competence centre.

As part of the project to create a Digital Management System (DMS), a prototype digital solution was developed in the nuclear industry; a decision-making process using the DMS was approved, and a plan was developed for the roll-out of the pilot solution. A contractor was selected through competitive tendering, and the design phase began.

A project to develop the Technologies, Materials and Structures (TMS) digital platform was launched under the resolution of the Steering Board of the Digital ROSATOM programme. It involves creating a digital ecosystem based on information about those materials and technologies that provide a foundation for any technical systems. The platform will enable seamless communication between consumers and suppliers of materials and technologies, including developers of new materials and designers that are willing to apply them to accomplish their tasks, as well as owners of new technologies and industrial partners that will create new products based on these technologies.

Pilot projects in the field of end-to-end digital technologies and data management were successfully implemented. A prototype text mining solution based on natural language processing technologies was developed jointly with JSC RASU. A pilot sample of the knowledge management system was designed. Stages of projects focused on prototyping predictive analytics solutions in the organisations of the Fuel Division were successfully implemented. Based on their outcomes, the Corporation plans to develop a digital platform for big data and predictive analytics.

The Corporation continued to develop 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 NRU MEPhI). In 2021, the laboratories focused on the development of professional competences and personnel training for the nuclear industry in the field of end-to-end digital technologies and data management.

As part of the project to develop the Technologies, Materials and Structures digital platform, in 2022, the Corporation plans to develop a detailed solution concept and carry out an analysis of business processes and marketing research. As part of the Navigator Digital Management System project, the Corporation plans to pilot a module for the Operations Committee. A text mining solution for regulatory documents will be productised.

In 2022, the Corporation plans to include LSP projects in the EDT & DM programme, develop road maps for the application of digital technologies at production sites, create RPS benchmarks, review initiatives to create industry-wide platforms, such as AR/VR, AI and digital twins, and implement pilot projects to test the readiness of technological solutions and assess potential benefits from their implementation in nuclear organisations in the future.

As part of the EDT & DM programme, ROSATOM will also continue to work on neuromorphic technologies in order to search for, analyse and develop applied solutions for the industry.

1.9.4. Digital products

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

In December 2021, the Corporation unveiled two software products for supercomputer modelling and engineering analysis developed by FSUE RFNC VNIIEF and forming part of the Logos family.

— Logos Platform. The software module is designed to enable technical integration of individual Logos modules and their integration with third-party original developments.

— A Consortium of Russian Developers of CAD/CAE Systems was created based on the Logos Platform. The Consortium comprises FSUE RFNC VNIIEF, JSC ETC GET (a subsidiary of JSC Rusatom Service), LLC 3V Services and LLC Fidesys under the general management of LLC Rusatom Digital Solutions.

— Logos Hydrogeology is a Logos software module focused on modelling environmental conditions in the vicinity of man-made and industrial facilities.

Enterprise and production management

Digital Engineering is a set of services focused on practical application of modern digital design and analysis technologies. It is a project of the Fuel Division (JSC TVEL). Consumers of these services include enterprises in prioritised sectors of the Russian industry: nuclear power, oil, chemical and aircraft engineering, the automotive industry and the conventional power industry.

Dedal-Scout is a digital service for automating field service procedures. Products developed by JSC Scientific Production Complex Dedal have been included in the Register of Domestic Software. Full-scale roll-out of the software suite is scheduled for 2022.

Digital infrastructure

The Xelent Data Centre is the first commercial data centre in Saint Petersburg that has undergone certification in accordance with the Tier III Design standard. It is one of the ten largest data centres in Russia. The data centre provides services to more than 350 companies. Its current capacity totals 984 racks (including 954 commercial racks), while the network connection capacity totals 10 MW (with potential for expansion to 14 MW).

In 2021, JSC AtomaData-Centre (a subsidiary of JSC Rosenergoatom, which is the integrator of commercial data centre infrastructure) completed the acquisition of the Xelent Data Centre in Saint Petersburg. The Xelent Data Centre will be used both by JSC Rosenergoatom itself and by existing and new commercial customers.

The StoreData Data Centre is a 160-rack data centre. This is a Tier-3 data centre built in accordance with the TIA-942 international standard, with an expected uptime of at least 99.98%. It has highly reliable, PCI DSS certified infrastructure. The StoreData capacities and infrastructure will be used to roll out the format of a compact specialised data centre that provides customers with the most highly customised services.

In 2021, JSC AtomaData-Centre completed the acquisition of a controlling stake in the StoreData Data Centre in Moscow. TVEL telecommunication equipment: a digital product was launched on the market.

RFNC VNIITF opened a digital product showroom in Moscow where a working model of the Micro Data Centre and software capabilities are displayed.

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. An in-house expert review of the development and sales strategy was carried out to launch the digital product of JSC ASE on the external market.

MDDR consumers include industrial and infrastructure construction, mining and public sector companies. The following Multi-D products have been included in the Register of Domestic Software: Multi-D Docs&Resources, the Multi-D Unified Time Schedule, the Multi-D Enterprise Service Bus, the Executive Documentation Module of the Electronic Document Management Subsystem of the IMS 4.0 System.

A pilot project focused on the Multi-D ESB (Enterprise Service Bus) product was completed. The project was approved by an external customer. Plans include a full-scale roll-out of the product.

Plans for 2022

In 2022, 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 (integration and synergy with AT Consulting; launching the following digital products on the market: REPEAT, Intellectum, Multi-D ESB, the Micro Data Centre; implementing the Dedal-Scout digital project; the first version of the Logos digital product in English; preparing and presenting a strategy for a new focus area: Effective Cybersecurity);
— Adopting a 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&A.

To maintain and enhance its own digital HR brand, the Corporation will act as a partner for a number of events, including the ICPC International Collegiate Programming Contest.

One of the key communication tasks in 2022 is to create a website about digitisation with a focus on developing and promoting ROSATOM’s digital products and solutions for Russian industry and the military-industrial complex.

1.10. RESEARCH AND INNOVATIONS

Key results in 2021:

— comprehensive programme titled ‘Development of Technical Capabilities, Technology and Scientific Research in the Use of Nuclear Energy in the Russian Federation until 2024’ was launched.

— ROSATOM updated its Innovative Development and Technological Modernisation Programme until 2030.

— 45 integrated technological projects and 160 projects 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 344.

Despite the ongoing COVID-19 pandemic, in the reporting year, the Corporation promoted new technologies and products. ROSATOM achieved major results in the nuclear power industry, designed new icebreakers and technologies of the future, expanded the range of non-nuclear products that are in demand in various industrial sectors, developed and introduced medical and composite technologies, technological solutions for the mining of rare-earth metals and industrial waste processing, and digital platforms.

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. 20 dated 9 July 2021), ROSATOM updated its Innovative Development and Technological Modernisation Programme until 2030 (the IDP). As part of the update, a description of the impact of key innovative projects and activities on the KPIs of the IDP and plans for developing its organisational structure and management mechanisms were included in the IDP. The Programme was supplemented with an analysis of risks associated with potential issues with financing for the IDP over the planning horizon, and information on projected spending on cooperation with universities and research institutions. Procedures for monitoring the IDP and the relevant indicators, as well as links between the IDP and digital transformation in the nuclear industry were described in greater detail. Measures related to cooperation between ROSATOM and regional governments in its regions of operation, aimed at leveraging the innovation potential of the regions were included in the medium-term IDP, and a greater emphasis was placed on developing prioritised areas of ROSATOM’s R&D and technological activities in the sphere of environmentally friendly operations, hydrogen energy and artificial intelligence. Methodological guidelines on the management of the IDP were updated in order to align them with the approved updated version of the IDP (order No. 1/396-P dated 31 March 2021).

As part of efforts to achieve sustainable development goal, the global energy industry is undergoing a global transformation: an ‘energy transition’, which is focused primarily on the decarbonisation of the economy and a transition to zero-carbon or low-carbon energy sources, carbon-free fuels and technologies, including the production of hydrogen as an energy resource and a component of various production processes.

It is expected that in the long term, demand will be focused primarily on low-carbon hydrogen. The key hydrogen production solution being examined by global players involves electrolysis using renewable energy; another option is steam methane reforming at gas-fired thermal power plants equipped with CO2 capture systems. Large-scale low-carbon hydrogen production can also involve the use of nuclear power; the development of advanced high-temperature gas-cooled reactors (HTGRs) will also enable high-temperature electrolysis.

IDP projects are grouped into four themes:

— Strategic areas of R&D and technological development of national importance, and the relevant key projects and activities;

— Prioritised R&D and technological development project areas, and the relevant key projects and activities;

— Prioritised innovative projects and activities in the sphere of digital transformation;

— Key organisational projects to improve ROSATOM’s performance.

The IDP section titled ‘Strategic Areas of R&D and Technological Development of National Importance’ includes key projects and activities aimed at providing remote Russian regions with clean and affordable energy, and entering growing global markets for closed-cycle technologies and fuel, as well as markets for small and medium-size nuclear power plants.
Projects and activities focused on developing technologies for a two-component nuclear power industry based on closed nuclear fuel cycles are aimed at accelerating technological development in the Russian Federation by developing new-generation industrial nuclear power technologies for a two-component nuclear power system based on VVER and fast neutron reactors and a CNFC, which will provide a basis for the development of nuclear energy facilities that will be competitive on the global market.

The relevant projects and activities are aimed at accelerating technological development in the Russian Federation by creating modern research infrastructure to provide the necessary research facilities.

Projects and activities in this area will facilitate progress in harnessing thermonuclear energy, which is the most ambitious goal set by humankind in the 20th century, by supporting the development of thermonuclear and plasma technologies that will serve as a basis for inexhaustible sources of clean energy, sources of particles and radiation for various applications, powerful engines for spacecraft, innovative equipment for healthcare, mechanical engineering, microelectronics and other knowledge-intensive sectors of the economy.

Projects and activities in this area will involve developing new materials with unique properties and a wide range of innovative technologies that will make the next-generation power industry, and high-technology sectors of the economy more competitive, will make it possible to produce a wider range of high value-added products to support economic growth at a rate above the global average and will enable an increase in production of non-resource non-energy goods, as well as new energy products and technologies.

Projects and activities in this subsection are aimed at laying the foundation for a new nuclear power system of the future that is based on technologies that are safer and more environmentally friendly, enabling expanded replenishment of resources of the nuclear power industry and providing an affordable source of energy for households and industrial enterprises. Their implementation is expected to result in the development of references for power units, and international recognition of nuclear power as a low-carbon energy source, which is the most ambitious goal set by humankind in the 20th century, by supporting the development of thermonuclear and plasma technologies that will serve as a basis for inexhaustible sources of clean energy, sources of particles and radiation for various applications, powerful engines for spacecraft, innovative equipment for healthcare, mechanical engineering, microelectronics and other knowledge-intensive sectors of the economy.

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As part of the Ecology National Project, the Corporation is implementing a federal project titled ‘Infrastructure for Hazard Class 1 and 2 Waste Management’. The aim of the project is to build an integrated secure system for managing hazard class 1 and 2 waste, which involves creating a management and monitoring system.

Projects and activities focused on developing technologies for a two-component nuclear power industry based on a CNFC

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Projects and activities focused on the development of advanced energy systems

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Prioritised areas of the IDP are focused on achieving technological excellence, improving technological security, reducing production costs, enhancing ROSATOM’s export potential and achieving unique research results.

The following 10 areas have been prioritised:

— The Prony Project: closing the NFC based on fast neutron reactors;
— Developing the modern nuclear power industry based on VVER technology;
— Small nuclear power plants;
— SNF processing and multiple recycling of nuclear materials;
— Laser technologies;
— Thermonuclear fusion and plasma technologies;
— Materials and technologies;
— Nuclear medicine;
— Superconductivity;
— Hydrogen energy.

45 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 2021 as part of the IDP.

21 ‘process’ projects supported effective management of R&D, technology and innovation activities.

Performance indicators in the sphere of innovation between 2018 and 2021

<table>
<thead>
<tr>
<th>Indicator, unit of measurement</th>
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<td>2,850</td>
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40 The year-on-year decrease was caused by an increase in the output of innovative products.

41 An increase in the GRI 103-3 compared to 2020 was driven by the launch of the Hydrogen Energy programme.
To develop and apply various approaches and techniques for qualitative and quantitative analysis of outcomes of innovation activities of nuclear organisations, assessing innovations and selecting the most effective innovation tools, in 2021, ROSATOM approved the Uniform Industry-Wide Methodological Guidelines for Rating Innovation Activities and Rewarding ROSATOM’s Organisations Based on the Ratings (order No. 1/1608-P dated 7 December 2021). In addition to promoting innovation, identifying areas for improvement and enabling rapid development of innovation processes in organisations, innovation ratings assigned to nuclear organisations will play an important role in informing management decisions.

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’


The CP DTTS involves building a solid scientific and technological foundation in those areas which most specialists around the world have prioritised for the coming decades. The outcomes of the programme contribute to the achievement of national development goals of the Russian Federation set in Decree No. 474 of the President of the Russian Federation dated 21 July 2020 by supporting decent and productive work and successful entrepreneurship and providing opportunities for self-fulfilment and the unlocking of talent.

The programme is implemented as part of large-scale cooperation in the sphere of scientific research and technology with organisations of the National Research Centre Kurchatov Institute, institutes of the Russian Academy of Sciences under the jurisdiction of the Russian Ministry of Education and Science, and organisations of other government agencies.

All CP DTTS deliverables, targets and milestones for 2021 have been achieved in full.

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

The Proryv (Breakthrough) Project is being implemented as part of a federal project titled ‘New Nuclear Power Industry, Including Small Nuclear Reactors for Remote Areas’ included in the CP DTTS. The project 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 2021, engineering designs were developed for a sodium-cooled reactor unit with improved technical and economic characteristics (BN-1200M).

The engineering design of the core of a 300 MW pilot and demonstration lead-cooled reactor unit (BREST-OD-300) was adjusted in order to obtain an operating licence. The construction (concreting) of the pilot and demonstration energy facility comprising a power unit with the BREST-OD-300 reactor started at the site of JSC SCP. In June 2021, an official ceremony was held at the site of JSC SCP as part of the Year of Science to mark the start of concreting of the power unit with the BREST-OD-300 reactor unit; the event was attended by representatives of the National Research Centre Kurchatov Institute, the IAEA and the OECD Nuclear Energy Agency (NEA).

As part of the construction of the fabrication module and the start-up facility for the refabrication of dense mixed uranium/plutonium fuel for fast neutron reactors, the transuranium element handling section of the fabrication/refabrication module was supplied.

Phase 1 of the ATOM hardware and software system was commissioned as part of the construction of a training and information centre for the pilot and demonstration energy facility.


Comprehensive R&D was carried out to validate design solutions for ensuring the safe operation of the MBIR nuclear research facility. An automated process control system was developed for the MBIR facility. As part of the construction of the MBIR multipurpose fast neutron research reactor, construction and installation operations were completed at a drainage pump station, and the construction and installation of the reactor unit was completed up to the +13 m level.

The condition of safety plates of the small rotating plug in the BOR-60 reactor was examined. Necessary calculations and materials science research were carried out to validate the safe operation of the BOR-60 reactor.
Implementation of the Federal Project ‘Development of Controlled Thermonuclear Fusion Technologies and Innovative Plasma Technologies’

A plasma accelerator with an exhaust velocity of more than 100 km/s was built, and a prototype of a plasma jet engine for next-generation spacecraft was designed based on the accelerator. A set of R&D activities was carried out to support the achievement of first criticality at the T-15MD tokamak, which is the first new controlled thermonuclear fusion research facility built in Russia in 20 years. Design documentation was developed and approved for the technical upgrade of a pilot superconductor production site (JSC Bochvar Inorganic Materials Research Institute). Positive opinions of a state expert review panel and building permits were obtained for the renovation of the TSP thermonuclear facility (stage 1) and 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 (stage 1) (JSC SRC RF TRINITI).

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

Sets of R&D activities (stages scheduled for 2021) were completed. The following advanced technologies were developed:

— Technology for the production of spherical refractory metal powders, which will considerably reduce the labour intensity of advanced development of nuclear and space equipment and rockets and will help to deliver operating performance that was impossible to achieve in practice in the past;
— Technology (computer code) for the modelling of new materials used in the production of fuel elements and fuel assemblies for fast neutron reactor units.

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

Activities were carried out to ensure the achievement of first criticality and enable the commissioning of power units No. 1 and 2 of Kurilsk NPP-2. As at the reporting date, preparation for the commissioning of Kurilsk NPP-2, which comprises two power units with VVER-TDI reactors, was 37.48% complete.

As part of the development of design documentation for small NPPs based on the RITM-200N reactor unit, in 2021, field work and front-end engineering design were completed, provisional environmental impact assessment materials were prepared; an investment case was prepared.

Pursuant to Order No. 2816-r of the Government of the Russian Federation dated 6 October 2021, the list of initiatives to promote social and economic development in the Russian Federation until 2030 was approved; these include an initiative titled ‘New Nuclear Power Industry, Including Small Nuclear Reactors for Remote Areas’. Small nuclear power plants make an important contribution to ensuring energy security and providing steady power and heat supply to remote regions for both large industrial enterprises and households. Given the general geographic characteristics, objectives related to the development of industrial clusters, initiatives to develop mining and manufacturing enterprises and the need to provide energy supply to remote regions, the development of this area is of particular relevance for the Russian Federation. ROSATOM plans to implement the initiative starting from 2022 as part of a federal project titled ‘New Nuclear Power Industry, Including Small Nuclear Reactors for Remote Areas’ included in the CP DTTS.

1.10.4. International projects. Development of unique ‘mega science’ research facilities

In 2021, 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 implementation of the project involves conducting research and developing technologies that will provide the groundwork for thermonuclear energy generation, which provides fuel resources that are virtually inexhaustible, meet high safety standards and are environmentally friendly.

In 2021, equipment and reactor systems were designed, manufactured and delivered to the construction site in accordance with the ITER construction schedule as part of Russia’s commitments under the ITER project.

At year-end 2021, a total offset was received amounting to 44.3% of Russia’s total in-kind commitments, and in-cash commitments to the ITER Organisation were fully met.

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

The cash contribution to FAIR was made in accordance with the relevant budget allocation.

By the end of 2021, the Russian Federation met 59.5% of its commitments on cash contributions for the construction of the Facility for Antiproton and Ion Research in Europe (as part of allocated budget funding).
In the reporting year, ROSATOM’s representatives participated in all meetings of FAIR working groups. Despite the coronavirus pandemic, capital construction of FAIR facilities is progressing rapidly. Russian organisations continued to supply equipment for the FAIR accelerator complex and detectors. By year-end 2021, contracts worth a total of EUR 93.3 million (in 2005 prices) had been concluded.

Participation in the Generation IV International Forum (GIF)

By the end of the reporting year, 14 countries and organisations had signed the GIF Charter and were official GIF members: Australia, Argentina, Brazil, the UK, Euratom, Canada, China, the Russian Federation, the US, France, Switzerland, South Africa, South Korea and Japan.

In 2021, Russian specialists and experts successfully participated in online events and meetings covering all areas of GIF activities: meetings of its governing bodies, Working Groups and thematic activities focused on SFR (sodium-cooled fast reactor), SCWR (supercritical-water-cooled reactor), LFR (lead-cooled fast reactor) and MSR (molten salt reactor) systems.

Russian specialists contributed to the successful completion of the mission of the Task Force on Safety Design Criteria, which developed two Safety Design Guidelines for Fast Reactor Systems and joined the permanent Risk and Safety Working Group.

Proposals of the Russian Federation were submitted to the SCWR System Steering Committee, reviewed, approved and incorporated in the Project Plan for Thermal Hydraulics and Safety for the period from 2021 through 2025. Russia’s contribution to the GIF Secretariat was paid in full.

Establishment of the Consortium for the International Research Centre Based on the MBIR Multipurpose Fast Neutron Research Reactor (IRC MBIR Consortium)

MBIR is the largest among research reactors currently under construction or in operation; it will provide the nuclear industry with state-of-the-art technologically advanced research infrastructure for the next 50 years. Its unique characteristics and technological capabilities will make it possible to significantly expand the scope of research aimed at validating solutions for a two-component nuclear power industry and a closed nuclear fuel cycle and will greatly accelerate the development of safe Generation IV nuclear power plants.

The International Research Centre Based on the MBIR Multipurpose Fast Neutron Research Reactor is intended to become a centre of competence and cooperation for the global scientific community to address current challenges facing the nuclear industry.

In July 2021, a Consortium Agreement was signed for the International Research Centre Based on the MBIR Multipurpose Fast Neutron Research Reactor, providing a legal framework for promoting cooperation between its members.

In 2021, Memoranda of Understanding were signed with three foreign organisations from China, the Czech Republic and France; they not only reflect the willingness of overseas partners to participate in the project but also set out the financial terms and conditions of this participation, including the required reactor capabilities.

The IRC MBIR Consortium continues to be promoted on international platforms and at international forums. The project was presented at an international conference titled ‘Modern Problems of Nuclear Power and Nuclear Technology’ in Tashkent and at the Congress of Young Scientists in Seoul.

The MBIR multipurpose fast neutron research reactor is being built as part of a Federal Project 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” at the site of JSC SSC RIAR.

1.10.5. Plan of R&D Topics of ROSATOM

The implementation of the Consolidated Industry-Wide Plan of R&D Topics (CIFT) 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 is prepared according to a number of criteria, such as ensuring that the product/technology being developed by ROSATOM outperforms existing analogues in terms of their main technical characteristics, as well as the export potential and national security. It also takes into account the findings of benchmarking, patent search and technology readiness assessment conducted by ROSATOM and the commitment to accelerating research and development.

Every year, ROSATOM increases the amount of its own funds allocated for R&D in prioritised areas of scientific and technological development as part of the Consolidated Industry-Wide Plan of R&D Topics, which opens up opportunities for putting researchers’ ideas into practice.

Amount of R&D funding provided by ROSATOM

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of R&amp;D activities funded and completed</td>
<td>124</td>
<td>145</td>
<td>160</td>
</tr>
<tr>
<td>Funding, RUB billion</td>
<td>5.4</td>
<td>9.5</td>
<td>11.4</td>
</tr>
</tbody>
</table>
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 engages 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. In December 2021, the Corporation’s representatives led by ROSATOM’s Director General Alexey Likhachev actively participated in a number of events, including the Congress of Young Scientists at the Sirius Centre; a national science and technology congress titled ‘National Science and Technology Breakthrough Trends 2030’ hosted by the Russian Academy of Sciences; a conference titled ‘Launch of the F-1 Reactor: the Start of the Nuclear Era’ at the National Research Centre Kurchatov Institute.

Universities and research institutions actively participate in the implementation of ROSATOM’s programmes such as Development of Technical Capabilities, Technology and Scientific Research in the Use of Nuclear Energy in the Russian Federation until 2024, 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 the Priority 2030 programme, in 2021, NRNU MEPhI (a core university of ROSATOM) was included in the first group of universities in the Research Leadership track. Strategic initiatives forming part of the programme are implemented in close cooperation with ROSATOM’s organisations.

2021 saw the launch of the Greater Sarov project aimed at establishing the National Centre for Physics and Mathematics (NCPM). On 1 September 2021, the first 50 Master’s degree students enrolled at the Sarov branch of Lomonosov Moscow State University, where physics and mathematics students are offered unique educational facilities and accommodation.

In 2021, ROSATOM was actively developing cooperation platforms (consortia and alliances) in order to expand cooperation with universities and research institutions in the sphere of digital technology, environmental protection, new materials, new energy technologies, etc.

In the reporting year, more than 25 universities were involved in ROSATOM’s research and innovation projects. In 2021, the volume of orders for R&D performed by universities totalled RUB 1.74 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 2019 and 2021, RUB million

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount (RUB million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>1,357.24</td>
</tr>
<tr>
<td>2020</td>
<td>1,681.26</td>
</tr>
<tr>
<td>2021</td>
<td>1,743.33</td>
</tr>
</tbody>
</table>

In 2021, the volume of orders for R&D performed by research institutions outside the industry totalled RUB 5.9 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, 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 Institute of Applied Physics of the Russian Academy of Sciences and the Institute of Applied Physics of the Russian Academy of Sciences.

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

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount (RUB million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>4,245.38</td>
</tr>
<tr>
<td>2020</td>
<td>5,981.94</td>
</tr>
<tr>
<td>2021</td>
<td>5,959.27</td>
</tr>
</tbody>
</table>

1.10.7. Science competitions

Under the cooperation agreement between ROSATOM 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 2021. The objective of the competition is to support experimen-
nal and theoretical research aimed at obtaining basic scientific knowledge that can provide the foundation for tackling practical tasks facing ROSATOM. Following the competition, projects focused on the relevant topics received funding totalling RUB 200 million.

In 2021, ROSATOM became a partner of the Technological Breakthrough Award organised by the Platform for National Technology Initiative, 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 Proryv, JSC TVEL, ASE and JSC Nitrogaphite) won awards in the Technological Breakthrough in Nuclear Power and Industry category.

1.10.8. Knowledge management system

The knowledge management system (KMS) is being implemented at ROSATOM in stages:

— KMS 1.0: adapting the IAEA knowledge management approach (from 2011 through 2014). Establishing and developing a framework for ROSATOM’s Knowledge Management System, adapting the IAEA knowledge management approach, developing ROSATOM’s basic local regulations governing main KMS processes.

— KMS 2.0: building core infrastructure elements and KMS processes (from 2014 through 2019). Introducing regulations developed by ROSATOM in nuclear organisations and developing infrastructure elements, including digital and IT tools that support core KMS processes. Given the strategic objective of technological development and the start of investment in R&D (implementation of the Consolidated Industry-Wide Plan of R&D Topics and the CP DTTS), special emphasis is placed on knowledge acquired as a result of scientific research.

— KMS 3.0: arranging core infrastructure elements and KMS processes into an integrated set of digital services, Digital Science (from 2020 through 2024).

Starting from 2020, the KMS is developed under a platform logic, with all solutions developed to date for the knowledge management system (R&D information databases, portals, expert networks) incorporated into a digital platform. The aim of the project is to create an integrated set of digital R&D services, which involves developing the features and functions of existing information systems, and to create a common information space that makes it possible to follow the digital footprint of R&D activities and competences and record progress through Technology Readiness Levels (TRLs).
The Digital Science project was approved by the Steering Board of the Integrated Digital Platform for the Nuclear Industry programme in 2020. The steering board of the project consists of the heads of industry functions and ROSATOM’s Divisions.

As part of the Integrated Digital Platform for the Nuclear Industry programme, services and modules forming part of the Digital Science Set of Digital Services (Digital Science SDS) have been rolled out; they make it possible to follow the digital footprint of R&D activities and competences, keep all documents generated during the preparation, implementation and acceptance of research projects, record progress through Technology Readiness Levels and manage the knowledge and competences accumulated in the industry.

More specifically, as part of the Digital Science project, a pilot version of an information platform for the Common Information Space of the CP DTTS (CIS CP DTTS) has been developed at the request of ROSATOM. The platform will make it possible to assess the actual contribution of research and researchers to social and economic development and the implementation of national projects. ROSATOM and its organisations are required to prepare all monthly reports on federal projects included in the CP DTTS using the CIS CP DTTS. More than 345 participants from 15 nuclear organisations have already been connected to the system.

Access to the system enables executives and experts to promptly redirect research efforts and return to previous stages, if necessary. An end-to-end project methodology (Lean Smart Science) is applied; it involves optimising processes to focus on priorities, which helps to avoid process misalignment, data duplication and delays in data transfer and processing.

Services forming part of the Common Information Space facilitate the management of the CP DTTS:

- The services prevent the risk of duplication and plagiarism when planning and performing R&D and make it possible to consult main digital scientific libraries (the patent database, the e-library). In addition, about 6,000 reports on R&D completed by ROSATOM’s organisations since 2011 as part of federal projects and programmes and CIPT documents have been digitised;
- A digital archive of the programme is maintained, providing quick controlled access to programme materials in the field of R&D and to management documentation. Each participant of the CP DTTS has been connected to the platform based on their role in the programme. In the target model, the database is linked to the facility information model and captures the digital footprint of the technology portfolio from technical specifications to the implementation stage;
- Key parameters of implementation of the CP DTTS are monitored in real time (including for monthly reporting). This helps to accomplish the objective set by the Executive Office of the Government of the Russian Federation, namely integration with government information systems of federal executive bodies, supervisory and auditing agencies.

In the future, ROSATOM plans to integrate the system with other management systems used in the industry, such as financial and accounting systems, as well as systems for intellectual property accounting.

ROSATOM’s experience can also be applied at the government level to accomplish the objectives set in the Government Programme of the Russian Federation titled ‘Scientific and Technological Development in the Russian Federation’. Services being developed as part of the CIS CP DTTS and approaches to shaping the digital management environment have been proposed for implementation on the GOSTECH government information platform under the GOSTECH SCIENCE domain name.

### 1.10.9. Intellectual property management

In 2021, 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 2021 totalled 344 (against a target of 288).

#### Number of items of intellectual property, pcs

<table>
<thead>
<tr>
<th>Year</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patent activity</td>
<td>1,778</td>
<td>2,562</td>
<td>2,906</td>
</tr>
</tbody>
</table>

#### Indicator 2019 2020 2021

- **Number of patents obtained for inventions, utility models and industrial designs, certificates for computer software and databases and items of know-how registered in the Russian Federation, pcs.**
  - 2019: 735 (10,411)
  - 2020: 666 (10,682)
  - 2021: 401 (11,498)

- **Number of applications filed for inventions, utility models and industrial designs, certificates for computer software and databases in the Russian Federation, pcs.**
  - 2019: 371
  - 2020: 412
  - 2021: 238

- **Number of foreign patents obtained by ROSATOM, applications for foreign patents submitted and registered under the established procedure, registered trade secrets (know-how) reflecting the commercialisation and expansion of the scope of application of intellectual property in the nuclear industry, pcs.**
  - 2019: 439
  - 2020: 784
  - 2021: 344

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**GOSTECH.SCIENCE domain name.**

**Number of foreign patents obtained by ROSATOM, applications for foreign patents submitted and registered under the established procedure, registered trade secrets (know-how) reflecting the commercialisation and expansion of the scope of application of intellectual property in the nuclear industry, pcs.**

- Following on Russia’s National Audit Department of ROSATOM.
- The image diagrams changes in the number of foreign patents obtained by ROSATOM, applications for foreign patents 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 2018 and 2021 (as a cumulative total).
- Figures in brackets show the number of items of intellectual property as a cumulative total taking into account their legal protection status as at 31 December 2021.
In 2021:

— More than 160 foreign patent applications were submitted;
— ROSATOM started to form intellectual property portfolios covering five technologies;
— Further steps were taken to improve the mechanism for the use of patent research findings when initiating government contracts;
— An approach and methodological guidelines were developed for legal protection of key technical solutions for projects included in the CP DTTS;
— Lists of intellectual property were compiled for reactor technologies that form the basis of ROSATOM’s core products;
— The Russian Federation regained exclusive rights over inventions, and the threat of patent infringement was prevented;
— Three workshops on intellectual property were held.

Plans for 2022

— To ensure optimal legal protection of intellectual property created by ROSATOM and its organisations;
— To continue to improve the methodological and regulatory framework for intellectual property management at all stages of its life cycle;
— To hold at least three workshops on intellectual property.

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

Long-term priorities in the sphere of scientific and technological development in the nuclear industry are informed by prioritised areas approved by ROSATOM’s Strategic Council and formalised in the government programme of the Russian Federation ‘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 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 necessary and sufficient range of small nuclear power plants 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, 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 a 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.
Key research activities of the Division’s institutes in 2021 included the following:

- Radiopharmaceuticals and materials for equipment that will enable timely cancer diagnosis and treatment.
- In industries, there is an increased focus on developing nuclear medicine. Researchers in the Division are developing increased thermal conductivity and energy capacity.
- Technologies to be applied in nuclear power, microelectronics, instrumentation, aerospace and other technologies and materials and participate in the construction of unique facilities and infrastructure for the nuclear power operation of nuclear reactors of various types.
- Specialist companies from JSC RI SPA LUCH participated in a project to produce uranium-zirconium metal fuel and manufacture a pilot batch of fuel elements based on the resulting alloy. These elements are characterised by increased thermal conductivity and energy capacity.
- JSC SRC RF TRINITI developed a technology for producing large-sized high-strength graphite with adjustable properties which potentially can be used in small high-temperature gas-cooled nuclear reactors (HTGRs) and in space engines.
- JSC SRC RF TRINITI developed an innovative mobile laser unit designed for efficient and safe underwater cutting of large metal structures, such as sunken ships, submerged port structures and offshore oil and gas platforms.
- JSC IPPE developed a method for accelerated radiation testing of structural materials. The method will make it possible to obtain information on the properties of samples under study faster and will help to ensure the safe operation of nuclear facilities.
- JSC Research Institute of Nuclear Materials (INM) developed a technology for producing carbon matrices with two types of radioisotopes, which have been used to build mock-ups of the most powerful independent power sources to date. Such batteries are needed to power various systems on spacecraft, in microelectronics, instrumentation and household appliances.

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, including JSC SSC RIAR, JSC SSC RF – Leupinsky Institute of Physics and Power Engineering (IPPE), JSC RI SPA LUCH, JSC NIIgraphite, JSC SRC RF TRINITI, etc., are directly involved in R&D and innovation activities.

In 2021, the Division demonstrated the best performance of the past few years. It significantly expanded its portfolio of international orders and its product line, and improved its financial performance. Revenue of the Division increased by 11% compared to 2020. In addition, over the past five years, revenue from new products has increased five-fold, accounting for around 40% of total revenue.

In 2021, organisations managed by JSC Science and Innovations carried out 64 research and development (R&D) projects as part of the Consolidated Industry-Wide Plan of R&D Topics, which is 25% more than in 2020.

In addition to technologies to be applied in nuclear power, microelectronics, instrumentation, aerospace and other industries, there is an increased focus on developing nuclear medicine. Researchers in the Division are developing radiopharmaceuticals and materials for equipment that will enable timely cancer diagnosis and treatment.

Key research activities of the Division’s institutes in 2021 included the following:

- JSC SSC RIAR developed a new technology to produce MNUP fuel containing minor actinides for fast neutron reactors (including the BRESt-OD-300 reactor under construction in Seversk) and produced an experimental batch of fuel pellets.
- JSC IPPE developed a method for accelerated radiation testing of structural materials. The method will make it possible to obtain information on the properties of samples under study faster and will help to ensure the safe operation of nuclear facilities.
- JSC Research Institute of Nuclear Materials (INM) developed a technology for producing carbon matrices with two types of radioisotopes, which have been used to build mock-ups of the most powerful independent power sources to date. Such batteries are needed to power various systems on spacecraft, in microelectronics, instrumentation and household appliances.
- Specialists from JSC RI SPA LUCH participated in a project to produce uranium-zirconium metal fuel and manufacture a pilot batch of fuel elements based on the resulting alloy. These elements are characterised by increased thermal conductivity and energy capacity. They are currently being used in international critical experiments at the Delta test bench; the results of these experiments are important for ensuring the reliable operation of nuclear reactors of various types.
- JSC NIIgraphite developed a technology for producing large-sized high-strength graphite with adjustable properties which potentially can be used in small high-temperature gas-cooled nuclear reactors (HTGRs) and in space engines.
- JSC SRC RF TRINITI developed an innovative mobile laser unit designed for efficient and safe underwater cutting of large metal structures, such as sunken ships, submerged port structures and offshore oil and gas platforms.

Specialists from the Industry-Wide Competence Centre for Intellectual Property Management at JSC Science and Innovations obtained 155 patents in more than 35 countries and filed 42 new applications. These patents cover primarily technologies related to reactor units equipped with water–cooled water–moderated power reactors (VVERs), fast neutron reactors and small NPPs. In addition, nine patents were obtained and 35 applications were filed in Russia.

A highlight of 2021 was the launch of a comprehensive programme titled ‘Development of Technical Capabilities, Technology and Scientific Research in the Use of Nuclear Energy in the Russian Federation’ for the period from 2021 through 2024 (CP DTTS). As part of its implementation, institutes forming part of the Division develop new technologies and materials and participate in the construction of unique facilities and infrastructure for the nuclear power operation of nuclear facilities and controlled thermonuclear fusion, as well as small nuclear power plants.

The phases of the project to build the Multipurpose Fast Neutron Research Reactor (MBIR) scheduled for 2021 have been successfully completed. This work forms part of a Federal project to produce state-of-the-art experimental test facilities for the development of technologies for a two-component nuclear power industry based on a closed nuclear fuel cycle. All major construction tasks have been completed ahead of schedule, with some tasks fulfilled a month and a half or two months ahead of schedule. Key events of the reporting year included the installation of monolithic reinforced concrete structures of the reactor unit up to the +13 metre level and the installation of the floor slab at the base of the reactor pit. In addition, a national programme of advanced research at MBIR for the...
period from 2028 through 2040 has been approved and will inform the discussions on a future international pro-
gramme of experimental research. MBIR will be the most powerful among research reactors currently in operation
and under construction in the world; it will provide the nuclear industry with technologically advanced state-of-art
research infrastructure for the rest of the century.

A large number of R&D activities are centred around basic research on thermonuclear fusion and plasma physics
(as part of a federal project focused on fusion and plasma technologies) and the development of the relevant
facilities. Examples include the T-11M tokamak in Troitsk, where in 2021 the emitter system was successfully reloaded
with lithium externally without disturbing the vacuum in its working chamber. The new technology will be used
in the T-15MD tokamak recently built at NRC Kurchatov Institute, which is an important part of the international
thermonuclear ITER project.

In October 2021, JSC SRC RF TRINITI received a positive opinion of the state expert review panel on the design
documentation for experimental test facilities. After the completion of construction, the institute will be able to test
plasma propulsion engines and a powerful neutron source, as well as materials for advanced fusion reactors.

Key projects focused on developing new materials and technologies include R&D conducted by JSC SRC RF TRINITI,
JSC Nitgraphite and JSC RI SPA LUCH. For instance, last year, JSC SRC RF TRINITI developed six versions of flameless
hydrogen oxidation catalysts which are more than ten times more cost-effective than existing ones. After all tests are
completed, the Russian industry will have a unique, globally competitive energy product.

Specialists from JSC Nitgraphite created new carbon materials with increased corrosion resistance. Their potential ap-
plications include spent fuel reprocessing modules for molten-salt reactors, where this is one of the key requirements
for further development of the technology.

In 2021, JSC RI SPA LUCH completed the development of a three-axis laser scanner for Russian 3D metal printers,
which is unique in the world. This is a key component that will improve the quality of products produced using addi-
tive manufacturing methods.

Key achievements in 2021 included the completion by specialists of JSC RI SPA LUCH of a ten-year project to convert
the IVG.1M research reactor in Kazakhstan to low-enriched nuclear fuel. Previously, the reactor had used highly en-
riched uranium (HEU). After a series of unique studies, new technologies have been developed that do not involve the
use of sensitive nuclear materials, and the technical and economic feasibility of the conversion has been confirmed.
The results of the project, which is aimed at improving safety, can be applied to other HEU-fuelled research reactors
abroad.

Another major international project started in 2021. Together with partners from Japan and the EUI, the Research
Institute of Nuclear Materials (NIM) is conducting reactor tests of functional materials for the future European DEMO
fusion reactor. This research will identify the materials that will form the basis of the world’s first experimental fusion
power plant.

In 2021, studies began on the use of plutonium recovered from spent MOX fuel in fast neutron reactors. This is the
first project of its kind. In addition to JSC Science and Innovations, several organisations of ROSATOM and French
partners are involved in the project. The successful implementation of the project will contribute to the development
of a two-component nuclear power industry and a cheaper and more sustainable nuclear fuel cycle.

About 110 Doctors of Sciences and almost 450 Candidates of Sciences are involved in the Division’s R&D projects. No
other Russian institution has such a high concentration of scientists.

Plans for 2022

— To implement federal projects forming part of the CP OTTS;
— 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 recy-
  cling of nuclear materials; projects focused on hydrogen energy, creating new and improving existing materials,
  nuclear medicine, superconductivity, laser, thermonuclear and plasma technologies;
— To expand the number of patenting countries in order to obtain patent protection for technical solutions;
— 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 sustain-
  able development of the Division and the nuclear industry as a whole.
1.11. PERFORMANCE OF DIVISIONS

1.11.1. Mining Division

Key results in 2021:
— JSC Atomredmetzoloto and Uranium One jointly produced 7,100 tonnes of uranium (15% of global uranium production).
— The uranium production plan was 100% completed.
— Mine No. 8 of PJSC PIMCU reached the milestone of one million cubic metres of rock mass.

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

In addition to uranium mining, the Mining Division is actively developing non-uranium businesses, including scandium mining as a by-product (JSC Dalur), brown coal mining (PJSC PIMCU), the design of an integrated production facility at the Pavlovskoye lead and zinc deposit, gold mining projects (JSC Elkon MMP), etc.

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

Key operating results
JSC Atomredmetzoloto and Uranium One, which are subsidiaries of ROSATOM, jointly produced 7,100 tonnes of uranium in 2021, accounting for 15% of global uranium production.

The Mining Division’s uranium production plan was 100% completed, with Mine No. 8 operated by PJSC PIMCU reaching the milestone of one million cubic metres of rock mass.

Uranium production in the Mining Division totalled 2,635 tonnes, down 7% year on year. The main driver behind the decrease in production was a high level of depletion of existing mines developed by PJSC PIMCU. PJSC PIMCU continued the construction of the new Mine No. 6; in 2021, it completed the infrastructure programme and launched the construction of surface facilities.

In 2021, JSC Khiagda began preparations for the development of the Kolchikanskoye uranium deposit.

JSC Dalur completed geological exploration of the Dobrovolnoye deposit and launched the construction of a processing facility at a pilot production site using building information modelling (BIM) technology.

The Mining Division leverages digital technologies to develop new mines. At the Istochnoye deposit in Buryatia, processes at all production stages have been digitised and automated to the fullest possible extent. In 2021, experience gained by the Division was leveraged at the Khokhlovskoye deposit in the Kurgan Region.

The Smart Mine project is an innovative smart technology for managing uranium deposits mined through drillhole in-situ leaching. Software systems used by JSC Dalur enable a reliable assessment of mining and geological conditions at mining sites, the modelling of mining options, an accurate performance analysis, and prompt decision-making when reviewing progress and forecasting further development of a deposit, as well as during geological modelling and planning.

As for the gold mining business, in 2021, pilot gold mining operations started at the Severnoye deposit, and the first batch of gold in the form of doré bars was produced.

The management of the Mining Division is aware that new ‘green’ energy sources are a solution of the future. The Division is also implementing a number of projects in this area, ranging from in-house manufacture of lithium-ion battery-powered mining equipment to the development of a lithium mining project in Russia.

In 2021, ROSATOM approved the project to mine lithium in Russia. The project is at a feasibility study stage. The Kolmanskop deposit (Murmansk Region) has been selected as a prioritised site for the project, which will involve lithium mining and subsequent production of lithium carbonate to meet the needs of manufacturing enterprises that will produce energy storage systems. Given the growing global demand for electric vehicles and green energy, the development of the Russian lithium deposit will be accelerated.

Local production of self-propelled mining equipment
The aim of the project is to set up and develop production of mining equipment at the repair and mechanical plant of PJSC PIMCU to replace imports. In 2021, the first load-haul-dump machine was shipped to a foreign customer. This marked a new stage in the company’s development: expansion into the international mining equipment market. Today, environmentally friendly battery-powered machinery accounts for 25% of the underground equipment fleet. Reduced noise and air pollution levels in mine workings help to improve working conditions and reduce the negative impact on employees’ health. Zero carbon dioxide emissions reduce the environmental footprint of both the production cycle and logistics operations.
New products and businesses

The Mining Division is a centre of responsibility tasked with supplying ROSATOM and the Russian Federation with uranium and other strategic metals which are used in cutting-edge areas of modern economic development, such as additive manufacturing, robotics, energy storage systems, high-temperature and renewable energy, etc.

In 2021, the Mining Division achieved impressive results in developing new businesses. Production of coal with a high calorific value (sized coal) at PJSC PIMCU reached a stable level, which enabled an increase in coal sales to new consumers both in Russia and abroad. JSC Dalur continued to ramp up the output of scandium products (scandium oxide and aluminium-scandium alloy) in 2021.

Plans for 2022

In the medium term, the key priorities of the Mining Division are to further improve uranium mining performance, including through the development of new deposits, and actively develop new businesses.

The construction of Mine No. 6 at PJSC PIMCU remains a priority for the Mining Division. Upon commissioning, the project will make it possible to offset a decline in uranium production and will support the long-term operation of the joint-stock company. In 2022, the construction of a headframe is scheduled to begin at Mine No. 6.

To maintain production, the Division continues to develop new uranium deposits using in-situ leaching (ISL), which is an environmentally friendly and cost-effective technique:

— JSC Khiagda: start of development of the Dybrynskoye deposit;
— JSC Dalur: completion of construction of pilot site facilities at the Dobrovolskoye deposit.

As part of its new business development strategy, the Mining Division will continue to take active steps to increase the degree of processing of raw materials that it produces (scandium oxide production at JSC Dalur, sized coal mining at PJSC PIMCU) and expand its metals portfolio to include gold, rare and rare-earth metals and their compounds.

Support for social and charity initiatives in Krasnokamensk (Zabaykalsky Territory)

In 2021, the Division held the 8th Contest of Charity and Social Projects. Based on the contest results, financial assistance totalling RUB 3.75 million was provided for 38 out of 50 important social projects submitted for the contest. A range of training and development events titled ‘Project Workshop: From Problems to Solutions’ was arranged for social entrepreneurs. A grant programme titled ‘Krasnokamensk: a Zero Waste Lifestyle’ was launched for the first time to sponsor a delegation of volunteers from Krasnokamensk attending the We Are Together International Forum held in Moscow.

1.11.2. Fuel Division

Key results in 2021:

— In 2021, revenue totalled RUB 235.7 billion, up 13% year on year.
— An engineering design of a fuel element based on uranium-plutonium nitride fuel (MNUP fuel) was developed for the BREST-OD-300 reactor.
— Accident tolerant fuel (ATF) meeting new-generation safety standards started to be used.
— The first batch of REMIX fuel was loaded at Balakovo NPP.
— The first full reloading of the BN-800 reactor core with MOX fuel was carried out at Beloyarsk NPP.

The Fuel Division of ROSATOM (hereinafter referred to as the Fuel Division; its holding company is JSC TVEL) is a leading player on the global nuclear fuel cycle front-end market and the only supplier of nuclear fuel for Russian NPPs and the nuclear-powered icebreaker fleet.

The Fuel Division comprises nuclear fuel fabrication, uranium conversion and enrichment, and gas centrifuge production enterprises, as well as research and design organisations.

JSC TVEL’s core business is mainly focused on the global market. The company 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 its own in-house design of fuel assemblies for PWR reactors and markets it as TVS-K fuel. The Fuel Division’s organisations also fabricate nuclear fuel and its components for Russian- and foreign-design research reactors around the world.

The Fuel Division also supplies the Russian and global markets with a wide range of non-nuclear products and services for a variety of applications, including the metals, chemical and mechanical engineering sectors, additive manufacturing and energy storage. The optimal organisational format for the development of non-nuclear businesses in the Fuel Division is the creation of industry integrators.

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

For details, see ‘Performance of the Mining Division in 2021’.
Key operating results

Core nuclear business and NFC-related R&D activities

Despite the COVID-19 pandemic and related lockdowns, the Division met all the targets of the 2021 production programme and made the scheduled deliveries of nuclear fuel to all Russian and foreign customers.

The construction of an innovative nuclear power unit with a BRysterskiy OD-300 lead-cooled fast neutron reactor was launched at the Siberian Chemical Plant (JSC SCP) in Seversk. Concreting was started in June; concreting of foundation slabs for the reactor building and the turbine building was completed in November 2021. The new power unit will form part of the Pilot and Demonstration Energy Facility (PDEF), which will comprise a nuclear power plant and onsite facilities forming part of the closed nuclear fuel cycle. This facility will be unique in the global nuclear industry.

Accident tolerant fuel (ATF) meeting new-generation safety standards and REMIX fuel were loaded into the VVER-1000 reactor core.

The Division manages its production operations in such a way as to support comprehensive economic, social and environmental development of its organisations and the regions where they are located. The company is aware of its responsibility towards local communities in its regions of operation and, accordingly, pursues a socially oriented policy that meets the fundamental needs of the residents of its home towns and cities without compromising the interests of future generations.

Pilot production of uranium/plutonium REMIX fuel was launched at JSC SCP. The use of this fuel will considerably increase the availability of feedstock for the nuclear power industry by closing the nuclear fuel cycle and will enable the recycling of irradiated nuclear fuel instead of storing it.

The Fuel Division, in cooperation with Beloyarsk NPP, the Pilot and Demonstration Engineering Centre for the Decommissioning of RBMK Reactors and a number of nuclear organisations, established a programme to develop technologies and infrastructure for the management of SNF–contaminated waste, with 25 initiatives scheduled for 2022–2028. A comprehensive programme for the management of minor actinides until 2030 was developed and approved, with detailed cost estimates prepared for 2022–2024. The implementation of the programme will contribute significantly to the development of SNF management technologies and practices.

On 31 August 2021, the first graduates of a joint English-language Master’s degree programme run by JSC TVEL, ROSATOM and Lomonosov Moscow State University received their degrees in nuclear decommissioning project management.

ROSATOM’s innovative nuclear fuel projects reached the final of the Technological Breakthrough 2021 Award in the Technological Breakthrough in Nuclear Power and Industry category. The winning projects included accident tolerant fuel (ATF) meeting new-generation safety standards and REMIX fuel for VVER reactors.

VVER-1000 fuel assemblies with experimental fuel elements based on uranium/plutonium REMIX fuel were successfully piloted at power unit No. 3 of Balakovo NPP.

The first batch of VVER-1000 fuel assemblies consisting entirely of REMIX fuel rods was loaded into the reactor at power unit No. 1.

The first full reloading of the core of the BN-800 fast reactor with uranium/plutonium MOX fuel was carried out at Beloyarsk NPP.

The active phase of construction of the second depleted uranium hexafluoride (DUHF) processing unit, W2-ECP, was launched at the Electrochemical Plant in Zelenogorsk (JSC PA ECP). As a result of the project, the existing Russian DUHF defluorination or deconversion capacity will double.

A new technology for the production of uranium dioxide using the reductive pyrohydrolysis method was implemented at the MSZ Machinery Manufacturing Plant (JSC MSZ) in Elektrostal. A large-scale project to replace obsolete gas plasma units with modern equipment will help to make the production process much more cost-efficient and environmentally friendly.

In 2021, a new production facility was commissioned at JSC MSZ; it will produce nuclear fuel for the Chinese CFR-600 fast reactor.

JSC Chepetsk Mechanical Plant completed a large-scale project to launch zirconium sponge production. The production technology was developed in-house by Russian specialists. Twelve manufacturing process stages were developed from scratch; unique equipment was manufactured, and a new large-scale production facility was built.

A new production facility for the fabrication of TVS-K nuclear fuel for Western-design reactors was commissioned at the Novosibirsk Chemical Concentrates Plant to enable commercial supply of various versions of fuel for NPPs with PWR reactors.

The Uranium Enrichment Centre (JSC UEC) delivered the first batch of enriched uranium product to Kazakhstan for Ulba-FA LLP, a Kazakhstan-China joint venture in Ust-Kamenogorsk specialising in nuclear fuel fabrication for Chinese NPP reactors.

JSC TVEL and the Nuclear Power Corporation of India Limited (NPCIL) signed contract documents for the implementation of a comprehensive engineering project which involves transitioning two operating power units equipped with VVER-1000 reactors at Kudankulam NPP to new TVS-2M fuel and extending the fuel cycle from 12 to 18 months.
1.11.3. Mechanical Engineering Division

Key results in 2021:
— Mechanical engineering products were delivered to 16 NPPs.
— The Division's share in the Russian power machine engineering industry stood at 42.2%.
— The Division's consolidated revenue reached RUB 106 billion.
— The order portfolio grew to RUB 988 billion.

The Mechanical Engineering Division 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 in Russia, the CIS and the European Union. Organisations managed by JSC Atomenergomash are located in six regions of the Russian Federation, with another three organisations located abroad.

The Mechanical Engineering Division leverages its expertise acquired over the years in the development and production of equipment for the nuclear power industry and is successful in developing adjacent business areas at an accelerating pace. JSC Atomenergomash offers a range of solutions for the manufacture and supply of equipment for the nuclear and thermal power industries, shipbuilding, the oil and gas industry, and the special steel market. Extensive production and technological capabilities of organisations of the Mechanical Engineering Division and control over the entire production chain enable the Division to supply its customers with high-quality reliable equipment. JSC Atomenergomash has well-established manufacturing operations, which enable it to effectively participate in NPP construction projects and provide maintenance and upgrade services.

Equipment produced by the Mechanical Engineering Division is used at all Russian-design NPPs; the Division is the chief designer and single-source supplier of all marine reactor units for the Artiksa, Sibir and Ural multipurpose nuclear icebreakers with RITM-200 reactors, which are rightly considered the largest and most powerful icebreakers, and for the next-generation Lider nuclear icebreaker with a RITM-400 reactor, which is currently at the design stage and which will enable year-round navigation along the Northern Sea Route.

The Mechanical Engineering Division manufactures high-performance equipment for the Russian oil and gas industry. In addition, organisations of the Mechanical Engineering Division have a proven track record in the design and manufacture of equipment for the thermal power industry: the Mechanical Engineering Division has supplied equipment to 40% of CHPPs in Russia and the CIS. As part of the Clean Country Federal Project, the Mechanical Engineering Division has become the main producer of key process equipment for waste-to-energy plants.

Key operating results

In the reporting year, organisations of the Mechanical Engineering Division delivered mechanical engineering products to 16 NPPs.

At the end of the reporting year, the share of the Mechanical Engineering Division in the Russian power machine engineering industry stood at 42.2%.

Combined revenue of the Mechanical Engineering Division reached RUB 106 billion in 2021, up by 28% year on year. JSC Atomenergomash achieved revenue growth by increasing the supply of products as part of ROSATOM's NPP construction plans and by developing new non-nuclear businesses. In 2021, the order portfolio of the Mechanical Engineering Division grew to RUB 988 billion.

In 2021, revenue of the Mechanical Engineering Division from the development of new businesses totalled RUB 53.6 billion.

In the reporting year, the Mechanical Engineering Division delivered a set of pipes for the main coolant pipeline (MCP), reactor coolant pump (RCP) casings, the reactor vessel and four steam generators, the fourth moisture separator-reheater (MSR), the second high-pressure feed heater, a separation tank for the MSR and fuel handling machines to Rooppur NPP (Republic of Bangladesh).

Steam generators, the emergency core cooling system, in-vessel components, RCP casings and MCP pipe spools were delivered to Akkuyu NPP (Turkey).
A contract was concluded with FSUE Atomflot for the supply of four modernised floating nuclear power units (MFPUs), and a revenue contract was signed for the supply of shaft lines, steering gear and large-size hull castings for the Lider icebreaker.

Deliveries of hull castings and propeller blanks for follow-on multipurpose nuclear icebreaker No. 4 were completed.

A design concept of an LNG carrier with an innovative LNG storage and transportation system based on Type B independent tanks (Project 10070) and draft design specifications for a semi-submersible heavy-lift vessel for the transportation of floating nuclear power units and other items were developed.

Pursuant to instructions from the Russian President regarding import substitution for critical equipment, JSC Efremov Institute of Electrophysical Apparatus (NIIEFA) built and put into operation Europe’s first and the world’s third test bench for critical equipment for liquefied natural gas (LNG) production.

Full sets of process equipment for four waste-to-energy plants in the Moscow Region were delivered. Contracts for the supply of equipment for a waste-to-energy plant in Kazan were negotiated.

A contract was signed with Mondi Syktyvkar for the supply and installation of a utility boiler at the company’s CHPP in Syktyvkar and the provision of installation and pre-commissioning supervision services.

Plans for 2022

Key objectives of the Mechanical Engineering Division for 2022:

— To ensure the supply of key equipment and perform work under ROSATOM’s NPP construction programme;
— 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.

The Division manages its production operations in such a way as to support comprehensive economic, social and environmental development of its organisations and the regions where they are located. The Division’s organisations actively participate in initiatives promoting the development of their regions of operation. The Division cooperates with municipal administrations and provides annual assistance to socially important municipal facilities and to local residents. For instance, in 2021, an organisation of the Mechanical Engineering Division planted the Grove of Victory in the Gladyshevsky Nature Reserve (Vyborgsky District of the Leningrad Region) to commemorate the heroic deeds of our people during World War II. The event was a follow-up to the nationwide Forest of Victory campaign.

Full sets of process equipment for four waste-to-energy plants in the Moscow Region were delivered. Contracts for the supply of equipment for a waste-to-energy plant in Kazan were negotiated.

1.11.4. Engineering Division

Key results in 2021:

— Power unit No. 2 of Leningrad NPP-2 and power unit No. 1 of the Belarusian NPP were put into operation.
— The construction of power units No. 5 and 6 of Kudankulam NPP in India and the nuclear island of power unit No. 7 of Tianwan NPP and power unit No. 3 of Xudabao NPP in China was started.
— The first criticality procedure was started at power unit No. 2 of the Belarusian NPP.

ROSATOM’s Engineering Division (hereinafter referred to as the Engineering Division) comprises leading companies in the nuclear industry: JSC ASE (Nizhny Novgorod), the Joint Design Institute (Moscow, Saint Petersburg and Nizhny Novgorod branches of JSC Atomenergoproekt) and a number of subsidiaries.

Thermal power:

— To expand the package supply of equipment for waste-to-energy plants and develop engineering and maintenance competences;
— To expand the portfolio of thermal power engineering orders in Russia as part of waste-to-energy plant construction programmes and negotiate the conditions for further implementation of the programme.

Shipbuilding and the construction of floating power units:

— To finalise a full engineering design of the modernised floating power unit (MFPU) and launch the construction of the flagship MFPU;
— To manufacture and deliver the blanks and the core support plate for the RITM-400 reactor unit and prepare for the delivery of castings for ice cutters, rudder horns and the icebreaker stem;
— To obtain the approval of the Russian Maritime Register of Shipping for the LNG carrier design based on Type B independent tanks;
— To develop a conceptual design of a semi-submersible heavy-lift vessel for the transportation of floating power units and other items;
— To develop other promising projects focused on vessels and marine equipment for the benefit of the Mechanical Engineering Division and the Corporation.

For details, see the Appendix ‘Performance of the Mechanical Engineering Division in 2021’.
Key operating results

**Power unit No. 2 of Leningrad NPP-2 was put into operation in March 2021.**

At the construction site of power units No. 1 and 2 of Kursk NPP-2:

- Concreting of the foundation slab of the 20URS modular pumping station was completed at power unit No. 2 of Kursk NPP-2 (March 2021);
- Emergency core cooling system tanks of the 10UJA reactor were moved into final position at power unit No. 1 of Kursk NPP-2 (March 2021);
- The support truss of the 20UIA reactor pit was moved into final position at power unit No. 2 of Kursk NPP-2 (April 2021);
- Installation work was completed in the 10UIA reactor pit of power unit No. 1 of Kursk NPP-2 (October 2021).

In June 2021, power unit No. 1 of the Belarusian NPP was put into operation. In December 2021, the first criticality procedure (the loading of nuclear fuel) was started at power unit No. 2.

As part of the construction of Paks II NPP (Hungary), a licence was obtained for pit excavation up to the -5.000 level at the site of power unit No. 2.

Licensing documents for power units No. 1 and 2 and power units No. 3 and 4 of El Dabaa NPP (Egypt) were submitted to the Egyptian regulator in June 2021 and December 2021 respectively. The technical designs of power units No. 1 and 2 of El Dabaa NPP were submitted (December 2021).

Construction was started at power units No. 3 and 6 of Kudankulam NPP (India), including the start of concreting. Since the launch of the project, 29 shiploads of equipment for power units No. 3–5 have been supplied from Russia to India.

**VVER-1200 design: a generation 3+ reactor**

2021 saw the commissioning of power unit No. 2 of Leningrad NPP-2 and power unit No. 1 of the Belarussian NPP, which are equipped with VVER-1200 reactors. The VVER-1200 design is resilient to external stress from the impact of earthquakes, tornadoes and hurricanes, the crash of a commercial aircraft, extreme climate impacts, maximum changes in pressure caused by an external shock wave, human error and other factors; it is resilient to accidents comparable to the Fukushima nuclear disaster. Power units of this type are more efficient and 20% more powerful than a VVER-1000 power unit. One NPP power unit equipped with a VVER-1200 reactor can generate 8 billion kWh of electricity per year (this amount of energy would be sufficient for 96 million light bulbs to run continuously for a month). These power units have a service life of 60 years with a potential for expansion to 80 years (which is twice as long as the service life of an RBMK-1000 reactor, for instance).

This design is used in new NPP power units currently under construction in Belarus, Finland, Hungary and Egypt.

**VVER-TOI: a generation 3+ reactor**

Design characteristics include:

- Enhanced seismic resistance;
- Output power manoeuvring;
- Enhanced seismic resistance;
- Produced power varies from 1.00 to 1.04 times the nominal power of the reactor (the reactor can work at higher power levels than the design power level without exceeding the permissible reactor power level);
- Resilience to external stress from the impact of natural disasters, including those caused by man-made factors (earthquakes, floods, tsunamis, etc.);
- Resilience to internal stress from the impact of human error and technical malfunctions;
- Production of MOX fuel.

Plans and development prospects

The reactor vessel for power unit No. 2 was delivered to the construction site of Rooppur NPP (Bangladesh) (August 2021). The reactor vessel of power unit No. 1 was moved into final position (September 2021).

A licence was obtained for the construction of the nuclear island of power units No. 7 and 8 of Tianwan NPP in China (May 2021). Concreting of the nuclear island was started at power unit No. 7 (May 2021).

A licence was obtained for the construction of the nuclear island of power units No. 3 and 4 of Xudabao NPP in China (July 2021). Concreting of the nuclear island was started at power unit No. 3 (July 2021).

**Project to upgrade thermal installation equipment at Rooppur NPP**

A project codenamed Teplotetch-4.0 has been launched ahead of schedule. Among other things, the project involves the wide use of two types of automatic orbital welding machines: argon arc welding machines (which are characterized by a welding speed that is 15% higher compared to human-operated machines and a consistently high quality of welded joints) and automatic pressing argon arc welding machines (the joint welding speed is 40% faster compared to a machine operated by a professional welder; preparation of pipeline joints is not required). These machines have not been used before at NPPs on a commercial scale.

**A project to upgrade thermal installation equipment at Rooppur NPP**

- To start the concreting of the nuclear island of power unit No. 8 of Tianwan NPP in China (completed in February 2022);
- To launch power unit No. 2 of the Belarusian NPP;
- To start the concreting of the foundation slab of the reactor building of power unit No. 1 of El Dabaa NPP (Egypt);
- To move the reactor vessel at power unit No. 2 at Rooppur NPP (Bangladesh) into final position;
- To start the concreting of the nuclear island of power unit No. 4 of Xudabao NPP in China (completed in May 2022).
Progress on these activities will be monitored using the Unified Time Schedule information system and will be supported by RPS projects aimed at lead time optimisation.

In addition, successful pilot projects forming part of a programme to make large NPPs more competitive will be rolled out at these sites.

For details, see the Appendix ‘Performance of the Engineering Division in 2021’.

1.11.5. Power Engineering Division

Key results in 2021:
— Electricity output at Russian NPPs reached 222.4 billion kWh (102.2% of the balance target set by the Federal Antimonopoly Service of Russia).
— Power unit No. 2 of Leningrad NPP-2 was commissioned.
— NPPs accounted for 19.7% of Russia’s energy mix.
— Performance against the targets of JSC Rosenergoatom’s investment programme stood at 105.5%.

The Power Engineering Division of ROSATOM (hereinafter referred to as the Power Engineering Division; its holding company is JSC Rosenergoatom) is the only NPP operator in Russia and a major player on the Russian electricity market.

The Power Engineering 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 Power Engineering 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 Power Engineering Division comprises JSC Rosenergoatom (hereinafter referred to as Rosenergoatom) and its branches, including 10 operating nuclear power plants and the floating thermal nuclear power plant with total installed capacity of 29.577 GW.

On 18 March 2021, power unit No. 2 of Leningrad NPP-2 equipped with a VVER-1200 reactor with installed capacity of 1,188.151 MW was commissioned.

On 19 December 2021, power unit No. 1 of Kursk NPP equipped with an RBMK-1000 reactor with installed capacity of 1,000 MW was shut down for decommissioning.

In 2021, electricity output at NPPs totalled 222.437 billion kWh, or 102.2% of the balance target set by the Federal Antimonopoly Service (FAS) of Russia (217.674 billion kWh) and 103.1% of the actual electricity output in 2020 (215.745 billion kWh).

The NPP capacity factor stood at 83.18% in 2021; the share of nuclear power generation in electricity output in Russia totalled 19.7%.

Electricity output exceeded the target set by the FAS of Russia by 4.76 billion kWh mainly because the duration of scheduled repairs at power units was reduced by 216 days.

Plans for 2022

The main operational objective is to maintain electricity output at a level equal to or exceeding the balance target approved by the FAS of Russia at 217.87 billion kWh.

Construction of power units No. 1 and 2 of Kursk NPP-2:
— To install the reactor vessel at power unit No. 1 of Kursk NPP-2 in accordance with the government order;
— To complete the concreting of the ceiling of the reactor coolant pump at power unit No. 2 of Kursk NPP-2.

Electricity demand management

The Power Engineering Division continues to provide electricity demand management services to businesses. Following competitive tendering for demand-side management services, the Division (JSC Rosenergoatom and JSC Atom Energy Trade) increased its total managed capacity to more than 100 MW by the end of 2021 (a 20-fold year-on-year increase). The demand-side management pilot project will continue in 2022.

Key operating results

As at 31 December 2021, the Power Engineering Division operated 35 nuclear power units at NPPs and a floating thermal nuclear power plant with total installed capacity of 29.577 GW.

Electricity demand management

The Power Engineering Division continues to provide electricity demand management services to businesses. Following competitive tendering for demand-side management services, the Division (JSC Rosenergoatom and JSC Atom Energy Trade) increased its total managed capacity to more than 100 MW by the end of 2021 (a 20-fold year-on-year increase). The demand-side management pilot project will continue in 2022.

Plans for 2022

The main operational objective is to maintain electricity output at a level equal to or exceeding the balance target approved by the FAS of Russia at 217.87 billion kWh.

Construction of power units No. 1 and 2 of Kursk NPP-2:
— To install the reactor vessel at power unit No. 1 of Kursk NPP-2 in accordance with the government order;
— To complete the concreting of the ceiling of the reactor coolant pump at power unit No. 2 of Kursk NPP-2.
Digitisation:

— To roll out virtual workstation infrastructure for 5,000 users comprising software and hardware fully developed and produced in Russia;
— To further expand the data centre network, including in the Moscow and North-Western Regions, and develop data centre infrastructure solutions for the Arctic and a number of ROSATOM’s overseas sites;
— To continue to develop the Digital NPP Operation Template, a single industry-wide digital solution for the efficient operation of nuclear facilities in Russia and abroad.

For details, see the Appendix ‘Performance of the Power Engineering Division in 2021’.

1.12. RESOURCE MANAGEMENT

1.12.1. Corporate governance

Corporate governance system

Principles of corporate governance:

— Standardisation of governance in the organisations in the Russian nuclear power industry and the nuclear weapons sector, 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 individual organisations;
— Removing non-operating and inactive companies 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.

Supervisory Board

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 is ROSATOM’s highest governing body.

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

The Supervisory Board members and chairman are appointed by the President of the Russian Federation.

The powers and functions of the Supervisory Board are stipulated in the Law.

The Supervisory Board members, except for ROSATOM’s Director General, are not executives of ROSATOM.

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

There are no collective advisory bodies 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).

Composition of ROSATOM’s Supervisory Board as at 31 December 2021

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sergey Kirienko</td>
<td>First Deputy Chief of the Presidential Executive Office, Chairman of the Supervisory Board</td>
</tr>
<tr>
<td>Yury Borisov</td>
<td>Deputy Chairman of the Government of the Russian Federation</td>
</tr>
<tr>
<td>Igor Borovkov</td>
<td>Acting Chief of Staff of the Military Industrial Commission under the Government of the Russian Federation, Deputy Chief of Staff of the Russian Government</td>
</tr>
<tr>
<td>Larissa Brychyova</td>
<td>Assistant to the President of the Russian Federation, Head of the Legal Department of the Presidential Administration</td>
</tr>
</tbody>
</table>


GRI 102-10

GRI 102-18

GRI 102-23

GRI 102-35
In 2021, the composition of the Supervisory Board changed as follows:

Pursuant to Decree No. 62 of the President of the Russian Federation dated 1 February 2021, Yury Borisov, Deputy Chairman of the Government of the Russian Federation, was appointed to the Supervisory Board; Andrey Klepach resigned from the Supervisory Board.

In 2021, the Supervisory Board held 17 meetings, including two in-person meetings, and considered 47 issues.

In 2021, the Supervisory Board approved the following:

- The report on progress against key performance targets of ROSATOM in 2020 (minutes No. 143 dated 20 April 2021);
- ROSATOM’s key performance targets for 2021 (minutes No. 143 dated 20 April 2021);
- Key performance targets of federal nuclear organisations for 2021 (minutes No. 143 dated 20 April 2021);
- ROSATOM’s annual report for 2020 (minutes No. 146 dated 29 June 2021).

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.

Members of the Supervisory Board receive no salary or other remuneration for their participation in the work of the Supervisory Board. (For details on the remuneration system, see section 3.2.3 ‘Personnel costs and remuneration system’).

ROSATOM’s Director General

The functions and 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.

ROSATOM’s Management Board

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

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

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

Members of the Management Board receive no remuneration for their participation in the work of the Management Board. (For details on the remuneration system, see section 3.2.3 ‘Personnel costs and remuneration system’).

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

The Management Board comprises 16 members; there are no women on the Board.

Composition of the Management Board as at 31 December 2021

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alexey Likhachev</td>
<td>ROSATOM’s Director General, Chairman of the Management Board</td>
</tr>
<tr>
<td>Ivan Kamenskikh</td>
<td>First Deputy Director General, Director for Special Projects</td>
</tr>
<tr>
<td>Alexander Lokshin</td>
<td>First Deputy Director General for Nuclear Energy</td>
</tr>
<tr>
<td>Kirill Komarov</td>
<td>First Deputy Director General for Development and International Business</td>
</tr>
<tr>
<td>Oleg Shubin</td>
<td>First Deputy Director General, Director for the NWD Directorate</td>
</tr>
</tbody>
</table>

Alexey Likhachev is ROSATOM’s Director General (appointed by Decree No. 527 of the President of Russia dated 5 October 2016).
In 2021, Oleg Shubin, First Deputy Director General, Director for the NWD Directorate, was appointed to the Management Board.

In 2021, the Management Board held 36 meetings (all by absentee voting). The Board considered 354 issues, including the following key issues:

- Progress against key performance targets of ROSATOM in 2020;
- Approval of ROSATOM’s key performance targets for the period from 2022 through 2024;
- Approval of ROSATOM’s key performance targets for 2021.

### Auditing Commission

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

### Composition of the Auditing Commission as at 31 December 2021

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roman Artyukhin</td>
<td>Head of the Federal Treasury, Chairman of the Auditing Commission</td>
</tr>
<tr>
<td>Olga Alliueva</td>
<td>Administrative Aide in the Presidential Domestic Policy Directorate of the Presidential Executive Office</td>
</tr>
</tbody>
</table>

### Commissions, boards and committees under the governing bodies

In 2021, ROSATOM had about 30 permanent committees, boards and commissions under the governing bodies.

#### Key collective and advisory bodies as at 31 December 2021

<table>
<thead>
<tr>
<th>Committee/Board/Commission</th>
<th>Chairman</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strategic Council</td>
<td>Sergey Kirienko, Chairman of the Supervisory Board of ROSATOM</td>
</tr>
<tr>
<td>Operations Committee</td>
<td>Alexey Likhachev, Director General of ROSATOM</td>
</tr>
<tr>
<td>Staff and Incentives Committee</td>
<td>Steering Board of the Proryv (Breakthrough) Project</td>
</tr>
<tr>
<td>Executive Committee on the Development of the Technology for New Materials and Substances High-Technology Area in the Russian Federation</td>
<td>Oleg Shubin, First Deputy Director General, Director for the NWD Directorate</td>
</tr>
<tr>
<td>Investment Committee of ROSATOM</td>
<td>Ethics Board</td>
</tr>
<tr>
<td>Committee on the Standardisation of Technical Specifications</td>
<td>Steering Committee on Overseas NPP Personnel Training</td>
</tr>
</tbody>
</table>
Committee/Board/Commission | Chairman
---|---
Committee on the Restructuring of Non-Core Assets, Real Property and Equity | Kirill Komarov, First Deputy Director General for Development and International Business
Committee on Cost within International Sales | 
Committee on Strategic Partnerships, Mergers and Acquisitions | 
Committee on Venture Capital Financing | 
Charity Committee | 
Committee on Contracting within International Sales | 
Expert Council for Sustainable Development | 
Risk Committee | Sergey Novikov, State Secretary, Deputy Director General for Execution of State Powers and Budgeting
Science Committee | Yury Olenin, Deputy Director General for Science and Strategy
Technical Committee of the Proryv Project | Evgeny Adams, Scientific Leader of the Proryv Project
Central Procurement Commission | Roman Zimonas, Director for Procurement, Logistics and Quality Management
Committee on Procurement Strategies | 
Central Arbitration Committee (in procurement) | Herman Gonso, Chairman of the Central Arbitration Committee
Committee on Pricing in the Construction of Nuclear Facilities | Gennady Sakharov, Director for Capital Investments, State Construction Supervision and Government Expert Review
Council of ROSATOM for Information Technology Architecture | Vasily Erykalov, Chief Enterprise Systems Architect in the Department for Technical Policy in IT
Council for Physical Protection of ROSATOM | Konstantin Denisov, Deputy Director General for Security

Improvement of the corporate governance system

The Corporation continued to adopt new 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 2021

1. ROSATOM completed the reorganisation and corporatisation of federal state unitary enterprises (FSUEs) in the nuclear industry (the state registration of JSC LUCH Research and Production Association, Research and Development Institute established as a result of a transformation of FSUE LUCH Research and Production Association, Research and Development Institute was completed, and the reorganisation of FSUE VNIIA through a merger with FSUE Mars Moscow Experimental Design Bureau was completed).
2. JSC AEM-Technologies took steps to acquire mechanical engineering assets of a number of major Russian companies.
3. ROSATOM established a company in order to implement a project to provide power supply to the mining and processing plant currently under construction in the Chukotka Autonomous District.
4. ROSATOM completed the reorganisation of its Engineering Division within JSC ASE and established a Joint Design Institute at JSC Atomenergoproekt (Moscow).

Non-arm’s length transactions

In accordance with Federal Law No. 317-FZ of 1 December 2007, the Supervisory Board approves non-arm’s length transactions.

In 2021, ROSATOM's Supervisory Board approved nine non-arm’s length transactions, including with the following organisations:

- NRC Kurchatov Institute;
- State Space Corporation Roscosmos;
- PJSC Rosseti;
- NRNU MEPhI.

Plans for 2022 and for the medium term

- To transfer shares of four joint-stock companies under federal ownership to ROSATOM as an asset contribution of the Russian Federation pursuant to orders of the Government of the Russian Federation;
- To conduct a number of M&A transactions in the industry (e.g. the acquisition of shares in PJSC Quadra – Power Generation, the acquisition of a shareholding in the company acting as an integrator in the sphere of information technology, etc.) and provide the relevant legal support;
- To implement a pilot project to transfer some legal, corporate and property-related processes in individual nuclear organisations to a shared service centre to be created.
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.

In 2021:

— An automated risk assessment and management system (IRMS) was piloted; it had been developed as part of project B-RM1-1 to build an Industry-Wide Risk Management System in ROSATOM;
— 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);
— Quantitative assessment of project risks (allowance for risks and uncertainties) was carried out in accordance with the methodology developed by the Corporation for pilot projects and in accordance with the approved assessment schedule for TCM NC accuracy class 3;
— 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;
— Established risk appetite indicators were supplemented with sustainability indicators in order to identify, prioritise and assess key risks affecting the achievement of sustainable development goals.

A risk management process at JSC Atomenergoprom

<table>
<thead>
<tr>
<th>RMS processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. RISK IDENTIFICATION</td>
</tr>
<tr>
<td>Proactive risk identification at all management levels, appointment of risk owners</td>
</tr>
<tr>
<td>2. RISK ASSESSMENT</td>
</tr>
<tr>
<td>Qualitative and quantitative assessment of the impact on the Corporation's objectives within different time frames</td>
</tr>
<tr>
<td>3. RISK MANAGEMENT</td>
</tr>
<tr>
<td>Planning of risk management measures, assessment of their effectiveness</td>
</tr>
<tr>
<td>4. RISK MONITORING</td>
</tr>
<tr>
<td>Monitoring compliance with the risk appetite level</td>
</tr>
</tbody>
</table>

Organisational model of ROSATOM’s risk management system applied in the Company

- **Director General and Strategic Council**
- **Risk Committee**
- **Risk owners at the Corporation and Division levels**
- **Risk Management Department/Risk Officers in Divisions**

- **Strategic level**
  - Aligning risk management with the Corporation’s business strategy

- **Tactical level**
  - Organisation of effective RMS functioning in accordance with the Corporation’s strategy and established risk appetite

- **Operational level**
  - Risk identification and assessment; development and implementation of risk management measures

- **Organisational and methodological support of RMS processes at the Corporation and Division levels**
Key business risks49

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.

Risk radar

Comprehensive risk management measures largely offset the negative impact of external factors on the implementation of ROSATOM’s strategy.

Risk management outcomes in 2021

Change in estimated risk levels for 202250:

- increase 
- decrease 
- no significant changes

ROSATOM’s strategic goals51:

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

Financial risks

1. Currency risk
2. Interest rate risk
3. Credit risk
4. Liquidity risk
5. Nuclear fuel cycle product and service market risk
6. Electricity and capacity market risk
7. Risk of a decrease in power generation
8. Industrial and environmental safety risk
9. Political risk
10. Risk of loss of and damage to assets
11. Reputational risk
12. Project risks
13. Climate risks (including environmental risk)
14. Social and political risks

Management approaches:

- 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);
- Use of financial hedging instruments.

Results:

Foreign currency liabilities were met without raising additional funds to compensate for exchange rate fluctuations.
Divergent trends in the exchange rates of currencies in which project financing, key items of capital expenditure and operating cash flows are denominated were taken into account.
An optimal ratio of assets and liabilities denominated in the same currency was maintained.

2. Interest rate risk

Management approaches:

- Maintaining a balance of interest income and interest expenses in terms of timing and amounts;
- Reasonable selection of interest rates (fixed or floating) for the expected maturity period. All things being equal, the Corporation prefers long-term fixed-rate loans with the option of penalty-free early repayment;

For details on sustainability risks, see sections on climate, environmental, social and corruption risks.

GRI 102-15

GRI 103-3

GRI 102-15

51 For details on sustainability risks, see sections on climate, environmental, social and corruption risks.

49 The annual report does not contain an exhaustive description of all risks that may affect ROSATOM’s operations; it only provides information on key risks.

50 Information on changes in estimated risk levels is provided as at 31 December 2021.
### Risks and Changes in Risk Levels (Risk Owners)

<table>
<thead>
<tr>
<th>Risk Description</th>
<th>Risk Management Practices</th>
<th>Connection with Strategic Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial risks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Nuclear Fuel Cycle (NFC) Product and Service Market Risk</td>
<td>- Maintaining an optimal balance between market-focused and escalation pricing mechanisms (based on benchmark price inflation) in contracts; - Aligning pricing mechanisms used for procurement and those used in contracts with a high level of commodity risk; - Discussing the volume of future orders with customers in advance; - Embedding quantitative flexibility and options in contracts with suppliers to align purchase and sales volumes; - Providing supply guarantee mechanisms; - Improving the technical and economic characteristics of nuclear fuel; - Developing new types of fuel; - Promoting products in new market segments.</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td>6. Electricity and Capacity Market Risk</td>
<td>- The risk depends exclusively on external factors. The risk cannot be hedged using financial instruments due to the low liquidity of the market. To reduce the risk, power supply divisions of JSC Rosenergoatom are actively engaging with the Association NP Market Council to obtain approval for amendments to the regulatory framework governing the wholesale electricity and capacity market and are negotiating with PJSC FGC UES and JSC SO UPS in order to align the schedule of power grid equipment maintenance.</td>
<td>1</td>
</tr>
</tbody>
</table>

### Hardship

- Floating-rate loans on which interest rates may be increased may be refinanced using the intra-group liquidity pool.

Results: The Corporation maintains a stable long-term loan portfolio. The average interest rate on the total debt portfolio is maintained below 5.0% per annum, including by optimising the loan portfolio, increasing the share of long-term fixed-rate foreign-currency loans and raising subsidised financing. There was no significant increase in the risk level in 2021 due to the effective use of the risk management approaches described above. For details, see the section ‘Financial Management’.

### Credit Risk

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

Management approaches:
- 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: Losses through the fault of counterparties were minimised.

### Liquidity Risk

- Lack of funds for the fulfilment of obligations by the Corporation and its organisations

Management approaches:
- Centralised cash management (cash pooling);
- Rolling liquidity forecasts and cash-flow budget;
- Maintaining required amounts of open lines of credit with banks;
- Reducing the period of keeping spare cash on bank deposits when this is advisable from an economic perspective;
- Discussing matters related to state support with federal executive authorities;
- Active use of project financing instruments as part of implementation of projects and programmes by ROSATOM and its organisations.

Results: ROSATOM maintained sufficient liquidity to repay liabilities on time, preventing unacceptable losses and reputational risk. For details, see the section ‘Financial Management’.
8. Health, safety and environmental (HSE) risks

Major accidents/ incidents in nuclear organisations

Management approaches:
- Occupational safety and health monitoring in nuclear organisations, including inspections and preventative visits, development of action plans and implementation of risk mitigation measures;
- Measures to improve HSE performance in ROSATOM’s 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 hosting nuclear power and nuclear industry enterprises;
- Measures to upgrade process equipment and improve production processes in the enterprises;

9. Political risk

Management approaches:
- Coordination with the Russian Ministry of Foreign Affairs and other authorities;
- Providing political support for global operations of nuclear organisations, including through ROSATOM’s overseas representatives in Russian missions abroad;
- 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;

Operational risks

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

Decrease in power generation due to equipment shutdowns and unavailability

Management approaches:
- To improve NPP safety, reliability and resilience, prevent equipment failures, meet the load schedule, achieve the target for electricity and heat supply, and accelerate efforts to achieve key targets for electricity output and full government orders, JSC Rosenergoatom has adopted and is using a special mode of operation to achieve the target for electricity output;
- On an annual basis: Implementation of the NPP life extension programme and equipment upgrades to increase installed capacity and power generation at operating power units (including the possibility of power units operating at above nameplate capacity).

Results:
In 2021, nuclear power generation totalled 222.4 billion kWh. The rate of fulfilment of government orders (performance against the balance target set by the Federal Antimonopoly Service (FAS) of Russia) stood at 102.19%. Electricity output exceeded the target mainly due to a reduction in the duration of scheduled repairs at NPP power units, including power units No. 1 and 4 of Balakovo NPP, power units No. 3 and 4 of Kursk NPP, power unit No. 1 of Rostov NPP, etc. 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.

For details, see ‘Performance of the Power Engineering Division in 2021’. 
11. Reputational risk
(Communications Department of ROSATOM and Heads of Divisions)
Changes in stakeholder perception of the trustworthiness and appeal of the Corporation and its organisations

Management approaches:
— Measures to shape a positive public opinion on the development of the Corporation's technologies and projects (both nuclear and non-nuclear) through improved information transparency and open stakeholder engagement (including the functioning of an industry-wide public reporting system);
— The transition of ROSATOM’s organisations to a single brand made an important contribution to enhancing the Corporation’s reputation. This enables consistent positioning of ROSATOM’s organisations on the Russian and international markets, which, in turn, helps Russian nuclear organisations and their projects gain greater recognition from partners and customers;
— Continuous efforts to improve the recognition and appeal of ROSATOM’s HR brand (both in the industry and among prospective employees and within the expert community).

Risks and changes in risk levels (risk owners)

<table>
<thead>
<tr>
<th>Risk description</th>
<th>Risk management practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corruption and other offences leading to a damage to/loss of assets</td>
<td>Management approaches: ROSATOM and its organisations have adopted an industry-wide system for the prevention of corruption and other offences.</td>
</tr>
<tr>
<td>Examinining alternative options for the supply of equipment that has been produced by the Corporation or in production</td>
<td>— Prioritised implementation of industry-wide anti-corruption regulations in new businesses.</td>
</tr>
<tr>
<td>Developing and implementing an action plan in response to sanctions, as well as responding to the tightening of existing and imposition of new trade restrictions on target end markets</td>
<td>— Detection, timely prevention and settlement of conflicts of interest;</td>
</tr>
<tr>
<td>Taking into account political interests of governments in the Corporation’s and markets</td>
<td>— Reviewing and updating industry-wide regulations on asset protection and management approaches;</td>
</tr>
<tr>
<td>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</td>
<td>— Reporting evidence of corruption and other offences, including through feedback mechanisms (the hotline);</td>
</tr>
<tr>
<td>Further product diversification (wind power, nuclear medicine, composite materials)</td>
<td>— Introduction of online anti-corruption training based on mobile platforms accessible to every employee in the industry;</td>
</tr>
</tbody>
</table>

Results:
The conclusion of 18 international agreements on the peaceful use of nuclear energy is a positive sign. At year-end 2021, ROSATOM’s portfolio of overseas projects comprised 35 nuclear power units in 12 countries. Overseas projects involving the construction of 24 power units in 9 countries are in the active stage of implementation. Despite restrictions necessitated by the spread of the coronavirus disease, in 2021, none of ROSATOM’s overseas construction projects were suspended.

Explanation of the increase:
— The risk tends to increase, as persisting sanctions pressure on Russian individuals and legal entities generally increases uncertainty over the possibility of implementation of specific economic projects;
— Growing political tensions;
— Tightening of the sanctions regime by the US and the EU and retaliatory possibilities of implementation of specific economic projects;
— The risk tends to increase, as persisting sanctions pressure on Russian individuals and legal entities generally increases uncertainty over the possibility of implementation of specific economic projects;
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— Growing political tensions;
— Tightening of the sanctions regime by the US and the EU and retaliatory possibilities of implementation of specific economic projects.
For details, see the section ‘Strategic Communications’ and the chapter ‘Social responsibility’. Successful communication campaigns, including the coverage of ROSATOM’s major achievements in Russia and abroad, have been implemented. There was no significant increase in the level of reputational risk in 2021. Strong correlation with political risk, which tended to increase, was largely offset by technological risk, with a decrease in correlation between the two, and economic risk, which remained relatively stable.

Management approaches:

- 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 practices;
- Regular monitoring and control of risk management as part of overseas projects;
- 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;
- 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;
- Implementing a corporate project management system;
- Developing procedures (standardised solutions) for project risk management;
- Implementing best project management practices (including ROSATOM’s industry-wide risk management system and the TCM NC cost and schedule management methodology) and ROSATOM’s 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.

Results: ROSATOM continuously improves the system for managing all stages of NPP construction, from front-end engineering design to the commissioning of power units. The Corporation carries out quantitative risk assessment for NPP construction projects (using the Monte Carlo method). Steps are being taken to develop and improve the project risk management system at all stages of project implementation: qualification of contractors, project management, systematic monitoring, etc.

Risk management practices

Steps are being taken to develop and improve the project risk management system at all stages of project implementation: qualification of contractors, project management, systematic monitoring, etc. Risk management measures implemented by the Corporation have enabled it to avoid a negative impact on key performance indicators.
13. Climate 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:

- 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;
- Calculations performed as part of an assessment of external impacts take into account the climatic characteristics of the customer country and form part of a probabilistic safety analysis of NPPs; and
- Industrial environmental control is performed to ensure that the operations of enterprises that make an impact on the environment comply with statutory limits and applicable environmental laws and regulations;
- ROSATOM monitors compliance of its operations with statutory limits on environmental and health impacts.

Results:

- The operation of wind power generation facilities produce virtually no CO or CO2 emissions, helping to maintain the natural ecological balance and reduce the likelihood of adverse climate changes or natural anomalies.
- In 2021, ROSATOM completed the construction and commissioned the Kochubeyevskaya WPP (210 MW), the Marchenkosvkaya WPP (120 MW), the Kochubeyevskaya WPP (210 MW), and the Muzhinskaya WPP (60 MW). ROSATOM’s portfolio of wind power projects increased by 466 MW (with commissioning scheduled for 2025–2027) and reached 1.7 GW. The capacity of the Corporation’s WPPs totals 720 MW, with electricity output totalling 1.2 billion kWh.

14. Social and political risks

Management approaches:

- ROSSATOM 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; and
- 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; and
- In order to reduce social risks in its regions of operation, ROSATOM 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.
## Risks and changes in risk levels (risk owners)

<table>
<thead>
<tr>
<th>Risk description</th>
<th>Risk management practices</th>
<th>Connection with strategic goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>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;</td>
<td>To prevent a deterioration in the epidemiological situation, ROSATOM fully complies with all requirements for public sanitation and disease prevention amid the spread of the new coronavirus disease (COVID-19) and recommendations by the Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing (Rospotrebnadzor); in addition, employees are vaccinated.</td>
<td>Result: ROSATOM succeeded in maintaining a stable environment in its host towns and cities and ensuring operational continuity in its organisations.</td>
</tr>
</tbody>
</table>

## 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.

The following risks (threats and opportunities) have been selected in order to monitor other risks:

### Threats:
- Risk of technologies developed by the Corporation becoming less competitive;
- Increased competition in the markets in which the Corporation operates;
- Utility companies losing confidence in the supply reliability of ROSATOM’s organisations;
- Growing stakeholder concerns or negative feedback from stakeholders;
- Loss of intellectual capital;
- A decrease in the employee satisfaction level.

### Opportunities:
- Access to new markets;
- Use of regulatory incentives (interest rate subsidies);
- Development of new products or services through R&D and innovation;
- Opportunities for business diversification;
- More efficient production and distribution processes;
- Improved resource efficiency;
- Measures to improve energy efficiency;
- Use of supportive policy incentives (subsidising ‘green’ technologies, etc.).

A supply chain monitoring system is in place, with a focus on monitoring compliance with sustainability requirements (media monitoring, questionnaire surveys, sustainability audit of suppliers).

A questionnaire survey has been conducted among all suppliers of uranium products.

Two suppliers have undergone a sustainability audit.

The Supplier Code of Conduct of JSC TENEX has been updated, and public consultations have been held with stakeholders, including foreign customers.

### Risk Insurance

Risk insurance is one of the main risk management approaches used by ROSATOM. To improve the reliability of insurance coverage, in 2021, the Corporation continued to cooperate with the insurance community on the reinsur- ance of Russian operators against property risks. A significant share of liability of Russian NPPs for potential nuclear damage has been transferred for reinsur- ance to the international pooling system[^52]. This proves that the international nuclear insurance community acknowledges the safety and reliability of Russian NPPs to be adequate.

In 2022, the Corporation plans to continue to engage experts from the Russian Nuclear Insurance Pool and the international pooling system to audit key nuclear organisations for insurance purposes.

[^52]: The international pooling system comprised of International Nuclear Insurance Pools is an unincorporated organisation representing the interests of nuclear insurance pools from 27 countries.

GRI 103-2
Objectives for 2022 and for the medium term

ROSATOM has developed an action plan for 2022 covering the key areas of the Risk Management Development Programme for the period from 2019 through 2024. This plan 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 plan sets three key objectives for the development of risk management in the Russian nuclear industry:

— 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.

Plans for 2022 include implementing the second stage of the ISRM project in accordance with instructions from ROSATOM.

1.12.3. Internal control system

Key results in 2021:

— 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 leadership of the Internal Control and Audit Function in the sphere of control practices was confirmed by awards in the Best Internal Audit Service of the Year category (Association Institute of Internal Auditors, Russia) and the Efficiency of the Internal Control System category for the best internal controller, the best methodologist and the best company in terms of performance of the internal control system (National Association of Internal Auditors and Controllers, Russia).
— A ‘reasonable level of assurance’ was expressed for the internal control and audit function in an international ranking**.

* Internal customers are the Corporation’s business process owners that request internal audit services.
** The methodology of the Vigeo Eiris rating agency includes three levels of assurance: ‘reasonable’, ‘moderate’ and ‘weak’.

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).
The following measures were implemented in order to improve the internal control system:

- A leaflet titled 'Internal Control System Explained in Simple Terms' was developed and posted on the intranet portal of the ICAF;
- Specialised internal control bodies (SICBs) of ROSATOM’s organisations assumed greater responsibility by adopting a leadership model;
- Priorities for the development of control activities in terms of assisting the business in the achievement of sustainable development goals were determined.

For the SICBs to provide reasonable assurance regarding the achievement of ROSATOM’s business goals, the following steps were taken in 2021:

- Control activities were focused on the implementation of federal projects and strategic programmes in which the Corporation and its organisations participate, with 78% of control activities focused on the achievement of strategic goals, including 17% focused on project implementation;
- A number of internal audits were conducted, including an audit of efficiency of the production planning process as part of the Akkuyu NPP project and an audit of implementation of the Paks II NPP project, which made it possible to identify the potential for reducing the cost of NPP construction projects (the relevant organisational measures were taken as part of the projects). Following an audit of the system for the monitoring of market conditions, a system for managing the profitability of new businesses was established in new business integrators; the management process was optimised; steps were taken to ensure that ROSATOM’s key performance targets are met taking into account the profitability of new businesses;
- Project audit techniques were mastered, and criteria were established for assessing project management efficiency;
- The focus of audits of financial and business operations was shifted to monitoring the implementation of project and strategic programmes. For instance, following the audits of financial and business operations of LLC Rusatom – Additive Technologies and FSUE Alexandrov Research Institute of Technology, a system was established for the monitoring R&D forming part of the Programme to Develop Technical Capabilities, Technology and Scientific Research and the Consolidated Industry-Wide Plan of R&D Topics, with the portfolio of orders for new products growing seven-fold.

Continuous improvement of professional knowledge and skills of employees throughout the SICB hierarchy was achieved in 2021:

- 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 150 people, more than 10 events were held in 2021);
- A uniform system was developed for selecting applicants for various internal audit positions in ROSATOM’s organisations (in the form of test questions taking into account qualifications and required competences);
- A methodology for assessing basic competences (professional and technical knowledge and skills) of SICB employees and a methodology for assessing basic competences based on the quality and effectiveness of completed control activities were developed; these methodologies are aligned with the provisions of professional standards for internal auditors and internal controllers;
- Certification of compliance with the professional standard for internal auditors was carried out;
- A number of centralised standardised methodologies were developed, including a methodology for assessing the performance of the risk management system and the efficiency of internal controls in business processes, and a checklist of questions focused on sustainable development to be included in audit programmes.

Outcomes of control activities in 2021

In the reporting year, ROSATOM’s SICBs conducted 722 inspections in Russian nuclear organisations.

External supervisory bodies conducted 17 inspections, including 11 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 575 corrective measures and approved them for implementation. Based on the findings of inspections conducted in the reporting year, disciplinary sanctions were imposed on 358 employees of nuclear organisations, including 32 senior managers.

Stakeholder control

In 2021, a range of features and functions for filing complaints regarding procurement processes conducted in accordance with ROSATOM’s Uniform Industrial Procurement Standard (the Regulations on Procurement) (UIPS) in electronic form on the relevant page on the official procurement website of the nuclear industry and on electronic trading platforms became operational. 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.
ROSATOM 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 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.

As part of training programmes, an online course titled ‘Procurement Monitoring in the Nuclear Industry’ was developed in cooperation with ROSATOM’s Corporate Academy for the Procurement School run by the Academy. 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 in procurement departments regarding the application of provisions of the UIPS and the business reputation score of suppliers; a Q&A forum for employees in the industry has been put into operation as part of the Partner Special Monitoring and Analytics Unit.

The Central Arbitration Committee and the arbitration committees of the Power Engineering, Fuel and Engineering Divisions received 869 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. 496 complaints were investigated; 113 complaints (22.8% 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 0.19% in 2020 to 0.14% in 2021).

In addition, the Central Arbitration Committee reviewed 31 complaints related to the calculation of the business reputation score of suppliers (with five complaints deemed to be valid), reflecting a 20% increase compared to 2020.

<table>
<thead>
<tr>
<th>Changes in indicators pertaining to control activities</th>
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</thead>
<tbody>
<tr>
<td>Indicator</td>
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<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Third-party inspections</td>
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<tr>
<td>Number of inspections</td>
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<tr>
<td>Outcomes of inspections</td>
</tr>
<tr>
<td>Quality of organisation and performance of internal financial control and internal financial audit as assessed by the Russian Ministry of Finance, %</td>
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<tr>
<td>Internal inspections</td>
</tr>
<tr>
<td>Number of inspections</td>
</tr>
<tr>
<td>Outcomes of inspections</td>
</tr>
<tr>
<td>Number of employees on whom disciplinary sanctions were imposed</td>
</tr>
<tr>
<td>including the number of senior managers</td>
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<tr>
<td>Stakeholder control</td>
</tr>
<tr>
<td>Number of complaints in the sphere of procurement</td>
</tr>
<tr>
<td>Number of reports (complaints) accepted for investigation</td>
</tr>
<tr>
<td>Outcomes of investigation of complaints in the sphere of procurement</td>
</tr>
<tr>
<td>Number of valid complaints</td>
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<tr>
<td>Valid complaints as a percentage of the total number of investigated complaints</td>
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<tr>
<td>Valid complaints as a percentage of the total number of purchases</td>
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Changes in indicators pertaining to control activities
Plans for 2022

In 2022, efforts aimed at improving the performance of governance and internal control systems in the Corporation and its organisations and further enhancing control activities will involve implementing a set of measures, including the following:

— Rolling out project audit and strategic audit practices;
— Mastering continuous auditing techniques;
— Developing control activities with a focus on improving the maturity of the industry in the sphere of sustainable development;
— Digitisation of control activities;
— Automation of the information system for calculating the business reputation score;
— Creating a Q&A forum for suppliers;
— Developing a methodology for monitoring current procurement procedures.

1.12.4. Prevention of corruption and other offences

Key results in 2021:

— ROSATOM implemented all measures required to support the government anti-corruption policy, including compliance with prohibitions, restrictions and requirements for preventing or resolving conflicts of interest.
— More than 7,000 employees took part in professional development events focused on combating corruption.
— Disciplinary and financial sanctions were imposed against more than 2,000 executives.

1.12.4.1. Prevention of corruption

ROSATOM’s anti-corruption system

ROSATOM is committed to preventing corruption and works systematically to ensure that all its employees, including senior executives of ROSATOM and its organisations, comply with legislation. These efforts are based on anti-corruption regulations.


ROSATOM implemented all measures required to support the government anti-corruption policy, including compliance with prohibitions, restrictions and requirements for preventing or resolving conflicts of interest.

Every executive in ROSATOM and its organisations is responsible for compliance of their subordinates with the legislation of the Russian Federation and ROSATOM’s local regulations and for timely implementation of effective measures aimed at preventing and resolving conflicts of interest. Responsibility for prevention of corruption in ROSATOM lies with the Asset Protection Department.

Existing organisations in the industry have adopted industry-wide anti-corruption standards, which are a set of anti-corruption regulations aligned with the requirements of anti-corruption legislation. Furthermore, companies established, acquired, etc. under the procedure established by law are inquired about prioritised anti-corruption measures.

Key results in 2021

Steps were taken to ensure compliance with anti-corruption laws and management decisions and to create and maintain an environment that prevents involvement in corruption.

The Anti-Corruption section of ROSATOM’s official website was updated on a regular basis; it contains up-to-date materials grouped into the following subsections:

— Anti-Corruption Laws and Regulations;
— Anti-Corruption Review;
— Methodological Guidelines;
— Forms of Anti-Corruption Documents to Be Filled In;
— Information on the Income, Expenses, Property and Liabilities of ROSATOM’s Employees;
— Commission for Compliance with Requirements for Professional Conduct and Settlement of Conflicts of Interest in ROSATOM;
— Feedback Channels for Reporting Corruption;
— Submit a Report on the Findings of an Independent Anti-Corruption Review;
— Information Materials;
— Information on the Average Monthly Salary of Executives, Their Deputies and Chief Accountants of Federal State Unitary Enterprises under ROSATOM’s Jurisdiction;
— Anti-Corruption Training.
Feedback channels were provided for employees of nuclear organisations and other stakeholders concerning anti-corruption matters.

All reports of corruption and other offences received through the hotline and other channels were investigated.

Sanctions for offences

ROSATOM adheres to a strict approach regarding suspected instances of corruption and other offences.

In 2021, disciplinary and financial sanctions were imposed against more than 2,000 executives.

Materials concerning corruption and other offences were submitted to law enforcement agencies under the established procedure, with criminal proceedings instituted, where applicable.

Employee training in anti-corruption practices

In 2021, ROSATOM continued to support the professional development of executives responsible for preventing corruption and other offences, as well as managers and employees in the sector. At the same time, preventive measures were implemented and professional development activities for employees focused on combating corruption were conducted taking into account restrictions necessitated by the COVID-19 pandemic.

In 2021, more than 7,000 employees of ROSATOM and its organisations took part in professional development events focused on combating corruption (training, participation in conferences, etc.), including:

— More than 400 employees whose responsibilities include preventing corruption (subparagraph (a) of paragraph 39 of the National Plan);
— 142 employees newly hired by ROSATOM, including 10 employees appointed to positions involving responsibility for compliance with anti-corruption standards (subparagraph (b) of paragraph 39 of the National Plan);
— At least 500 employees involved in the procurement of goods, work and services (subparagraph (c) of paragraph 39 of the National Plan);
— More than 460 employees in these categories underwent training using video conferencing and other remote communication technologies.

Furthermore, anti-corruption training programmes were made available to almost all employees in the industry (more than 200,000 people) through industry-wide mobile online training platforms.

Face-to-face and online anti-corruption training courses for employees of ROSATOM and nuclear organisations involved in the procurement process were developed and rolled out in cooperation with the Procurement, Logistics and Quality School of ROSATOM’s Corporate Academy.

Preventing corruption in the sphere of procurement

Pursuant to resolutions No. 145 dated 16 June 2021, No. 147 dated 14 July 2021 and No. 150 dated 29 October 2021 of ROSATOM’s Supervisory Board, in order to improve procurement terms and conditions, procedures and mechanisms, ROSATOM updated its Uniform Industrial Procurement Standard (the Regulations on Procurement) approved by resolution No. 37 of ROSATOM’s Supervisory Board dated 7 February 2012 (the UIPS).

The annual procurement programme, the procurement plan and the procurement schedule, as well as amendments thereto, are posted in the integrated procurement information system and are made publicly available. Procurement is conducted electronically through online trading platforms; ROSATOM also maintains an electronic register of contracts.

All procurement procedures are subject to approval by asset protection departments.

ROSATOM tops corporate transparency and procurement transparency rankings according to anti-corruption NGOs and a number of civil society organisations.

A large share of procurement was conducted on behalf of ROSATOM and nuclear organisations by the authorised bodies of qualified buyers, which prevented the risk of corruption in relations between customers and suppliers. Employees of the authorised bodies filed tax returns under the established procedure.

ROSATOM’s permitting bodies acted as a barrier preventing irregularities in the procurement process. Detected violations were duly investigated by internal audit and asset protection divisions.
To minimise corruption risks amid the COVID-19 pandemic, in 2021, ROSATOM continued to apply the provisions of orders establishing special terms and conditions for procurement (Orders of ROSATOM No. 1/357-P dated 8 April 2020 and No. 1/374-P dated 13 April 2020); this included simplifying and speeding up individual procedures and appointing executives responsible for applying them, with priority given to open competitive tendering.

For details, see the section ‘Procurement Management’.

Preventing and resolving conflicts of interest

ROSATOM took systematic steps to prevent and resolve conflicts of interest.

All instances of perceived conflicts of interest in nuclear organisations were investigated.

At the same time, the number of voluntary reports of perceived conflicts of interest by employees of the organisations doubled.

The following documents were filed on time and in full:

- The Director General of ROSATOM filed certificates of income, expenses, property and liabilities for the reporting year with the Presidential Anti-Corruption Directorate.
- Deputy and First Deputy Directors General and the Chief Accountant of ROSATOM filed certificates of income, expenses, property and liabilities for the reporting year with the Personnel Department of the Government of the Russian Federation.

The Presidential Anti-Corruption Directorate and the Department of Public Service and Personnel of the Government of the Russian Federation did not raise any issues when accepting the certificates.

Plans for 2022 and for the medium term

In 2022 and in the medium term, ROSATOM and its organisations plan to implement a set of anti-corruption measures in accordance with instructions provided in the National Plan.

1.12.5. Financial management

Key results in 2021:

- A total of about RUB 44 billion has been saved in the industry through intra-group financing.
- The Analytical Credit Rating Agency (ACRA) confirmed ROSATOM’s credit rating at the highest possible level, AAA(RU), with a stable outlook.

Implementation of ROSATOM’s financial strategy in 2021

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 legal framework regulating financial management (including the Uniform Industry-Wide Financial Policy);
- Vertical integration of treasury departments in subsidiaries, 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 2021 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 2021, the Corporation continued to work towards:

— Accumulating spare cash in the accounts of pool leaders;
— Improving the accuracy of payment scheduling (a rolling liquidity forecast);
— 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.

In 2021, ROSATOM continued to work towards further centralisation of the treasury function, including the development of a Payment Factory at JSC Atomenergoprom. This project is aimed at further improving the performance of the treasury function in the industry.

A total of about RUB 44 billion was saved in the industry through intra-group financing between 2010 and 2021.

Green bonds

On 25 June 2021, JSC Atomenergoprom (the company that consolidates ROSATOM’s civilian assets) 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 in the issue have a par value of RUB 1,000 each and a maturity of five years.

This is the first placement of exchange-traded bonds by a Russian issuer to finance renewable energy sources. Proceeds from the bond placement have been used to refinance expenditure on the Wind Power programme. They were more than eight times oversubscribed. The initial coupon rate on the bonds was set in the range of 7.7-7.8% per annum. With a planned placement volume of RUB 10 billion, demand for the bonds eventually exceeded RUB 80 billion. As the bond issue was oversubscribed, the company was able to lower the coupon rate to 7.5% per annum, which corresponds to an effective yield of 7.64%.

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. Expert RA also assigned the ruAAA rating to the bond issue.

Parties to the transaction included all categories of investors, such as banks, managers, investment firms and insurance companies; it also generated demand from individuals.

In December 2021, JSC Atomenergoprom won the Cbonds Awards in the Green Bonds of the Year category.

Receiving and maintaining credit ratings

In the reporting year, JSC Atomenergoprom continued to take measures to maintain credit ratings assigned by the ‘Big Three’ international rating agencies (S&P, Moody’s Investors Service and Fitch Ratings) and the national rating agency, JSC Expert RA.

As at 31 December 2021, JSC Atomenergoprom was rated at the level of Russia’s sovereign credit ratings:

— BBB-/A-3 with a stable outlook by S&P;
— BBB with a stable outlook by Fitch Ratings;
— Ba3 with a stable outlook by the Moody’s Investors Service international rating agency;
— ruAAA with a stable outlook by the national rating agency, JSC Expert RA.

In addition, in 2021, 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 rubles at 8.6% as at 31 December 2021. Despite the economic crisis caused by the COVID-19 pandemic, throughout 2021, the Corporation maintained sufficient liquidity to ensure that it and its organisations operate normally and fulfil their contractual obligations on time.

A pool leader is an organisation of the Corporation on whose accounts spare cash is accumulated and subsequently redistributed between ROSATOM organisations through loan agreements. The organisation performing the functions of a pool leader is appointed under the resolution of ROSATOM executive bodies.
JSC Atomenergoprom obtained funding on preferential terms 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, with a total limit of RUB 2.635 billion. In addition, in 2021, JSC ZO-Podolsk secured investment funding for equipment purchase and modernisation totalling RUB 973.4 million at a preferential rate as part of the corporate competitiveness improvement programme approved by Decree No. 191 of the Government of the Russian Federation dated 23 February 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 FSUE) enabled an optimal debt burden distribution between JSC Atomenergoprom and organisations outside its scope.

ROSATOM continued to search for sources of financing for projects in traditional and new business areas:

— A project finance deal was closed as part of the project to build a 340 MW wind power plant. This is the first project involving the use of sustainable finance mechanisms: the price terms of the credit facility are linked with target indicators for the construction and operation stages. The use of this model is especially important for the Corporation in the context of its efforts to accomplish long-term sustainable development objectives. The bank will provide RUB 40 billion for a 12-year period;

— As a follow-up to export credit support arrangements for ROSATOM’s projects made with the French Export Credit Agency Bpifrance Assurance Export and formalised in the outcome document of the 26th session of the Franco–Russian Economic, Financial, Industrial and Trade Council (CEFIC) held on 21 December 2021, the Corporation continued to cooperate with the French Ministry for the Economy and Finance in order to develop a ‘new mechanism’ for financing its overseas NPP construction projects. Despite challenges posed by the pandemic, throughout 2021 the Corporation held talks with the Ministry, including a technical workshop for the French Ministry for the Economy and Finance (the Ministry), the French Export Credit Agency Bpifrance Assurance Export, banks and French industrial companies to present ROSATOM’s current and future overseas NPP construction projects. Despite challenges posed by the pandemic, throughout 2021 the Corporation held talks with the Ministry, including a technical workshop for the French Ministry for the Economy and Finance (the Ministry), the French Export Credit Agency Bpifrance Assurance Export, banks and French industrial companies to present ROSATOM’s current and future overseas NPP construction projects. Despite challenges posed by the pandemic, throughout 2021 the Corporation held talks with the Ministry, including a technical workshop for the French Ministry for the Economy and Finance (the Ministry), the French Export Credit Agency Bpifrance Assurance Export, banks and French industrial companies to present ROSATOM’s current and future overseas NPP construction projects. Despite challenges posed by the pandemic, throughout 2021 the Corporation held talks with the Ministry, including a technical workshop for the French Ministry for the Economy and Finance (the Ministry), the French Export Credit Agency Bpifrance Assurance Export, banks and French industrial companies to present ROSATOM’s current and future overseas NPP construction projects.

— As part of the development of a concession model for the financing of construction of a pilot small nuclear power plant in the Sakhalin region, an agreement on the implementation of a zero–carbon nuclear power generation project in the Arctic zone of the Sakhalin region was signed with the Ministry for the Development of the Russian Far East and Arctic and the Head of the Sakhalin region at the 2021 Eastern Economic Forum. An interdepartmental working group was established in order to review matters related to a federal concession for the project; the group consists of representatives of ROSATOM and its organisations, the Ministry for the Development of the Russian Far East and Arctic, the Ministry of Economic Development and the Ministry of Energy of Russia;

— As part of the project to build the multipurpose fast neutron reactor research reactor (MIRB), the first syndicated loan agreement in the nuclear industry based on the principles of the Project Finance Factory was signed (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 financial partner was selected as part of the Federal Project titled ‘Infrastructure for the Management of Hazard Class 1 and 2 Waste’ that is being set up by ROSATOM. The project involves setting up sustainable development targets, the achievement of which will result in a decrease in the cost of financing;

— ROSATOM continued to take steps to promote project finance instruments in the industry, accumulate and share the relevant experience. This included holding several meetings of the industry-wide expert panel on the structuring of project finance in 2021;

— An interdepartmental working group on cooperation on strategic priorities and promising development areas formed jointly with the Autonomous Non-Profit Organisation Agency of Technological Development (the competent agency of the International Fund of Technological Development) continued to operate;

— A ‘packaged’ project finance solution was developed for investment projects of JSC Atomenergomash, which made it possible to set out specific, structured requirements of financial institutions in terms of the necessary materials and explanations concerning potential projects. The development of ‘packaged’ project finance solutions for ROSATOM’s investment projects will be continued in 2022.

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 and Procedure for Calculation of Income Tax for Controlled Foreign Companies; the Methodological Guidelines on Assessing the Applicability of Benefits under Tax Treaties (MLI).

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 and Procedure for Calculation of Income Tax for Controlled Foreign Companies; 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**

Since 2013, major organisations in the industry have been included in the consolidated taxpayer group (CTG), with JSC Atommexgasprom as a responsible member of the CTG 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. JSC Atommexgasprom and JSC Rosenergoatom joined the tax monitoring programme as from 1 January 2020. Starting from 1 January 2022, ROSATOM and nine organisations in the Fuel Division also joined the tax monitoring programme. 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 organisations, including scanned contracts and primary accounting records.

Currently, another 12 organisations in the industry are preparing to join the tax monitoring programme as from 1 January 2023.

The transition to tax monitoring enables ROSATOM’s organisations to significantly speed up decision-making on disputed tax issues, minimise risks and costs associated with tax control and enhance their reputation as reliable partners doing business in a transparent manner.

In 2021, ROSATOM’s representatives joined the Working Group on the Internal Control and Risk Management System established by the Federal Tax Service; in addition, together with JSC Greenatom, they participate in a pilot project launched by the Federal Tax Service to integrate taxpayers’ information systems with the Nalog 3 Automated Information System operated by the Federal Tax Service. Participation in working groups and projects enables the Corporation to obtain information on upcoming changes in tax legislation and the regulatory framework in advance and to make comments and proposals. ROSATOM is involved in the approval of draft laws; the Corporation also initiates amendments to tax legislation on matters relevant to organisations in the industry.

**Country-by-country reporting**

Organisations within the scope of consolidation of ROSATOM pay taxes to 27 foreign jurisdictions. In 2021, the share of taxes paid to overseas budgets in the total amount of taxes paid stood at 6.4%.

**Tax payments by ROSATOM to budgets of different levels in the Russian Federation, RUB billion**

<table>
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<tr>
<th>Level of the budget system</th>
<th>For 2019</th>
<th>For 2020</th>
<th>For 2021</th>
<th>Deviation, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal</td>
<td>135.4</td>
<td>150.5</td>
<td>170.5</td>
<td>+13.29%</td>
</tr>
<tr>
<td>Regional</td>
<td>71.5</td>
<td>99.0</td>
<td>78.2</td>
<td>-21.01%</td>
</tr>
<tr>
<td>Local</td>
<td>0.5</td>
<td>0.4</td>
<td>0.6</td>
<td>+50%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>207.4</td>
<td>249.9</td>
<td>249.3</td>
<td>-0.24%</td>
</tr>
</tbody>
</table>

**Plans for 2022 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 2021:
— The investment programme was 76% completed (+3 p.p. compared to 2020).
— Return on the investment portfolio stood at 16.6% (+2.4 p.p. compared to 2020).

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 2021

In 2021, ROSATOM’s investment programme was 76% completed\(^54\). Performance against the targets of the investment programme (including in the Divisions) increased by 3 percentage points compared to 2020 due to the gradual lifting of COVID-related restrictions.

At the same time, return on ROSATOM’s investment portfolio stood at 16.6%\(^55\).

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\(^{54}\) Including the investment programme of JSC Rosenergoatom.

\(^{55}\) Calculated for the period from 2021 through 2099.

\(^{56}\) Apart from NPP construction in Russia.
Measures to improve investment efficiency

In the reporting year, the basic project management principles applied during the implementation of federal projects by ROSATOM and its organisations were formalised.

Measures to improve the maturity of project management in ROSATOM’s organisations were updated.

Employees in the industry continued to develop their competences at the Project Management School. 401 people underwent assessment and subsequent training in 2021.

Investment processes were adapted to remote work, with resolutions on projects and the portfolio reviewed, agreed and approved/signed off virtually.

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.

Project costs fully financed using proceeds from operating activities were reviewed in four Divisions. It was established that the relevant workload was insignificant; a list of subsequent necessary adjustments to planning mechanisms in the Divisions and steps required for scaling up the solution across the industry was compiled.

A summary of guidelines and regulations on project management in the industry was put into effect. It consolidates and supersedes previous documents on these matters taking into account discrepancies between various documents. In addition, it has considerably simplified the application of the local regulatory framework governing projects and investment activities.

The project to migrate the Sirius information system to a new software platform has been approved and is being implemented in accordance with ROSATOM’s plans.

Plans for 2022 and for the medium term

To continue to develop project methodology on a systematic basis; to expand the scope of resources provided to project initiators by the specialised industry-wide centre;

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 restrictions imposed in 2021 in response to the pandemic;

— To increase the level of digitisation of projects and investment activities.

1.12.7. Procurement management

Key results in 2021:

— ROSATOM and its organisations placed 35,407 orders worth a total of RUB 1.003 trillion under a competitive tendering procedure using their own funds.

— 365 orders worth a total of RUB 84.0 billion were placed under a competitive tendering procedure using federal budget funds.

— Contracts were concluded with 23,173 counterparties.

— The share of electronic procurement totalled 99%.

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.

ROSATOM ranks high in professional procurement rankings every year

In 2021, the Corporation was also included in major procurement rankings and received the following awards:

— The Corporation topped the National Transparency Ranking in the Guaranteed Transparency category;

— JSC Russian Small and Medium Business Corporation thanked ROSATOM 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 was presented with the Standardiser of the Year Award for its practical contribution to the development of standards that are of major economic and social importance (a joint project of the Ministry of Industry and Trade, the Russian Federal Agency for Technical Regulation and Metrology (Rosstandart), the Russian Organisation for Quality and FSID Standardinform).
Governing and supervisory bodies in the sphere of procurement include:

— The Central Procurement Commission;
— Permanent procurement commissions of the Divisions;
— The Central Arbitration Committee of ROSATOM and arbitration committees of the Divisions;
— The Chief Controller.

Implementation of the annual procurement programme

In 2021, the demand of nuclear organisations for products with the required price and quality was met in full. ROSATOM and its organisations placed 35,407 orders worth a total of RUB 1,003.3 billion under a competitive tendering procedure using their own funds. The Corporation achieved savings totalling RUB 28.0 billion (5.2% of the value of completed purchases); overall, over the past 12 years, savings totalled RUB 338.7 billion.

365 orders worth a total of RUB 84.0 billion were placed by ROSATOM under a competitive tendering procedure using federal budget funds. Savings on procurement activities totalled RUB 1.25 billion (1.7% of the value of completed purchases).

As a result of the implementation of the annual procurement programme, contracts were concluded with 23,173 counterparties. The share of electronic procurement (excluding procurement for foreign projects) totalled 99%.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total value of orders placed under an open competitive tendering procedure</td>
<td>822.9</td>
<td>951.05</td>
<td>1,087.3</td>
</tr>
<tr>
<td>Using ROSATOM’s own funds</td>
<td>701.9</td>
<td>903.3</td>
<td>1,003.3</td>
</tr>
<tr>
<td>Using federal budget funds</td>
<td>121.0</td>
<td>47.75</td>
<td>84.00</td>
</tr>
</tbody>
</table>

Expanding access to procurement procedures for small and medium-sized enterprises (SMEs)

In 2021, nuclear organisations concluded 65,441 contracts with SMEs worth a total of RUB 282.0 billion; this included 47,421 contracts worth a total of RUB 173.8 billion concluded with SMEs by organisations subject to Decree No. 1352 of the Government of the Russian Federation. The value of contracts concluded following tendering exclusively among SMEs totalled RUB 72.6 billion. The target share of procurement from SMEs was achieved.

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 procurement managers of ROSATOM and its organisations using the system and enabled additional monitoring in order to minimise the number of errors in the course of procurement from SMEs.

Data reliability audits, including supplier assessment

In 2021, ROSATOM continued to improve the procedure for auditing the reliability of data provided by bidders. This is a tool for confirming that a supplier/contractor/manufacturer and entities that they engage are 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.

Order No. 1/857-P of ROSATOM dated 8 July 2021 on Amending the Uniform Industry-Wide Methodological Guidelines on Data Reliability Audit introduced an option of assessing the level of sustainable development of suppliers/contractors.

Uniform Industrial Procurement Standard (Regulations on Procurement) of ROSATOM: https://www.rosatom.ru/upload/iblock/186/1862e8e4edf96e08f31c2a788b2e453.
In the reporting year, 252 audits were conducted among manufacturers, contractors and service companies participating in procurement procedures:

- 216 audits were successfully passed by manufacturers/suppliers;
- 14 potential suppliers of products failed the audit;
- 22 organisations refused to undergo an audit;
- 42 audits were conducted remotely.

Analytics on contract performance show that the audit procedure helps to increase the share of contracts performed on schedule.

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 2021, ROSATOM continued to develop the logistics process by improving the relevant methodology.

In the reporting year, ROSATOM developed the Uniform Industry-Wide Methodological Guidelines on Just-in-Time Deliveries (Order No. 1/388-P dated 14 May 2021). This methodology will enable nuclear organisations to manage working capital more efficiently and reduce inventory.

The methodology for centralised procurement until 2024 was updated; the relevant amendments will help to increase the customer’s buying power and will make procurement procedures in nuclear organisations even more cost-effective.

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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 three times under the procedure approved by the Corporation. Two of these updates were 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. Key changes included the following:

- Requirements for bidders and criteria for the assessment of their bids were revised in order to align them with the exhaustive list of documents that a customer is entitled to request from small and medium-sized businesses participating in tendering as part of their bid, as stipulated in Federal Law No. 223-FZ;
- An additional stage of special tendering, namely the qualification of bidders, was abandoned;
- The form of declaration of compliance of a bidder/contractor (joint contractor) with the criteria for qualification as a SME was abandoned;
- The UIPS provisions were amended to align the wording with the provisions of Federal Law No. 223-FZ regarding the procedure for determining and providing a rationale for the initial (maximum) contract price and the price under a contract with a single supplier, including the procedure for determining the price formula;
- A new rationale was added for non-competitive procurement under the simplified procurement procedure, which involves purchasing Russian goods information on which is provided in the registers listed in Decree No. 192–193.

In 2021, ROSATOM continued to develop its Unified Industry-Wide Quality Management System, UIS Quality. The system is designed for automating nonconformity management and inspection management processes in order to reduce the lead time and improve product and process quality. The use of the system will enable a transition from hard copy documents to electronic document management involving the use of electronic signatures. For instance, in the reporting year, the system was integrated with a trusted service platform enabling the use of enhanced unqualified electronic signatures, with a time-tracking system for designers (Planner) and a system for recording events at nuclear power plants (NPP). The functions and features for managing legally relevant documents on quality became fully operational.

To enable the use of the UIS Quality system in overseas projects, steps were taken to localise the incoming equipment quality control process for the Akkuyu NPP project (Turkey) and the nonconformity management process for the Paks II NPP project (Hungary).

To date, more than 14,000 users from 300 organisations in the industry and 1,200 external counterparties have been connected to the system, and more than 50,000 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.

In the reporting year, ROSATOM developed the Uniform Industry-Wide Methodological Guidelines on Just-in-Time Deliveries (Order No. 1/388-P dated 14 May 2021). This methodology will enable nuclear organisations to manage working capital more efficiently and reduce inventory.
— It was stipulated that goods proposed for delivery must be included in the registers and bidders must provide information on the number of the relevant register entry, and that the number of the relevant register entry must be specified in the contract concluded following tendering under the simplified procurement procedure based on the new rationale;
— Replacement of goods included in one of the registers stipulated in Decree No. 2013 with goods not included in these registers during contract performance was prohibited; a new rationale was added for sourcing from a single supplier: the conclusion of a contract with a nuclear organisation that is a heat supplier for the supply of heat in the form of steam at prices set under the procedure approved by the Corporation;
— The scope of application of UIPS provisions stipulating that information contained in bids submitted during competitive tendering must be protected until the conclusion of the contract was expanded, with the relevant obligation imposed not only on the procurement authority but also on the customer (the initiator of the procurement process);
— It was stipulated 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;
— It was stipulated that the quality management system must undergo certification in the ROSATOMREGISTR Certification System (subject to the following conditions: if the relevant decision is made by the customer, and if there are two or more bidders). However, this assessment criterion does not apply if there is a requirement for a RAR certificate;
— The requirement that approval of the manufacturer quality assurance programme must not have been revoked was clarified;
— The requirement for addressing root causes of nonconformities detected during the performance of contracts concluded earlier was clarified;
— The following changes were made to the Methodology for Calculating the Initial Maximum Price:
   — For procurement of long-lead equipment with payments in roubles, currency adjustments to prices for imported products (in roubles)/Russian products (in foreign currencies) obtained from pricing sources were introduced in order to reflect changes in exchange rates, and it was stipulated that technical and commercial proposals must be requested from counterparties from the pricing source to which the currency adjustment is applied. If the price obtained from the pricing source is higher than the price stated in the technical and commercial proposal, only the latter is used;
   — For work/services, an obligatory requirement was set regarding a search for pricing sources in the Integrated Industry-Wide Price Database module of the UIS Procurement system (in this case, the search on the official procurement website of the nuclear industry is not carried out, as information contained in the Integrated Industry-Wide Price Database is duplicated on the website); and
   — New rationales were added for adjustments to technical and commercial proposals: adjustments with no additional requests sent to the supplier in the event of arithmetical errors; adjustments involving additional requests sent to the supplier if clarifications are required in terms of indexation (if the proposal expired no more than three months before the calculation data), the time frame, payment terms or volume (unless a reply to the additional request has been received before the calculation of the initial maximum price);
— The accuracy of calculation of the initial maximum price was improved taking into account inflation rates, with the search depth for contracts and offer prices reduced from three to two years;
— A single basis was provided for comparing pricing sources during the calculation of the initial maximum price and for comparing bids in the course of tendering, taking into account all taxes, fees and other expenses in accordance with the laws of the Russian Federation and taking into account the rulings of the Supreme Court of the Russian Federation.

To make non-competitive procurement procedures more transparent, optimise and speed up logistics processes, in 2021, ROSATOM continued to implement a new procurement method in the nuclear industry: the online store. As part of this approach, procurement has been fully automated and is conducted electronically. Amendments to the procedure for calculating 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. To reduce procurement lead time for simple products, the time frame for posting procurement information was reduced from 15 to 10 days.

The project was rolled out to new electronic platforms. At the end of the reporting year, procurement activities were carried out using the services of four electronic platforms (JSC Unified Electronic Trading Platform, JSC Electronic Trading Systems, LLC RTS-Tender, etc.).

Amid restrictions necessitated by the spread of the new coronavirus disease (COVID-19), in 2021, the practice of centralised monitoring and support of important contracts continued to be used in the industry. The accumulated experience will be incorporated into the integrated industry-wide supplier management system.

To streamline procurement planning and preparation processes and reduce procurement lead time, a number of simplifications were developed and introduced, including the following:

— 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 document management system 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;
— To provide assistance to organisations in the industry during the outbreak of COVID-19, special terms and conditions were established for procurement (ROSATOM issued Orders No. 1/315-P dated 17 March 2021, No. 1/551-P dated 30 April 2021 and No. 1/756-P dated 18 June 2021). For instance, on non-working days introduced in response to the spread of the coronavirus disease, the organisations were allowed to refrain from setting/applying the selection criteria requiring a data reliability audit to be conducted and the reliability of information provided in the bid concerning the availability of human and material resources and technical capabilities to be verified as part of the data reliability audit;
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 Committee, 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 further automate the logistics process and procurement activities, a shared information space was created, it comprises the following industry-wide subsystems:

1. The Procurement 2.0 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, the first release of the Procurement 2.0 subsystem was piloted, with a focus on procurement planning and preparation, including the drafting of technical specifications.

2. A subsystem for communication with suppliers (UIS Contract). The subsystem has been piloted. It is a platform containing information on contractual obligations and enabling the supplier to exchange information in a shared information space and to sign documents (using enhanced qualified and unqualified electronic signatures). Suppliers can view all their contracts, the status, risks, fulfilled and outstanding obligations. The customer can generate ‘chains’ of contracts; the system also provides information on how a breach of one contract may affect other contracts. This 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 the system.

3. 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 was developed, and pilot procurement transactions were 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 the products supplied to ROSATOM may be of poor quality. In addition, the proposed solution will help to enhance the digital culture.

To improve the overall efficiency and quality of procurement and contracting, in 2021, ROSATOM continued to develop the Qualified Buyer Service (QBS).

The QBS performs the full range of competitive and non-competitive procurement activities. The work of the QBS helped to reduce the workload of customer divisions and more than halved procurement lead time. In 2021, the average level of satisfaction reached 99.5% (+0.5% compared to 2020). The average procurement lead time from the identification of needs to the conclusion of a contract totalled 49 days (+5 days compared to 2020). Following the investigation of complaints by the Federal Antimonopoly Service of Russia, there were no complaints deemed to be valid. Following four inspections conducted in 2021 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.

The QBS actively introduces and improves new procurement tools:

- Long-term contracts are concluded;
- Category strategies are developed;
- The following procurement mechanisms are being tested: order splitting, the selection of several winners, bidders adopting the lowest price set based on the submitted bids;
- Additional sanctions clauses are incorporated into standard and non-standard contract forms in order to protect the customer’s interests.

A tailored professional approach has made it possible to optimise the performance 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 organisations 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 Quantum Computing and the Navigator Digital Management System; projects of 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 the executives of these divisions.

The high level of satisfaction with the performance of the QBS among procurement initiators and the fact that it successfully accomplishes its tasks supports the roll-out of the service across the industry, with QBS functions established in 18 nuclear organisations.

In 2021, ROSATOM also continued to participate in law-drafting activities. For instance, ROSATOM submitted a number of proposals to the Russian Ministry of Finance concerning amendments to Federal Law No. 223-FZ; more specifically, in order to expand the scope of electronic document exchange between customers and external counterparties during the conclusion/performance of contracts, ROSATOM proposed amendments to Federal Laws No. 223-FZ and No. 44-FZ granting customers the right to conclude contracts in their internal systems and subsequently upload the concluded (signed) contracts to an electronic platform; the Corporation also suggested including additional competitive procurement methods in Federal Law No. 223-FZ, namely simplified procurement procedures and ‘procurement in the online store’.

ROSATOM took steps to promote its position and put forward proposals on improving laws and regulations governing matters related to the achievement of the minimum share of procurement of Russian-made goods.
Improvement of foreign procurement processes

ROSATOM directly contributed to the development of the IAEA interactive toolkit for nuclear supply chain management. ROSATOM’s representatives actively participate as speakers in the IAEA Training Course on Nuclear Supply Chain and Procurement Management. In October 2021, this training course was organised by the Quality Management Department and was held online with technical assistance from ROSATOM’s Technical Academy (the event was attended by more than 50 participants from 15 countries).

The Contract Strategy developed in accordance with the Uniform Industry-Wide Guidelines for the Development and Application of Contract Strategies in Large NPP and NRTC Construction Projects abroad was approved for the Paks II NPP construction project. The Strategy is designed to improve the efficiency of project management, implementation and monitoring and to reduce the risk of cost and schedule overruns.

ROSATOM’s representatives actively participated as speakers in the Advanced Training Programme for Leaders of Overseas NPP Construction Projects run jointly by ROSATOM and the Skolkovo Innovation Centre, delivering presentations on procurement, logistics, quality management and the development of project contract strategies.

The procedure for the participation of foreign suppliers/contractors in procurement for overseas sites was streamlined and simplified. This involved a review of more than 50 cases presented by nuclear organisations operating on the international market, including the drafting of proposals for amendments to the industry-wide procurement methodology.

In 2021, ROSATOM started to develop a system for the sharing of best practices in the sphere of procurement, logistics and quality management: it developed a framework supported by business process participants in the industry and formulated technical approaches to its implementation. In the future, ROSATOM plans to develop and implement the relevant IT solution.

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 2021, the procurement, logistics and quality school conducted a wide range of activities.

As training was converted to the online format, an additional development track was created as part of the development of the framework for the ‘Procurement for Everyone’ Procurement Officers’ Club to support comprehensive employee development by providing training in the form of webinars, podcasts, interviews, etc. The number of unique participants of the webinars totalled about 2,000 people. Training videos were developed; screencasts and podcasts were recorded for training through the Record Mobile app. This format enables employees to undergo training at a time that is convenient for them. More than 10 distance learning programmes were developed and updated for the procurement, logistics and quality school.

About 2,500 people completed training programmes of the procurement, logistics and quality school in 2021. The switch from face-to-face to online training provides more opportunities for training, as reflected by the fact that the scope of training increased by a factor of 2.5 compared to 2020 (in 2020, more than 1,000 people underwent training).

In order to develop employees’ competences in the sphere of nonconformity management, in 2021, 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 1,565 specialists completed continuing professional education courses on these topics and received the relevant certificates.

In addition, specialists in the industry were provided with online training using the RECORD system. A total of 6,795 people completed online training programmes between 2018 and 2021.

The following steps have been taken to provide assistance in the sphere of procurement for nuclear organisations and to streamline internal communication and cooperation throughout the procurement process.

The Procurement Assistance Portal information system 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 in the Q&A section of the Procurement Assistance Portal and sort them by topic.

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.

Existing standardised forms of technical specifications have been updated, and new forms have been developed to ensure procurement transparency, including during the procurement of additional products as part of contract performance by contractors, and to make the process more convenient to users (order No. 1/1203-P dated 21 September 2021).

A methodology for price audit of equipment manufacture has been developed in order to enable transparent pricing and enhance control, it is currently pending approval.

Uniform procurement procedures for tendering conducted exclusively among SMEs and the relevant document forms have been updated to incorporate new requirements (with the process to be automated in the future) pursuant to order No. 1/981-P dated 3 August 2021 and No. 1/1480-P dated 18 November 2021.
The methodological framework of orders has been streamlined by 10%. Automation to enable quick search (across stages of the logistics business process) has been included in the scope of a project to create a knowledge base based on domestically developed software. This solution will serve as an Information One-Stop Shop for participants of the process and will enable quick search for required information.

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 were established in the industry.

An integrated industry-wide support system has been created to handle complaints filed with antitrust authorities or courts when appeals are lodged against requirements set out in procurement documents in accordance with the UIPS.

In addition, in 2021, representatives of the Corporation and nuclear organisations regularly participated in conferences and other external events focused on the development of the procurement system.

On 24–26 March 2021, ROSATOM took part in the GOSZAKAZ Annual National Forum and Exhibition. 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 23 April 2021, Natalia Doroshenko, Deputy Director of the Department for Methodology and Procurement Organisation, spoke at an event held by the Russian-German Chamber of Commerce and presented the special features of ROSATOM’s procurement system to the audience.

On 15–21 August 2021, representatives of the Department for Methodology and Procurement Organisation and the Quality Management Department of ROSATOM took part in the Army 2021 Forum.

On 13 December 2021, Inna Melchenko, Director of the Department for Methodology and Procurement Organisation, took part in the closing ceremony of the 2021 National Procurement Transparency Ranking project and gave a presentation to the participants of the meeting outlining the objectives to be accomplished and challenges that need to be addressed in order to speed up procurement processes and make them more transparent.

In 2021, ROSATOM implemented an Action Programme adopted following the 2020 Industry-Wide Session on Procurement in the Nuclear Industry held on 17 November 2020. This included the following:

- New members were elected to ROSATOM’s Council for Improving Transparency, and the Council held regular meetings;
- An industry-wide system for appealing against decisions of the Federal Antimonopoly Service/court rulings regarding the procurement system was established and became operational (it was integrated into the Assistance Portal, which is currently at the content uploading stage);
- Two quick sessions were held with the Development and International Business Unit; cases illustrating various issues are requested and analysed on an ongoing basis.

**Plans in the sphere of procurement, logistics and quality management for 2022 and for the medium term**

The key objectives for 2022 and for the medium term in the sphere of procurement, logistics and quality management are as follows:

- To continue to streamline the methodological framework of orders, including its automation to enable quick search (across stages of the logistics business process) and integration with the UIS Procurement 2.0 knowledge base;
- To develop approaches to sustainability assessment of suppliers in the nuclear industry;
- To update uniform procedures for tendering conducted exclusively among SMEs and the relevant document forms to incorporate new requirements of Federal Law No. 223-FZ;
- To establish a 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 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;
- To support the development of procurement legislation;
- To enable efficient work of ROSATOM’s Council for Improving Transparency;
- To implement the framework for the ‘Procurement for Everyone’ Procurement Officers’ Club;
- To continue to develop the QBS in nuclear organisations; to roll out the QBS across the industry;
- To update online training courses developed jointly with ROSATOM’s Technical Academy. Nonconformity Management in the UIS Quality Systems for Key Users and Nonconformity Management in the UIS Quality Systems for Local Administrators, which form part of the Inspection Management module, due to a change in the range of functions.
1.12.8. Strategic communications

1.12.8.1. Stakeholder engagement

Key results in 2021:
— 77.4% of the population in Russia support the use of nuclear energy.
— 20 Nuclear Energy Information Centres in Russia and two Centres abroad.
— Viewership of channels broadcasting the Strana ROSATOM TV programme in various regions of Russia totals 12.2 million people.
— ROSATOM's representatives took part in more than 16 exhibitions in Russia and more than 90 overseas exhibitions and conferences, both in person and online.

Approaches to stakeholder engagement

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.

GRI 102-42
GRI 102-43

The stakeholder map is based on an assessment of the scale of the Corporation’s impact on stakeholders and their impact on the Corporation.
### Stakeholder interests

<table>
<thead>
<tr>
<th></th>
<th>Ensuring non-proliferation of nuclear materials and technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Nuclear and environmental safety</td>
</tr>
<tr>
<td>3</td>
<td>Technological modernisation in the nuclear industry</td>
</tr>
<tr>
<td>4</td>
<td>Efficient use of budget funds</td>
</tr>
<tr>
<td>5</td>
<td>Economic efficiency of ROSATOM’s organisations</td>
</tr>
<tr>
<td>6</td>
<td>Compliance with international and Russian legislation</td>
</tr>
<tr>
<td>7</td>
<td>Fair competition and responsible behaviour in the market</td>
</tr>
<tr>
<td>8</td>
<td>Competitiveness in global markets</td>
</tr>
<tr>
<td>9</td>
<td>Improvement of product and service quality</td>
</tr>
<tr>
<td>10</td>
<td>Transparency of ROSATOM’s operations, including transparency of procurement activities</td>
</tr>
<tr>
<td>11</td>
<td>Dealing with the legacy of past business operations and defence efforts in the industry</td>
</tr>
<tr>
<td>12</td>
<td>Reliable electricity supply</td>
</tr>
<tr>
<td>13</td>
<td>Adoption of international governance norms and standards</td>
</tr>
<tr>
<td>14</td>
<td>Adequate remuneration to employees; support for professional development of employees, safe working conditions</td>
</tr>
<tr>
<td>15</td>
<td>Improvement of the quality of life in the regions of operation</td>
</tr>
<tr>
<td>16</td>
<td>Talent development in ROSATOM and its organisations</td>
</tr>
</tbody>
</table>

### 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** Participation in the development of the regions of operation

**G** Opinion polls, customer satisfaction surveys

**H** Charity work

**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 communication

**Q** Public reports

### Stakeholder interests and types of stakeholder engagement

<table>
<thead>
<tr>
<th>Stakeholder interests</th>
<th>1–16, 8, C, E, F, G, P, Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government bodies of the Russian Federation</td>
<td>1–16, B, C, E, F, G, P, Q</td>
</tr>
<tr>
<td>Government regulators (supervisory bodies)</td>
<td>1, 2, 4, 6, 10, B, C, N, P, Q</td>
</tr>
<tr>
<td>Regional governments</td>
<td>2, 6, 10, 15, 8, C, E, F, G, P, Q</td>
</tr>
<tr>
<td>Local governments in the regions of operation</td>
<td>2, 11, 15, C, E, F, G, K, P, Q</td>
</tr>
<tr>
<td>Government bodies of foreign countries</td>
<td>1, 2, 6, 7, 10–13, 16, A, D, J, K, P, Q</td>
</tr>
<tr>
<td>International organisations, including those in the nuclear sector</td>
<td>1, 2, 6, 7, 10–13, 16, A, D, J, K, P, Q</td>
</tr>
<tr>
<td>Organisations forming part of ROSATOM</td>
<td>3, 5, 6, 13, 16, D, K, P, Q</td>
</tr>
<tr>
<td>Manufacturers and suppliers of equipment and services</td>
<td>5, 7, 10, K, I, P, Q</td>
</tr>
<tr>
<td>Consumers of technologies, products and services</td>
<td>3, 5, 6, 7, 8, 9, 12, K, H, P, Q</td>
</tr>
<tr>
<td>Business partners</td>
<td>5, 6, 7, 8, 9, 12, K, M, P, Q</td>
</tr>
<tr>
<td>Professional associations</td>
<td>6, 14, 16, F, D, K, O, P, Q</td>
</tr>
<tr>
<td>Non-governmental organisations, including environmental NGOs</td>
<td>2, 10, 11, 15, C, E, G, K, O, P, Q</td>
</tr>
<tr>
<td>Employees of the Corporation and its organisations, as well as organisations representing their interests</td>
<td>6, 10, 14, 16, F, D, I, E, O, P, Q</td>
</tr>
<tr>
<td>Local communities in the regions of operation</td>
<td>11, 15, C, E, F, G, H, K, D, O, P, Q</td>
</tr>
<tr>
<td>Educational institutions</td>
<td>3, 14, 16, D, J, P, Q</td>
</tr>
<tr>
<td>Financial institutions</td>
<td>3, 5, 8, 10, K, P, Q</td>
</tr>
<tr>
<td>Rating agencies, market analysts, experts</td>
<td>5, 10, 13, K, P, Q</td>
</tr>
<tr>
<td>Citizens of the Russian Federation</td>
<td>1, 2, 4, 6, 10, 11, 12, 15, H, O, P, Q</td>
</tr>
<tr>
<td>Research institutes</td>
<td>3, 11, K, O, P, Q</td>
</tr>
</tbody>
</table>
Industry media

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 59,000 copies and a readership of more than 300,000 people);
— A TV news programme (aired weekly in 24 nuclear towns and cities; the viewership of the channels broadcasting the programme totals 12.17 million people; in 2020, the viewership totalled 7.3 million people).

In 2022, the Corporation plans to provide weekly coverage in 24 nuclear towns and cities, with the viewership of the channels broadcasting the programme expected to exceed 12 million people.

Online communications

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 2021, ROSATOM’s official website was visited by more than 1.1 million people (2020: 990,000 people), or an average of 4,500 to 7,000 people 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. The section of the website describing ROSATOM’s new businesses was expanded considerably.

2021 saw an increase in the number of followers of ROSATOM’s official community pages on social media. The best performance was demonstrated by the YouTube channel (where the community expanded by 52%) and the group on Odnoklassniki (+54%). At year-end 2021, ROSATOM’s total audience on social media exceeded 340,000 people (2020: 285,000 people). In addition, ROSATOM’s communication campaigns on social media are conducted in seven foreign languages, with a reach of more than 20 million users in 150 countries.

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.

According to an independent opinion survey by the Levada-Centre61, 77.4% of the Russian population supported the use of nuclear power (75.2% in 2020; over the past few years, the figure has remained consistently high).

– Do you think that nuclear power should be actively developed, maintained at the current level, phased out or completely abandoned?
1. Actively developed 54.0%
2. Maintained at the current level 23.4%
3. Phased out 4.6%
4. Completely abandoned 7.4%
5. I do not know 10.6%

– Do you agree with the following statement: ‘Nuclear power is a “green”, environmentally friendly type of power generation’?
1. I completely agree 21.0%
2. I partly agree 38.4%
3. I partly disagree 20.3%
4. I completely disagree 11.1%
5. I do not know 9.2%

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 nuclear 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 and the Sergey Zenovach Theatre Art Studio. They perform in films and work in show business and in ROSATOM’s Divisions.

Despite the pandemic, in 2021, the summer session of the project was launched offline with participants from Russia and Hungary (71 people). Under the supervision of professional choreographers, directors, voice coaches and singing teachers, a musical titled ‘Atomic Love’ was produced. It was premiered at the Music Theatre of the Republic of Karelia in Petrozavodsk; the tour then continued in Saint Petersburg and concluded in Moscow on the main stage of the E. Cetera Theatre directed by Alexander Kalyagin. The central themes of the musical were science, friendship and love. The winter session of the project was launched in Sochi on the stage of the Presidential Lyceum in the Sirius federal territory and concluded in the assembly hall of ROSATOM in Moscow. A musical titled ‘Winter Fairy Tale 2021’ was staged in Sochi within two weeks and was performed 22 times. A subtitled live broadcast was arranged for viewers in Hungary, Belarus, India and Bangladesh.

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61 The survey was conducted on 12-23 February 2022 across a representative sample of the Russian population consisting of 3,944 people aged 18 and older.
Nuclear Energy Information Centres

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.

In 2021, the NEIC network comprised 20 centres in Russia, including the Atominarium in Sochi, as well as centres in Belarus (Minsk) and Kazakhstan (Nur-Sultan). In 2021, they were visited by more than 160,000 people. The Centres held 2,000 events and 11 large-scale KSTATI Science Festivals. Every year, the Information Centres implement more than 4,000 projects; since 2008, events hosted by the Centres have been attended by a total of more than 3 million people.

The KSTATI Science Festivals hosted by the NEICs are a series of annual offline events held in their host towns and cities, including webcasts and teleconferences with partners and universities. In 2021, webcasts and teleconferences became an integral part of all KSTATI Science Festivals. The Science Festivals help to integrate the NEIC audiences across all towns and cities into a single community, with 2,000 to 5,000 people participating in these events in person and dozens of thousands of viewers of all ages watching them online.

In 2021, NEIC employees assisted in organising and running large-scale federal projects, including the Homo Science festival held by ROSATOM to mark the 800th anniversary of the foundation of Nizhny Novgorod, the NAUKA 0+ science festival, a special voyage to the North Pole for children titled 'Icebreaker of Knowledge. Homo Science Project', and the Mendeleev Expedition to Lake Baikal. NEIC events were held in the Smera, Artex and Orlyonok Russian Children's Centres and the Sirius Educational Centre.

Two new projects were launched in 2021: the Atomic Workshop, which is a series of interactive activities focused on nuclear power and innovative technologies, and NEIC OPEN, weekly programmes run across the NEIC network which include lectures by famous experts, popular science talk shows, teleconferences with other regions, intellectual, board and team games, as well as workshops for people of all ages.

Participation in international educational initiatives

On World Science Day, on 10 November 2021, ROSATOM once again conducted the Global Atomic Quiz, an international educational initiative in a new format which is designed to acquainted users around the world with nuclear physics and atomic technology. The project was conducted in 11 languages on the website at quiz.atomforyou.com. The project was conducted in 11 languages on the website at quiz.atomforyou.com. 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 participants won prizes and took part in a guided tour of a Russian nuclear power plant, with a trip to the International Youth Nuclear Congress (IYNC 2022) as a special prize. The initiative attracted the attention of more than 11,000 people from more than 70 countries worldwide.

The Corporation is a key partner of the Rhisotope Project, a unique research initiative demonstrating the potential for applying nuclear technology for biodiversity conservation. The project is aimed at preventing the killing of rhinoceroses; its participants include the world’s leading universities: Wits University (South Africa), ANSTO (Australia), Colorado State University (US), National Research Tomsk Polytechnic University and the Science and Technology Centre for Nuclear Physics (Russia). The Rhisotope Project is a good example of the diversity of applications of nuclear technology. Isotopes inserted into rhinoceroses’ horns will help to detect smuggling and prevent horn trafficking. The project has been covered in more than 1,000 publications, including in the world’s leading media outlets.

In 2021, the Corporation took an active part in the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP26) in Glasgow, where it was represented at the exhibition stand of the Russian Federation. It also held the Clean Nuclear Energy Day as part of the programme of the Russian pavilion. The conference was attended by about 25,000 participants, including heads of state and government of more than 120 countries. The Corporation made an important contribution to ensuring that for the first time in its history, the conference addressed the topic of nuclear energy as a crucial tool for achieving low-carbon development goals.

In 2021, the Corporation launched an international awareness initiative titled ‘Atoms for People’. The project is intended to showcase the contribution of nuclear technology to the achievement of the UN Sustainable Development Goals through stories of people whose lives have been transformed by the ‘peaceful atom’. The initiative was launched in April as part of an online event titled ‘Why Humanity Needs Nuclear’, which was attended by experts from the World Nuclear Association, the World Energy Council (WEC), ITER and non-profit organisations. The broadcast on ROSATOM’s online platforms was viewed by more than 6,000 people in 40 countries. The project won the Platinum Award in the Marcom Awards (US), a prestigious international competition for marketing and communication professionals. The initiative is officially supported by the World Nuclear Association. Project website: atomsforhumanity.com

For details on cooperation with international intergovernmental organisations, see the section ‘International Cooperation’.

Communication activities abroad

In 2021, the Corporation took part in more than 90 overseas exhibitions and conferences, 59 of which were held online or in a mixed format. ROSATOM held events for suppliers in Egypt (attended by the country’s Prime Minister), Turkey and Finland.

New complex formats of events were adopted in response to new COVID prevention protocols. For instance, the Russia – Japan workshop on the prospects and advantages of the Northern Sea Route was held in the form of a teleconference, with participants situated in studios in Moscow and Tokyo.

The Akkuyu NPP Open Day included live broadcasts from several locations in Turkey and Russia, with residents of the Merin Province and MEPhI students offered an opportunity to take part in the event.

For the first time, the Corporation took an active part in the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP26) in Glasgow, where it was represented at the exhibition stand of the Russian Federation. It also held the Clean Nuclear Energy Day as part of the programme of the Russian pavilion. The conference was attended by about 25,000 participants, including heads of state and government of more than 120 countries. The Corporation made an important contribution to ensuring that for the first time in its history, the conference addressed the topic of nuclear energy as a crucial tool for achieving low-carbon development goals.
World Expo 2020 held in Dubai between 1 October 2021 and March 2022 was unique among events held in 2021 in terms of scale. The permanent exhibition in the Russian pavilion featured a multimedia exhibit of the Corporation showcasing state-of-the-art Russian nuclear technologies and their contribution to improving the quality of people’s lives. By the end of 2021, the Russian pavilion had been visited by more than 1 million guests.

For details on international exhibitions, see the section ‘International Business Development’.

Communications in the sphere of digitisation

As part of its communication and marketing activities in the sphere of digitisation, in 2021, ROSATOM focused primarily on supporting the implementation of the Uniform Digital Strategy and the sales of digital products. In 2021, the Corporation's digital projects and initiatives continued to receive regular and systematic media coverage.

According to a survey by VCIOM (Russian Public Opinion Research Centre), ROSATOM topped the Digital Import Substitution in Russia media ranking and ranked sixth in the Digital Corporation media ranking (rising two spots compared to 2020).

The Corporation actively participated in federal events, including INNOPROM, the IT in the Military Industry Forum (ITOPK), the Army 2021 Forum, the Open Innovations International Forum in Moscow, the Digital Industry of Industrial Russia (CIPR) conference, AI Journey, etc. In addition, ROSATOM acted as a partner of the Digital Breakthrough National Competition (a flagship project of the Russia – the Country of Opportunities presidential platform) and the ICPC International Collegiate Programming Contest.

In 2021, an agreement was signed on the establishment of the Consortium of Russian Developers of CAD/CAE Systems, and a conference titled ‘Import Substitution in CAE Systems in the Nuclear Industry’ was held.

1.12.9. Public reporting system

Dialogues with stakeholders

In order to improve transparency and accountability at ROSATOM, representatives of key stakeholders are engaged in the preparation of the report through participation in discussions of socially important aspects of the Corporation’s business and their reflection in the upcoming Report. In addition, stakeholder representatives participate in 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 SRS) 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 2021 report (see the subsection ‘Incorporation of Stakeholders’ Proposals’).

In the reporting year, the Corporation and its Divisions held dialogues with stakeholders (by correspondence and directly) in order to discuss the public annual report for 2021. During these events, stakeholder representatives voiced their requests and provided recommendations as to what information should be disclosed in the Report, and put forward proposals for developing the public reporting system (minutes of the dialogues have been posted on the reporting portal).

In 2022, the Corporation held a dialogue to assess the materiality of proposed topics, as well as public consultations on the draft annual report for 2021, where ROSATOM’s representatives presented the concept and content of the Report, and stakeholders voiced their recommendations and comments on ways to improve the Report (see the subsection ‘Incorporation of Stakeholders’ Proposals’).

Outcomes of the 2021 reporting campaign

The Report won in the Best Annual Report in the Non-Financial Sector category in the federal competition of annual reports held by the RAEX-Analytics agency (https://report.rosatom.ru) for the second year in a row. The results of the competition can be viewed on the RAEX website. ROSATOM’s Report was also awarded 5 stars (the highest score) for quality in the 2020 ranking of reports compiled by RAEX.

In the ESG ranking of reports compiled by RAEX Europe and covering 155 Russian companies, the Report was ranked among 18 top-tier companies.

The ESG Ranking of Sustainable Corporate Governance compiled jointly by the University of Perugia (Università degli Studi di Perugia, Italy) and the DA-Strategy Agency for Corporate Development included 499 Russian companies. In this ranking, the Report was rated ‘A’ (an A-rated company has a strategic approach to managing ESG aspects, manages ESG risks, actively involves stakeholders in governance, is characterised by a high level of transparency and accountability and has a well-developed corporate culture). This rating was assigned to 26 organisations.

5https://trave.a.ru/releases/2021/34_December/.
6Full information on the ranking is available at: https://trave.a.ru/files/presentations/ESG-2021_Analytics_Block_web.pdf.

GRI 102-43

<table>
<thead>
<tr>
<th>No.</th>
<th>Stakeholders’ proposals/recommendations</th>
<th>Incorporation and implementation of recommendations for the 2021 Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To bring forward the publication of ROSATOM’s Annual Report and the reports of ROSATOM’s Divisions to the summer months or September (at the latest) of the year following the reporting year.</td>
<td>The proposal has been taken into account.</td>
</tr>
<tr>
<td>2</td>
<td>To make sure that information disclosures in the reports of the Divisions cover not only the operations of the Divisions themselves but also key organisations managed by the Divisions.</td>
<td>The recommendation cannot be incorporated, as it contradicts ROSATOM’s local regulations on public reporting.</td>
</tr>
<tr>
<td>3</td>
<td>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.</td>
<td>At present, it is inadvisable to expand the list of stakeholders by including overseas representatives. The proposal will be considered in the course of preparation of 2022 reports.</td>
</tr>
<tr>
<td>4</td>
<td>To disclose information on information security/cybersecurity risk management.</td>
<td>Access to this information is restricted.</td>
</tr>
<tr>
<td>5</td>
<td>To disclose information on the tenure of each member of the Board of Directors and describe their previous work experience.</td>
<td>The Supervisory Board is ROSATOM’s highest governing body. The relevant (publicly available) information can be found on ROSATOM’s website.</td>
</tr>
<tr>
<td>6</td>
<td>To disclose information on ESG competences of the Board of Directors.</td>
<td>The powers and competencies of members of the Supervisory Board are stipulated in Federal Law No. 317-FZ of 1 December 2007 on State Atomic Energy Corporation Rosatom.</td>
</tr>
<tr>
<td>7</td>
<td>To collect and record data and disclose information on the carbon footprint of ROSATOM’s products and atmospheric emissions over their life cycle.</td>
<td>The proposal will be incorporated in the long term (after the relevant statistical tools and methods are developed).</td>
</tr>
<tr>
<td>8</td>
<td>To make descriptions of cases in the Report on the Development of Nuclear Towns and Cities less formal, to enliven dry figures.</td>
<td>The proposal will be incorporated in the Report for 2022.</td>
</tr>
<tr>
<td>9</td>
<td>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.</td>
<td>The proposal will be incorporated in the Report.</td>
</tr>
<tr>
<td>10</td>
<td>To focus more on disclosing information for the reporting year and not only plans for the next year.</td>
<td>The Report provides a balanced overview of performance in the reporting year and short-term plans.</td>
</tr>
<tr>
<td>11</td>
<td>To update the list of risks for 2022 in the next report.</td>
<td>The proposal will be taken into account in the course of preparation of the Report for 2022.</td>
</tr>
</tbody>
</table>

212–213
No. | Stakeholders’ proposals/recommendations | Incorporation and implementation of recommendations for the 2021 Report
---|---|---
25 | 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. | The proposal will be taken into account in the course of preparation of the Report for 2022.
26 | To provide more detailed information on the competences of ROSATOM’s Supervisory Board, potentially duplicating information provided on the corporate website. | The proposal has not been incorporated. In order to reduce the volume of the report, the information provided in the report and a link to ROSATOM’s website have been deemed to be sufficient.
27 | 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. | Given ambiguity in the interpretations of information on these changes, it is inadvisable to provide it.
28 | 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. | Given that the scope of ROSATOM’s public reports is limited and they perform different functions, the Communications Department has suggested the option of a different publication (e.g. a digest).

Statement of Public Assurance

Background
State Atomic Energy Corporation Rosatom (hereinafter referred to as ROSATOM or the Corporation) has suggested the option of a different approach to providing stakeholders with information on ROSATOM’s engagement with nuclear towns and cities. The proposal is aimed at facilitating the sharing of experience and knowledge with other regional organisations and local governments. However, given the limitations of the public reports’ scope, it is inadvisable to provide this information.

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 2021 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 2021 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.

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 Global Reporting Initiative Sustainability Reporting Standards (the Core ‘in accordance’ option). 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 AA1000APS Standard (2018), 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, which gives us reasons to hope that in the future, these topics will be fully incorporated in the Corporation’s Reports.

Materiality of information
To incorporate stakeholders’ requests as fully as possible, ROSATOM held a direct (online) foresight dialogue with stakeholders to identify material topics to be disclosed in the Report (the information received was compared with the results of a questionnaire survey conducted among the Corporation’s managers). We highly appreciate this initiative and recommend that ROSATOM should continue active collaboration with stakeholder representatives on this matter in the future as they represent the target audiences for the Corporation’s public reports.

Completeness of information
We believe that the reporting information adequately covers all material aspects and enables readers to draw conclusions on the Corporation’s performance in the reporting year.
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 2021, during the foresight dialogue aimed at identifying material topics to be disclosed in the 2021 Report and during the collection of written comments and recommendations on the draft Report for 2021.

We took part in determining material topics to be disclosed in the modular Report of ROSATOM.

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. The modular approach to public reporting used by ROSATOM in 2021 has enabled it to target information disclosure 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 2021

Alexander Ageev
Director General of the Institute for Economic Strategies of the Social Sciences Division of the Russian Academy of Sciences

Natalia Davydova
Director of the Environmental Projects Consulting Institute (Autonomous Non-Profit Organisation), member of ROSATOM’s Public Council

Sergey Baranovsky
President of the Inter-Regional Environmental Non-Governmental Organisation Green Cross

Gennady Sklyar
Deputy of the State Duma of the Russian Federation, member of the State Duma Committee on Industry and Trade

Natalia Nazarova
Deputy Chair of the State Duma Committee on Energy

Konstantin Dolgov
Deputy Chairman of the Committee on Economic Policy of the Federation Council of the Federal Assembly of Russia

Vladimir Kuznetsov
Chairman of the Russian Trade Union of Nuclear Power and Industry Workers
Pavel Belousov
Head of the Innovation and Technology Centre of Obninsk Institute for Nuclear Power Engineering of NRNU MEPHI, Associate Professor

Elena Feoktistova
Managing Director for Corporate Responsibility, Sustainable Development and Social Entrepreneurship of the Russian Union of Industrialists and Entrepreneurs (RSPP); Deputy Chair of the Steering Committee of the UN Global Compact Network Russia (Association ‘National Network of the Global Compact’)

Olga Plyamina
Director General of the Vernadsky Non-Governmental Environmental Foundation

Alexey Ekidin
Member of ROSATOM’s Public Council, Senior Researcher of the Institute of Industrial Ecology of the Urals Branch of the Russian Academy of Sciences

Alexander Nikitin
Chairman of the Board of the Environmental Rights Centre Bellona, Chairman of the Environmental Commission of ROSATOM’s Public Council

Andrey Khitrov
Director General of the Russian Union of Employers in the Nuclear Industry, Power and Science
ГЛАВА 2. ОТЧЕТ О РАЗВИТИИ БИЗНЕСА
You are reading a report on the performance of State Atomic Energy Corporation Rosatom in 2021. For years, our company has been consistently pursuing a policy of openness and transparency. ROSATOM's public reports are prepared and assured in accordance with international standards.

In the context of business development, the past year can certainly be described as successful: our 10-year portfolio of overseas orders exceeded USD 139.9 billion (as against USD 138.3 billion in 2020), while the portfolio of orders covering the entire life cycle totalled USD 205.4 billion (as against USD 204 billion in 2020). Despite all challenges posed by ongoing COVID-related restrictions, overseas revenue reached USD 8.98 billion, up by 15% year on year.

ROSATOM remains a global leader in terms of the size of its portfolio of overseas projects.

Despite the coronavirus pandemic, in 2021, we made impressive progress on our projects to build nuclear power units abroad. Closed borders hampered the implementation of large-scale international projects, but we made use of this time by speeding up our internal processes focused on the implementation of state-of-the-art IT solutions and by digitising our operations to the maximum possible extent. We took all necessary measures to prevent the spread of the coronavirus disease. This helped to prevent any disruption to our projects and ensure that all our international projects are on schedule.

In March 2021, work started at the third power unit of Akkuyu NPP, and in October, we obtained a licence for the construction of the fourth and last power unit of the first NPP in Turkey. In May, we entered a new phase of cooperation with our Chinese partners as we started the construction of the seventh power unit of Tianwan NPP and the third power unit of Xudabao NPP and obtained licences for the construction of the nuclear island at power unit No. 8 of Tianwan NPP and power unit No. 4 of Xudabao NPP. In India, we started the construction of power units No. 5 and 6 of Kudankulam NPP. In October, the reactor vessel was moved into final position at power unit No. 1 of Rooppur NPP in the People’s Republic of Bangladesh, which is a key milestone in the construction of any power unit. In December 2021, the first criticality procedure was started at power unit No. 2 of the Belarusian NPP. We expect to obtain new licences for NPP construction in 2022.

ROSATOM continues to develop small nuclear power plants. We are currently implementing several such projects in Russia and are negotiating with foreign partners. ROSATOM is building four modernised floating power units based on a RITM-2005 reactor with a capacity of 55 MW each for a mining and processing plant in Chukotka. We expect to commission the first two power units by the end of 2026. Another project involves building a small onshore power plant with a RITM-200 reactor to supply electricity to a gold mining enterprise in Yakutia. We hope to connect it to the grid by 2027. Later, in 2022, we signed a number of agreements concerning small NPPs with foreign partners: the Philippines, Kyrgyzstan and Armenia.

Last year, ROSATOM also remained a leader in the nuclear fuel cycle, ranking first in the world in terms of uranium enrichment, second in terms of uranium production and third in terms of nuclear fuel fabrication. In 2021, 34 new contracts for the supply of uranium products were signed with customers from eight countries. Of course, the Corporation continued to fulfill its existing contractual obligations in full.

It is important to note a global positive shift in the perception of the nuclear power industry, which was very obvious at environmental and climate conferences held in 2021. A consensus has definitely been reached that nuclear power is vital for a steady energy system and for the achievement of climate targets.

Of course, nuclear technology is not confined to energy applications. Non-energy technologies are used in science, healthcare, industry and agriculture; they contribute directly to the achievement of sustainable development goals and help to raise the standard of living throughout the world.

In July 2021, we started the construction of a research reactor in Bolivia, which will be a key component of a Nuclear Research and Technology Centre. Facilities forming part of the first and second stages of the Centre will be commissioned as early as this year. The first radiochemical production line was launched. An environmental permit was obtained for the construction of stage 3 (a radiobiology and radioecology laboratory). Construction and installation work at this facility is scheduled to be completed in 2023. In December 2021, an agreement was signed on the construction of a Centre for Nuclear Science, Technology and Innovation in Serbia. The documents signed by ROSATOM envisage building a centre with a cyclotron complex and radiochemicals production facilities in Serbia within the next three years.

2021 was equally successful in terms of new products. ROSATOM has built up considerable momentum towards a fundamental transformation from a nuclear power giant to a high-technology company in a broad sense of the world, which is confirmed by its performance over the past year.
In 2021, ROSATOM commissioned five wind power plants with a total capacity of 570 MW. The Corporation plans to commission additional capacities totalling 280 MW in 2022 and 1.7 GW by 2027.

In the sphere of composite materials, the Corporation has established an integrated domestic process chain covering all stages, from raw materials to finished products.

The international logistics business is developing steadily: in 2021, cargo traffic along the NSR reached a new record high of about 34.9 million tonnes as against 33 million tonnes in 2020. Transit traffic increased significantly, as 86 vessels transited along the NSR, with 75 of them sailing under foreign flags. German, Norwegian, Swiss and Chinese hauliers transported more than 2 million tonnes of cargo, which is almost twice as much as in 2020.

On 1 March 2022, an integrated system for the management of hazard class 1 and 2 waste became operational; it is operated by ROSATOM. At the same time, we are developing a network of state-of-the-art environmental technology parks to process waste into recycled products safely and efficiently and thus prevent environmental damage from legacy sites.

Looking ahead, I would like to emphasise that our efficient response to COVID-related restrictions, which I have mentioned at the beginning, and ROSATOM’s entire success story are a result of timely transformation and our ability to rise to challenges. 2022 has been marked by political tensions and the resulting uncertainty surrounding the business climate, which poses a new challenge that the Corporation will need to meet in order to become more competitive and efficient.

There is much to be done in terms of adapting to a new environment, searching for new markets and partners, redesigning our business and making fundamental changes to the structure of our offer. We have built a company that can promptly respond to both internal and external changes; this gives us confidence that we will successfully rise to the new challenges.

### 2.1. BUSINESS DIVERSIFICATION

#### Key results in 2021:

- Revenue from the sales of new products outside the scope of the nuclear industry totalled RUB 329.1 billion, up by 26% compared to 2020 (RUB 261.7 billion).
- The 10-year portfolio of orders for new products outside the scope of the nuclear industry reached RUB 1,974.1 billion, up by 23% compared to 2020 (RUB 1,602.1 billion).

One of ROSATOM’s strategic goals is to develop new products. The relevant operations provide new opportunities for developing healthcare and municipal infrastructure, improving environmental safety and making progress in other key areas relevant to sustainable development.

New business areas have been formed taking into account the maximum number of overlaps with existing technical, technological and research competences, including the research and production capabilities of ROSATOM’s organisations. Responsibility for new business development has been assigned to the Development and International Business Unit of ROSATOM.

#### 2.1.1. Management system

ROSATOM’s system for managing new businesses is focused on the development of strategic programmes covering 15 areas: Wind Power, Products and Services for the Oil and Gas Industry, Industrial and Consumer Waste Management, the Programme to Launch the Production of Composite Materials in the AM&T Division, Development of the Nuclear Medicine and Technology Product Line, Energy Storage Systems Based on Electrochemical Cells, Additive Manufacturing, Digital Products, the Smart City, an International Logistics Operator, Automated Process Control Systems and Electrical Engineering, Development of the Lithium Business, Renewable Energy (Foreign Markets), Hydrogen Energy, and Gold Mining. At the same time, the Corporation is actively searching for areas that could become strategically important in the near future. Responsibility for business diversification has been assigned to the New Business Support Department of ROSATOM.
2.1.2. Results in 2021

In the reporting year, revenue from the sales of new products by ROSATOM’s organisations to counterparties outside the industry totalled RUB 329.1 billion, with the target set at RUB 280 billion.

The 10-year order portfolio outside the scope of the industry reached RUB 1,974.1 billion, which is 23% above the target set for 2021 and the actual figure for 2020 (RUB 1,602.1 billion).

In 2021, the largest contributors to the order portfolio included Sales and Trading (16.6%), Wind Power (13.3%), the Mechanical Engineering Division (12.0%), and Automated Process Control Systems (APCS) and Electrical Engineering (12.0%).

Wind power

In the reporting year, the Corporation commissioned five new WPPs with a total capacity of 570 MW in Russia: the Kochubeyevskaya WPP (210 MW), the Marchenkovskaya WPP (120 MW), the Karmalinovskaya WPP (60 MW), the Bondarevskaya WPP (120 MW) and the Medvezhenskaya WPP (60 MW).

ROSATOM’s WPP project portfolio increased by 460 MW (with commissioning scheduled for 2025–2027) to 1.7 GW.

In 2022, the Corporation plans to commission three more WPPs: the Kuzminskaya WPP (160 MW), the Trunovskaya WPP (60 MW) and the Berestovskaya WPP (60 MW).

Hydrogen energy

As part of a project to build an export-oriented hydrogen production plant on Sakhalin Island, ROSATOM carried out a feasibility study jointly with a technology partner in 4Q 2021. Key project parameters are as follows:

— Construction of a hydrogen production plant based on steam methane reforming technology on Sakhalin Island; the plant will be equipped with a CO2 capture system that will enable subsequent CO2 utilisation (commercialisation);
— Hydrogen production method: steam methane reforming;
— Storage and transportation method: liquefied hydrogen.

The Corporation continues to implement the project to launch a hydrogen-powered train on Sakhalin Island.

In 2022, at least one pilot hydrogen energy project is expected to be moved to the implementation stage.

Environmental protection

As a key participant in the Ecology National Project, ROSATOM is implementing two major initiatives:

1. The development of an integrated system for hazard class 1 and 2 waste management (ROSATOM is responsible for a separate federal project focused on creating a system for managing the handling of hazard class 1 and 2 waste).

In accordance with the federal project, ROSATOM has an important task of creating a transparent market for industrial waste management in the country. In December 2021, market participants began to be connected to the federal state information system for class 1 and 2 waste management. On 1 March 2022, the federal environmental operator, FSUE FEO, started to provide services on the market for hazard class 1 and 2 waste in place; it will help to overcome the shortage of processing capacities and will enable highly efficient and safe processing of hazard class 1 and 2 waste into products needed by the industry.

2. Implementation of projects aimed at repairing historical environmental damage (by ‘non-nuclear’ enterprises). As part of this initiative, in the reporting year:

— The project to reclaim the Chebyabinsk municipal landfill, which is the country’s largest household waste landfill, was completed ahead of schedule. The reclamation process involved applying state-of-the-art technology. The project helped to improve the quality of life for more than 1 million people. Harmful emissions into the atmosphere in the city were reduced by 30%, and discharges of harmful leachate into the Mias River ceased completely. The 74-hectare area is now completely safe;
— The clean-up of the Krasny Bor toxic industrial waste landfill in the Leningrad Region is in progress;
— The Corporation is implementing a project to enhance environmental safety in the town of Ustoly to Svirksky in the Irkutsk Region. In 2021, a number of key activities were completed as planned, including the following:
  — Decommissioning of 12 brine wells;
  — Containment of an oil lens;
  — Dismantling of a mercury cell electrolysis workshop;
  — Preparation of the bulk of soil and building structures remaining after the dismantling of the mercury cell electrolysis workshop for further mercury remediation at the Vostok Environmental Technology Park;
— ROSATOM is working to repair historical environmental damage as part of a related federal project titled ‘Preservation of Lake Baikal’. A waste disposal project is being developed for the Baykalik Pulp and Paper Mill (BPPM). In 2021, prioritised measures were implemented to prevent an overflow of sludge water and contamination of Lake Baikal with waste from OJSC BPPM.

Thus, ROSATOM leverages its considerable experience to introduce high standards of environmental responsibility throughout the country as part of the Ecology National Project. This systematic approach will help to prevent the accumulation of environmental damage in the future.

In 2022, at least one project in the sphere of industrial and consumer waste management is expected to be moved to the implementation stage.
**Nuclear medicine**

In the reporting year, ROSATOM (via JSC Isotope Regional Alliance) provided steady supply of medical radioisotope products manufactured by JSC Karpov Institute of Physical Chemistry and JSC National Technical Physics and Automation Research Institute (NIITFA) to healthcare facilities across Russia. The Corporation supplies medical and industrial isotope products to more than 55 countries worldwide.

In 2021, the Corporation developed and produced a prototype of the ONYX radiation therapy facility (JSC NIITFA), conducted technical and qualification tests and commissioned a mass production site; intellectual property obtained during the development of the radiation therapy facility (17 certificates and patents) was registered and entered in the register. This work forms part of a project to create a radiation therapy facility based on a 6 MeV linear electron accelerator that will replace imported solutions and to develop the core of a competitive high-technology nuclear medicine industry based on radiation technology in the Russian Federation.

The Brachium gamma radiation therapy facility for brachytherapy was successfully registered40. Brachium is designed for cancer treatment using the contact radiation method. The device uses advanced high-dose brachytherapy technology, which enables treatment involving high-precision insertion of radiation sources. Mass production of Brachium facilities has been launched. A contract has been concluded for the supply of eight pieces of equipment.

A positive opinion was obtained from regulatory bodies for designs, cost estimates and the results of engineering surveys for a project to set up a modern pharmaceutical plant to produce medical isotopes at the site of JSC Karpov Institute of Physical Chemistry. The production facility at JSC Karpov Institute of Physical Chemistry will become the world’s leading enterprise producing an extensive range of radiopharmaceuticals, including the most widely used products based on iodine-131, samarium-153 and molybdenum-99. In addition, the enterprise will unveil advanced radiopharmaceuticals based on lutetium-177, actinium-225, strontium-89 and radium-223. These radiopharmaceuticals are used to provide high-technology medical care to patients with cancer, rheumatic disorders, endocrine and heart diseases.

Design and construction documents for the construction of two radionuclide therapy centres in the cities of Lipetsk and Ufa were submitted to regulators.

These achievements help to accomplish the objectives of the federal project titled “Combating Cancer”, which forms part of the Healthcare National Project; they will be in demand in cancer treatment using state-of-the-art domestically produced equipment.

In 2022, ROSATOM plans to complete phase 1 construction and installation work at the radiopharmaceuticals plant in Obninsk, and to complete the construction of the building frames of the Radionuclide Therapy Centres in Lipetsk and Ufa, as well as the Nuclear Medicine Centre in Irkutsk.

**New materials**

In the reporting year, JSC CMP launched the production of zirconium sponge, a material for making nuclear fuel cladding with the minimum level of hafnium impurities. Zirconium sponge is used in the production of fuel for both Russian- and foreign-design power reactors. Zirconium sponge is widely used in the production of fuel for all major types of power reactors (both Russian- and foreign-design).

In 2021, the Corporation launched industrial production of domestically manufactured PAN precursor at a site in the Alabuga Special Economic Zone and contributed to the establishment of an integrated production chain in Russia covering all stages, from PAN fibre to carbon fibre, fabrics and prepregs.

In 2021, as part of a project titled to upgrade the capacities of JSC Prepreg – Advanced Composite Materials (JSC Prepreg-ACM) and LLC Argon for successful qualification of fabrics and prepregs by key customers, ROSATOM built a laboratory unit, purchased laboratory furniture, acquired laboratory equipment (a gel timer, a thermal analysis facility, an automated titration system, an automated extractor, a water purification system for a chromatograph, etc.) and put it into operation.

In the field of polymer composite materials, as part of import substitution in key industries of the Russian Federation, the Corporation tested industrial technology for producing PAN precursors for the production of carbon fibres. Samples of carbon fibres of all types planned for production were obtained.

As part of an R&D project titled ‘Development and Testing of Aircraft Interior Materials’, a non-combustible binder and prepregs based on it were created in order to develop polymer composite materials that will replace imported aircraft interior materials in the future.

A competence centre named “Sirius. Composite Technology” was opened at the Sirius Presidential Lyceum in Sochi.

The Corporation assisted in the conclusion of contracts for the accelerated development of composite materials for the needs of strategic industries of the Russian Federation.

In 2022, ROSATOM plans to continue and accelerate its efforts to accomplish a crucial task of import substitution for strategic consumers in Russia.

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Additive manufacturing

A number of major state-owned companies, including ROSATOM, founded the Association for Additive Technology Development in Russia, which is a competence centre in the sphere of additive manufacturing.

A research and training laboratory specialising in additive manufacturing was opened at the Sirius Presidential Lyceum in Sochi. It was established by ROSATOM; the laboratory uses domestically produced 3D printers.

The Russian Ministry of Education and Science and the Russian Academy of Sciences adopted a resolution on the development of a comprehensive R&D programme titled ‘Additive Manufacturing’, which will cover the entire innovation cycle. Support was provided for the development of the programme; its approval is pending. Approval of the programme by the Government of the Russian Federation is scheduled for 2022.

As part of its efforts focused on technological tasks, in 2021, the Corporation produced a pilot batch of titanium powder using plasma atomisation and centrifugal atomisation methods, developed a pilot version of the Virtual Printer software for 3D modelling, preparing printing tasks and modelling the additive manufacturing process, commissioned a demonstration model of an RM-300M printer with a 300x300 mm working area at the Industrial Additive Manufacturing Centre, and commissioned MeltMaster 3D – 250M printers designed for printing implants made from titanium-based alloys. Printing technology was developed, and large-size (over 600 mm) items were produced from a heat-resistant nickel alloy using selective laser melting technology and domestically produced equipment. Prototypes of a standardised series of 200-1,000 W single-mode ytterbium fibre lasers for additive manufacturing equipment and for use in mass production of domestically designed additive manufacturing equipment were produced and tested; they were assigned the O1 designation.

The annual Leader Forum titled ‘Additive Manufacturing Technologies: Expanding the Horizons’ was held in December 2021; it was attended by more than 1,000 professional participants. A Strategy for the Development of Additive Manufacturing Technologies in the Russian Federation until 2030 was developed jointly with the Ministry of Industry and Trade of the Russian Federation (Order No. 1913-r of the Government of the Russian Federation dated 14 July 2021).

A regulatory framework for additive manufacturing is being developed, with 37 national standards approved to date, including 20 standards developed by ROSATOM and its organisations. ROSATOM is currently a leader in terms of the number of additive manufacturing standards being developed.

The development of a prototype of a direct laser metal deposition machine (a DMD 3D printer) is scheduled to be completed in 2022.

Digital technology

ROSATOM continues to implement road maps for Quantum Computing (development of prototypes of quantum processors) and New Production Technologies.

In 2021, as part of the implementation of the Quantum Computing road map, the operation of a prototype of a four-qubit trapped ion quantum processor and the performance of two-qubit operations on it using qudits (multilevel storage media) was demonstrated.

As part of efforts to develop mathematical modelling systems, the Logos product was recognised at the federal level as a ‘National CAE System’.

Plans for 2022 include updating some digital products, including the Logos product line, and releasing a version of the product ‘Productisation of a Standardised Personnel Management System’ that does not rely on imported technology.

Optimised and modernised floating power units

As part of the development of small NPPs, ROSATOM is also implementing a project to supply power to the Baimsky Mining and Processing Plant (Baimsky GOK) planned for construction at the Peschanka gold-copper-molybdenum deposit (Chukotka Autonomous District); this will involve docking three main modernised floating power units (MFPUs) with a total installed capacity of 318 MW and one standby MPU to replace the main ones during repairs and fuel reloading in the port of Nagloynyn (Chukotka Autonomous District).

On 23 July 2021, ROSATOM and LLC GDK Baimskaya signed an agreement to jointly implement the project to supply power to Baimsky GOK.

The first two MFPUs are scheduled to be commissioned in 2027, with the third and standby MFPUs to be commissioned in 2028 and 2031 respectively.

Smart City

ROSATOM continues to implement the Smart City digital platform in the regions where its organisations operate. The platform is designed to improve the efficiency of urban management.
By the end of 2021, digital services forming part of the Smart City platform had been rolled out in 36 towns and cities, including 18 towns and cities where ROSATOM’s nuclear facilities are located.

Overall, more than 600,000 people across the country used the Smart City services in 2021.

In 2021, ROSATOM joined the programmes to digitise regional and municipal segments of federal information systems and their components based on an integrated digital platform of the Russian Federation, GosTech, and the Federal State Information System Integrated Information Platform of the National Data Management System.

This included launching a project to develop urban digital applications in the town of Glazov for the benefit of and with assistance from local communities in order to reduce the digital divide by making digital services more accessible to the public, small and medium-sized businesses.

The Centre of Professional Management Communities at the Regional and Municipal Level is being developed pursuant to an order from Dmitry Chernyshenko, Deputy Prime Minister of the Russian Federation. The Centre covers over 500 municipalities and promotes horizontal cooperation aimed at developing digital products and addressing issues related to communication with federal and regional governments; it also formulates mandatory requirements for products developed at the federal and regional level.

In addition, in 2021, the Corporation launched the Digital Water Supply and Sewerage System, a new product for managing water supply systems, and piloted it in Glazov.

Three of ROSATOM’s projects reached the finals of the Digital Summit 2021 Award in the Best IT Solution for a Smart City category. A grant was obtained in 2021 from the Russian Information Technology Development Foundation for the roll-out of the Digital Water Supply and Sewerage System in Belgorod. The Lobachevsky Integration Platform project won the Kulibit 2021 National Digital and IT Award on the Public Administration category. The Corporation ranked second in the Small Projects category in the Project Olympus 2021 National Annual Competition; it also ranked first in the Data Analytics category and second in the Smart City Technologies category in the PROF-IT.Innovation 2021 competition. A combined project comprising the Our North portal (the LS CB area) and the Integrated Digital Regional Management Platform (the LS BI area) ranked fifth in the Best Municipal Practices competition held by the Russian Ministry of Construction, Housing and Utilities in 2021.

In 2022, the Corporation plans to launch the Digital Heat Supply product.

Equipment for the oil, gas and petrochemical industry

In 2021, pilot tests of a cryogenic electric pump for pumping liquefied natural gas (LNG) designed and produced by JSC Atomenergoprom’s organisations (JSC Africkantov OKBM, JSC NIEFA) were completed. This is the first high-voltage large-capacity LNG pump in the history of the Russian oil, gas and petrochemical industry to be independently designed and manufactured by a domestic manufacturer. The electric pump is used to load liquefied natural gas onto LNG carriers.

In addition, the construction of Europe’s first test bench for medium- and large-scale LNG plant equipment was completed in 2021. The facility was built on the NIEFA site in Saint Petersburg, and the commissioning permit was obtained. The test bench can be used to test pumps, turboexpanders and compressors. If required, the test bench can be adapted for testing other equipment. The existence of a test bench of this kind in Russia will reduce dependence on imported equipment and will contribute to the development of a new sector of Russian industry.

Agreements on new business development

2021 saw the signing of a number of framework agreements that enable ROSATOM to implement new business development projects and support current and proposed projects.

An agreement between ROSATOM, the Ministry for the Development of the Russian Far East and Arctic and the Sakha Republic (Yakutia) on the implementation of a zero-carbon nuclear power generation project in the Arctic zone of the Sakha Republic (Yakutia). An agreement on cooperation in the construction of a small NPP with a RITM-200N reactor unit in the village of Ust-Kuya, Ust-Yansky District, Sakha Republic (Yakutia), and support for its subsequent operation.

A letter of intent with PJSC Norilsk Nickel concerning the design and construction of a dual-fuel diesel/LNG icebreaker in order to provide icebreaker support services for vessels operated by PJSC MMC Norilsk Nickel.

A cooperation agreement with the Federal Agency for Tourism aimed at introducing good practices of increasing labour productivity based on lean manufacturing techniques. The agreement involves cooperation between the parties to replicate the successful experience of increasing labour productivity using lean manufacturing techniques and assistance in achieving the goals and accomplishing the objectives set in national projects by developing common approaches to replicating the successful experience of increasing labour productivity using lean manufacturing techniques as part of these projects.
An agreement on cooperation in the sphere of hydrogen energy with the Government of the Sakhalin Region, which involves developing and enhancing cooperation on hydrogen energy projects (including hydrogen production and export to the EU and Asia), large-scale hydrogen production, development of alternative hydrogen supply chains, including storage, transshipment and distribution to meet domestic demand and supply hydrogen to external markets. Construction of a large export-oriented hydrogen production plant on in the Sakhalin Region.

An agreement with the Government of the Sakhalin Region on cooperation in developing public transportation systems and improving the quality of transportation services provided to the public, which involves cooperation in examining equipment and information systems used in the transportation sector in the region in order to identify future areas of development of a smart transportation system in the Sakhalin Region, and examining the potential for using ‘green energy’ technologies and technologies aimed at reducing the carbon footprint of public transport.

A Road Map for the Introduction of ROSATOM’s Innovative High-Technology Products in JSC Russian Railways was signed. The Road Map is aimed at developing cooperation in the use of Russian digital products, expanding the application of traffic control systems and applying solutions for the development of high-speed railways.

On 3 June 2021, a Cooperation Agreement was concluded by ROSATOM and State Space Corporation ROSCOSMOS at the St. Petersburg International Economic Forum. The Agreement involves cooperation on projects focused on import substitution, cross-industry technology transfer and the development of technological and market cooperation in the implementation of promising projects, including those focused on expanding the application of domestically developed digital products. On 4 June 2021, ROSATOM and State Space Corporation ROSCOSMOS signed a framework cooperation agreement at the St. Petersburg International Economic Forum. The agreement defines the parties’ intention to set up cooperation in the development of an integrated system for the geotechnical monitoring of hazardous industrial facilities in the Russian Federation based on radar satellites to be built as part of a programme codenamed ‘Sphere’. The cooperation will also focus on developing integrated information support systems for navigation along the Northern Sea Route and the Northern Sea Transit Corridor.

### 2.2. INTERNATIONAL BUSINESS DEVELOPMENT

#### Key results in 2021:
- The 10-year portfolio of overseas orders totalled USD 139.9 billion (USD 138.3 billion in 2020).
- The portfolio of overseas orders covering the entire life cycle totalled USD 205.4 billion.
- Revenue from overseas orders reached USD 8.98 billion (USD 7.5 billion in 2020).
- The overseas NPP construction project portfolio comprised 35 power units in 12 countries around the world.
- Projects were underway in more than 50 countries worldwide.

#### 2.2.1. Promoting ROSATOM’s technologies on foreign markets

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

ROSATOM is actively promoting Russian nuclear technology for energy and non-energy applications both in countries that are beginning to develop nuclear power and in countries with a well-developed national nuclear power industry (including based on Russian technology).

In addition, ROSATOM provides support throughout the life cycle of nuclear facilities (including both energy and non-energy facilities) by supplying the global market with the full range of products and services in the front-end and back-end stages of the nuclear fuel cycle (NFC), as well as providing services related to the maintenance and modernisation of such facilities.

ROSATOM implements its projects in more than 50 countries worldwide. In order to achieve its objectives on the global market, ROSATOM also uses the existing infrastructure of its overseas divisions. At year-end 2021, 152 overseas divisions of ROSATOM and its organisations operated in 41 foreign countries worldwide. Among them, a special role is played by 14 Regional Centres and country offices of ROSATOM. They are managed by Rusatom International Network, a private institution that performs international business development, marketing and PR functions in the industry.
ROSATOM’s country offices and Regional Centres

ROSATOM attaches special importance to strengthening and developing partnerships with major companies in the global nuclear power market. More specifically, in 2021, the Corporation signed a Strategic Cooperation Agreement with Framatome S.A.S. (France) and a Memorandum of Understanding on Potential Cooperation with Eletrobras Termonuclear S.A (Brazil).

ROSATOM attaches great importance to cooperation with foreign organisations (non-profit organisations, including associations, initiatives, councils, etc.). For instance, as part of its international business, in 2021, ROSATOM and its organisations cooperated with 39 foreign organisations, including the World Nuclear Association (WNA) and the World Energy Council (WEC).

As part of the Corporation’s membership in the World Nuclear Association, representatives of ROSATOM and its organisations took part in the key WNA events, as well as its working groups and research initiatives.

In 2021, under the Patronage Agreement, ROSATOM continued to engage with the World Energy Council. Representatives of ROSATOM and its organisations took part in events held on WEC expert platforms, in the development of WEC research programmes and a programme for young leaders, Future Energy Leaders 100.

ROSATOM participated in more than 80 overseas exhibitions and conferences in 2021. More specifically, the Corporation took part in major international events held online, such as the Nuclear Power Plants Expo & Summit 2021 in Istanbul, Nordic Nuclear Forum in Helsinki, the Vienna Energy Forum in Vienna and the Annual Symposium of the World Nuclear Association (WNA) in London. ROSATOM’s representatives also participated in person in the exhibition and the business programme of the World Nuclear Exhibition in Paris.

As part of World Expo 2020, in December, ROSATOM participated in the Russia National Day and presented its exhibition display in the Russian pavilion. The Corporation also organised the Clean Nuclear Energy Day as part of the business programme of the 26th Conference of the Parties to the UN Framework Convention on Climate Change (COP26) in Glasgow.

Among ROSATOM’s own events, the highlights of 2021 included the Egyptian-Russian Nuclear Power Forum held on 7 December in Cairo by ROSATOM and the Egyptian Nuclear Power Plants Authority (NPPA), the plenary session of which was attended by Mostafa Madbouly, the Prime Minister of Egypt, and Mohamed Shaker, Egypt’s Minister of Electricity and Renewable Energy. The Forum was attended by a total of about 500 people.

To demonstrate Russian nuclear technology to the international community, ROSATOM organised virtual technical tours of Russian nuclear facilities for representatives of foreign companies, governments, educational institutions, the expert community and the media, both as part of major conventions and exhibitions (the IAEA General Conference, COP26, WNE, the Egyptian-Russian Nuclear Power Forum) and for individual delegations from foreign countries. A virtual open day was also held at the Akkuyu NPP site, including a live broadcast from the Akkuyu NPP construction site, with more than 600 participants from various Turkish cities.
2.2.2. Changes in foreign revenue and the portfolio of overseas orders

In the reporting year, ROSATOM’s 10-year portfolio of overseas orders reached USD 139.9 billion.

Changes in the portfolio of overseas orders, USD billion

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-year portfolio of overseas orders, including:</td>
<td>135.7</td>
<td>138.3</td>
<td>139.9</td>
</tr>
<tr>
<td>NPP construction abroad</td>
<td>93.0</td>
<td>89.1</td>
<td>84.1</td>
</tr>
<tr>
<td>NFC (including the back end)</td>
<td>29.0</td>
<td>30.9</td>
<td>34.0</td>
</tr>
<tr>
<td>Other activities</td>
<td>13.7</td>
<td>18.3</td>
<td>21.8</td>
</tr>
</tbody>
</table>

Changes in foreign revenue, USD million

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign revenue, including:</td>
<td>7,228</td>
<td>7,475</td>
<td>8,979</td>
</tr>
<tr>
<td>NPP construction abroad</td>
<td>3,595</td>
<td>4,098</td>
<td>4,896</td>
</tr>
<tr>
<td>NFC (including the back end)</td>
<td>3,082</td>
<td>2,899</td>
<td>3,336</td>
</tr>
<tr>
<td>Other activities</td>
<td>551</td>
<td>479</td>
<td>747</td>
</tr>
</tbody>
</table>

2.2.3. NPP construction abroad

In 2021, ROSATOM’s portfolio of overseas NPP construction projects included 35 power units at different stages of implementation. Russian-design nuclear reactors that are currently under construction fully meet international safety requirements.

<table>
<thead>
<tr>
<th>NPP, country</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rooppur NPP, Bangladesh</td>
<td>The reactor vessel and all four steam generators were moved into final position at power unit No. 1. The reactor vessel and steam generators for power unit No. 2 were manufactured and delivered to the construction site.</td>
</tr>
</tbody>
</table>

Europe

<table>
<thead>
<tr>
<th>NPP, country</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kudankulam NPP, India</td>
<td>Official ceremonies to mark the start of concreting were held at the construction sites of power units No. 5 and 6. This reflected the transition to the active phase of construction.</td>
</tr>
<tr>
<td>Tianwan NPP, China</td>
<td>A licence was obtained for the construction of the nuclear island of power units No. 7 and 8. A ceremony to mark the start of concreting was held at power unit No. 7. The supporting truss was delivered for the reactor pit of power unit No. 7.</td>
</tr>
<tr>
<td>Xudabai NPP, China</td>
<td>A licence was obtained for the construction of the nuclear island of power units No. 3 and 4. A ceremony to mark the start of concreting was held at power unit No. 3. Long-lead equipment is being manufactured.</td>
</tr>
</tbody>
</table>

Middle East and North Africa

<table>
<thead>
<tr>
<th>NPP, country</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>El Dabaa NPP, Egypt</td>
<td>A full set of documents for obtaining a licence for the construction of power units No. 1 and No. 2 was submitted to the Egyptian regulator for review. Safety analysis documents for power units No. 3 and No. 4 were submitted to the Egyptian customer as part of the licensing process for the construction of power units No. 3 and No. 4.</td>
</tr>
<tr>
<td>Akkuyu NPP, Turkey</td>
<td>The licence was obtained for construction of power unit No. 4. The reactor vessel was moved into final position at power unit No. 4. At power unit No. 2, the supporting and thrust trusses of the reactor vessel were moved into final position. At the facilities of power unit No. 3, installation of the first layer of the inner containment vessel was completed in the reactor building, and the concreting of the turbine building was completed.</td>
</tr>
</tbody>
</table>

2.2.4. NPP servicing abroad

ROSATOM provides maintenance services for 49 Russian-design power units abroad that are currently in operation or at the design/construction stage.

The Corporation’s product portfolio targeted at international markets includes a wide range of services covering the entire NPP life cycle: from assessing and developing key nuclear infrastructure components in customer countries to NPP decommissioning.
A contract for maintenance and repairs of equipment of power unit No. 1 of the Belarusian NPP was concluded and is being carried out.

2021 saw the completion of the project launched in 2015 to comprehensively upgrade the Armenian NPP and extend its service life. During this time, the Corporation completed a wide scope of work to improve safety, inspect and replace equipment at the NPP. As a result, the capacity of the power unit grew by 15% with nuclear fuel consumption remaining at the same level.

The Corporation provided support for scheduled preventive maintenance at Kudankulam NPP (India) and Tianwan NPP (China), including remote support.

Over 540 members of operating and maintenance personnel at foreign NPPs underwent training in 2021 as part of long-term and short-term training programmes, including at Rooppur NPP (Bangladesh), Akkuyu NPP (Turkey) and El Dabaa NPP (Egypt).

Measures were taken to improve nuclear infrastructure in Egypt, Turkey, Bolivia and Bangladesh. The Corporation continued to develop nuclear infrastructure of the Plurinational State of Bolivia for the Nuclear Research and Technology Centre (NRTC) construction project (this involved preparing documentation for the NRTC operator and providing advisory services).

2.2.5. Export of uranium products and natural uranium enrichment services

JSC TENEX is ROSATOM’s main organisation promoting uranium conversion and enrichment services on the global market and supplying enriched uranium for power and research reactors. In 2021, JSC TENEX remained one of the world’s leading suppliers of nuclear fuel cycle front-end products.

All obligations under existing contracts in the reporting year were fulfilled by JSC TENEX on time and in full, with uranium products supplied to 49 customers in 17 countries worldwide.

Uranium mining abroad

In 2021, uranium mining organisations of Uranium One implemented the annual production programme and produced 4,514 tonnes of uranium. A 6% year-on-year increase in production was driven by a significant reduction of the impact of the COVID-19 pandemic on the operations of joint uranium mining ventures in the Republic of Kazakhstan.

Uranium mining by the enterprises of JSC Uranium One Group, tonnes

<table>
<thead>
<tr>
<th>Year</th>
<th>Uranium mining</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>4,617</td>
</tr>
<tr>
<td>2020</td>
<td>4,276</td>
</tr>
<tr>
<td>2021</td>
<td>4,514</td>
</tr>
</tbody>
</table>

As at 31 December 2021, the mineral resource base of Uranium One organisations (including a 100% stake in Mantra Resources Pty Limited) under international reporting standards totalled 191,400 tonnes.

The Corporation plans to develop its mineral resource base and continuously improve the economics of its natural uranium mining projects.

2.2.6. Nuclear fuel export

In 2021, ROSATOM’s share on the global nuclear fuel fabrication market totalled 17%.

JSC TVEL, which exports nuclear fuel, continued to perform its obligations under existing contracts in full.

In the reporting year, Russian-made nuclear fuel fully met the demand for reactor fuel in Russia, as well as Armenia, Belarus, Bulgaria, Hungary, Slovakia and the Czech Republic. Nuclear fuel produced in Russia is also used in reactors at nuclear power plants in India, China, Ukraine and Finland.

In 2021, the first batch of nuclear fuel was delivered to the customer for the operation of the Belarusian NPP.

In the reporting year, contract documents were signed for fuel supply for start-up loading and the first reloading of the CFR-600 reactor (China).

JSC TVEL is consistently developing its production capabilities in order to operate on the global market. This included commissioning a line for the production of fuel for foreign-design reactors (PWRs) at the site of PJSC NCCP. The company started to supply enriched uranium product to Ulba-FA LLP, a joint Kazakh-Chinese enterprise producing nuclear fuel for Chinese NPP reactors.
2.2.7. New products for international markets

Construction of Nuclear Research and Technology Centres

In 2021, construction of the Nuclear Research and Technology Centre continued in Bolivia. This is one of ROSATOM’s key projects focused on new products. On 26 July 2021, concreting was started at stage 4 of the Centre in the presence of the President of the Plurinational State of Bolivia, Luis Alberto Arce Catacora. This marked the start of construction of the research reactor complex. At stage 1 and 2 facilities, all construction, installation and finishing operations were completed. The first radiopharmaceutical production line was launched. An environmental permit was obtained for the construction of stage 3 (a radiobiology and radioecology laboratory).

In December 2021, ROSATOM and the Government of the Republic of Serbia signed a General Framework Agreement on the Construction of a Centre for Nuclear Science, Technology and Innovation (CNSTI) and an Agreement on the Establishment of a Joint Venture that will implement this project in Serbia. In accordance with the documents signed by the parties, the first stage of the CNSTI comprising a Nuclear Medicine Centre with a cyclotron facility and radiopharmaceutical production facilities will be built in Serbia within the next three years.

In addition, in 2021, ROSATOM continued to implement intergovernmental agreements signed earlier on cooperation in the construction of NRTCs in Rwanda and Vietnam, with a focus on preparing for the development of feasibility studies for these projects.

Foreign customers show strong interest in projects to build nuclear medicine centres and multipurpose irradiation centres, which are widely used in healthcare and agriculture. In 2021, opportunities were discussed for the implementation of such projects in Africa, Asia and Latin America.

Isotope products

After a significant decline in consumption of radioactive isotope products for medical and industrial applications in 2020 due to the pandemic, 2021 saw a gradual restoration of logistics routes suitable for the transportation of radioactive isotopes and a gradual recovery of the medical isotope market.

In 2021, the Corporation managed not only to maintain its foreign revenue from isotope products, but also to achieve a 33% year-on-year increase.

Promoting life cycle back-end services

ROSATOM’s organisations successfully transported two batches of SNF from Kozloduy NPP (Bulgaria) to FSUE Mayak Production Association for reprocessing using a new transportation flowchart piloted in 2020.

As part of cooperation with Japan to assist in responding to the Fukushima Daiichi nuclear accident, JSC TENEX completed a two-year project to predict the properties of corium (materials from the damaged reactor core). The resulting data may be used during its extraction, transportation and storage.

Taking into account ROSATOM’s references for the decommissioning of facilities posing nuclear and radiation hazards, in June 2021, the CIS Economic Council decided to give JSC TVEL (ROSATOM’s integrator for the decommissioning of facilities posing nuclear and radiation hazards) the status of a basic organisation for SNF and RAW management and decommissioning of facilities posing nuclear and radiation hazards in the CIS countries. Thus, JSC TVEL has become a single point of contact and a single platform for communication with potential customers in the CIS countries.

The Corporation is promoting an integrated product, the Balanced NFC, on the global market. This is an offer incorporating certain elements of a closed nuclear fuel cycle and enabling effective recycling of regenerated nuclear materials and a significant decrease in the volume and radioactivity level of radioactive waste sent for near-surface or medium-depth disposal. This is achieved through SNF processing and high-level waste fractionation.

In December 2021, on the sidelines of the World Nuclear Exhibition in Paris, ROSATOM, the French Alternative Energies and Atomic Energy Commission (CEA) and EDF (France) signed a trilateral declaration of intent to develop long-term cooperation in research and development in the nuclear power industry. The document announces laboratory experiments, including all the phases required for the recycling of regenerated secondary plutonium from spent MOX fuel in Generation IV fast neutron reactors. The trilateral cooperation should demonstrate the recyclability in fast neutron reactors of those materials that are part of MOX fuel used in the current generation of light-water reactors.

If successful, the research will help to make the nuclear power much more sustainable.

Hydrogen energy

In 2021, ROSATOM continued to actively develop a new sector of the economy: Hydrogen Energy. In August 2021, the Government of the Russian Federation approved the Hydrogen Energy Development Concept, which highlights the importance of unlocking the national potential in the field of hydrogen production, use and transport, and enabling Russia to become one of the leading countries in this industry. As part of its hydrogen energy development efforts, ROSATOM has laid the groundwork and has developed plans for all prioritised aspects covered in the national Concept, including both domestically developed technologies and the establishment of international hydrogen supply chains.
In 2021, ROSATOM established business relations with numerous Japanese and Korean players in the emerging hydrogen market. Agreements were reached on the development of cooperation, including on the export of low-carbon hydrogen, and a number of bilateral agreements were signed.

2.2.8. Plans for 2022

In 2022, ROSATOM will continue to increase its foreign revenue. The target for the next year has been set at USD 9.3 billion. At the same time, even with such significant revenues, the Corporation plans to maintain its portfolio of overseas orders at the current level. The 2022 target for the portfolio of overseas orders covering the entire life cycle has been set at USD 204 billion.

Next year, ROSATOM plans to launch power unit No. 2 of the NPP in Belarus and to achieve steady progress in the implementation of other ongoing projects. More specifically, as part of the Akkuyu NPP construction project in Turkey, the Corporation plans to complete the installation of the dome of the inner containment vessel at power unit No. 1 and to move the reactor vessel of power unit No. 2 into final position. Concreting of the foundation of the reactor building will be started at power unit No. 4. At the Rooppur NPP site in Bangladesh, ROSATOM plans to complete the welding of the main circulation pipeline at power unit No. 1 and move the reactor vessel into final position at power unit No. 2 in 2022. In addition, ROSATOM will continue to engage with customers in order to obtain approvals for licensing documentation for the implementation of NPP construction projects in Hungary, Egypt and China.

As part of the NRTC construction project in Bolivia, the Corporation plans to commission stage 1 and 2 facilities of the NRTC and to complete construction and installation operations in the radiobiology and radioecology laboratory.

Given that the customers’ interest in the energy market is shifting towards flexible solutions (in terms of both the power generation volume and the amount of funding), the most important area in which the Corporation intends to achieve a major breakthrough in 2022 is the promotion of small nuclear power plants. In 2022, the relevant efforts will be focused on developing the product line of nuclear energy solutions of JSC Rusatom Energy Projects, a company set up to promote them. Many countries in Latin America, Africa, the Middle East, Central and Southeast Asia show strong interest in small nuclear power plants.

ROSATOM plans to consistently diversify its product offer and launch new products on new markets. In 2022, it plans to be more active on foreign markets in the wind power segment and to leverage the capabilities available in the Russian Federation. Special emphasis will be placed on the development of projects in the field of nuclear medicine, composite materials and energy storage systems, given the considerable potential of these market segments.

2.3. ENERGY EFFICIENCY

2.3.1. Energy efficiency management system. Implementation of energy efficiency management and energy management systems

Energy conservation is an important prerequisite for the efficient use of ROSATOM’s energy resources, making it more competitive and reducing the negative impact on the environment. An energy conservation and energy efficiency improvement programme for the period from 2018 to 2022 is being implemented in the Russian nuclear industry. Responsibility for enhancing energy efficiency lies with the Economic Analysis and Operational Efficiency Management Department of ROSATOM.

In accordance with the government programme of the Russian Federation titled ‘Development of the Nuclear Power and Industry Complex’ (hereinafter referred to as the ‘DNPIC programme’), between 2015 and 2020 and in 2021, the Corporation set and achieved the following targets for the reduction in energy consumption as a percentage of the actual consumption volume in 2015 and 2020 respectively:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Savings compared to 2015, %</td>
<td>4.0</td>
<td>6.7</td>
<td>8.9</td>
<td>9.7</td>
<td>9.84</td>
</tr>
<tr>
<td>Savings compared to 2020, %</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.5</td>
</tr>
<tr>
<td>Cumulative total savings between 2016 and 2021, RUB billion (excluding VAT)</td>
<td>–</td>
<td>2.4</td>
<td>2.6</td>
<td>2.9</td>
<td>2.95</td>
</tr>
<tr>
<td>Cumulative total savings in 2021, RUB billion (excluding VAT)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>0.35</td>
</tr>
</tbody>
</table>
### 2.3.2. Results in 2021

Energy consumption and energy cost allocation with a breakdown by Division and complex

#### Data on energy consumption in 2021

<table>
<thead>
<tr>
<th>Division/complex</th>
<th>Heat (Gcal)</th>
<th>Water (m³)</th>
<th>Electricity (kWh)</th>
<th>Other (tonnes of fuel equivalent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Actual consumption during the period under comparable conditions, '000 Gcal</td>
<td>% Actual consumption during the period under comparable conditions, '000 m³</td>
<td>% Actual consumption during the period under comparable conditions, '000 kWh</td>
<td>% Actual consumption during the period under comparable conditions, tonnes of fuel equivalent</td>
</tr>
<tr>
<td>JSC Atomredmetzoloto</td>
<td>598.06</td>
<td>3,777.57</td>
<td>476,907.81</td>
<td>1.31</td>
</tr>
<tr>
<td>JSC Atomenergomash</td>
<td>55.66</td>
<td>-10.2</td>
<td>1,358.74</td>
<td>5.05</td>
</tr>
<tr>
<td>JSC Rosenergoatom</td>
<td>404.57</td>
<td>1,185.66</td>
<td>970,350.70</td>
<td>2.43</td>
</tr>
<tr>
<td>JSC Science and Innovations</td>
<td>227.86</td>
<td>0.41</td>
<td>166,248.86</td>
<td>997.95</td>
</tr>
<tr>
<td>JSC RIR</td>
<td></td>
<td>191,991.61</td>
<td>2,006,852.24</td>
<td>0.74</td>
</tr>
<tr>
<td>FSUE Atomflot</td>
<td></td>
<td>191,33</td>
<td>15,047.86</td>
<td>0.23</td>
</tr>
<tr>
<td>Environmental Solutions</td>
<td>530.70</td>
<td>25,556.23</td>
<td>307,979.27</td>
<td>12,155.69</td>
</tr>
<tr>
<td>NWO</td>
<td>2,083.76</td>
<td>25,984.01</td>
<td>844,084.92</td>
<td>181,261.94</td>
</tr>
<tr>
<td>Other</td>
<td>2,114.84</td>
<td>352,585.61</td>
<td>3,098,093.66</td>
<td>15,610.58</td>
</tr>
<tr>
<td>Total across the industry</td>
<td>6,015.45</td>
<td>1,792,008.66</td>
<td>6,044,683.80</td>
<td>2,288,725.91</td>
</tr>
</tbody>
</table>

In 2021, energy costs of ROSATOM's organisations (under comparable conditions, in 2020 prices) were as follows:

#### Total energy costs in the industry (excluding VAT) between 2019 and 2021

<table>
<thead>
<tr>
<th>Division/complex</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>JSC Atomredmetzoloto</td>
<td>1.60</td>
<td>1.57</td>
<td>1.88</td>
</tr>
<tr>
<td>JSC Atomenergomash</td>
<td>0.81</td>
<td>0.77</td>
<td>1.05</td>
</tr>
<tr>
<td>JSC Rosenergoatom</td>
<td>1.91</td>
<td>1.77</td>
<td>2.30</td>
</tr>
<tr>
<td>JSC Science and Innovations</td>
<td>0.85</td>
<td>0.84</td>
<td>1.27</td>
</tr>
<tr>
<td>JSC RIR</td>
<td>5.29</td>
<td>5.04</td>
<td>5.52</td>
</tr>
<tr>
<td>FSUE Atomflot</td>
<td>0.13</td>
<td>0.13</td>
<td>0.19</td>
</tr>
<tr>
<td>Environmental Solutions</td>
<td>1.94</td>
<td>1.81</td>
<td>2.10</td>
</tr>
<tr>
<td>NWO</td>
<td>5.48</td>
<td>5.46</td>
<td>7.58</td>
</tr>
<tr>
<td>Other</td>
<td>9.15</td>
<td>9.60</td>
<td>13.35</td>
</tr>
<tr>
<td>Total across ROSATOM</td>
<td>27.16</td>
<td>26.99</td>
<td>35.24</td>
</tr>
</tbody>
</table>

Energy savings as a result of energy efficiency measures and energy cost savings achieved by ROSATOM, with a breakdown by Division and complex

In accordance with the DNPII programme, the energy conservation target for ROSATOM for 2021 has been set at 0.5% of the actual consumption volume in 2020.

According to reports by nuclear organisations, in the reporting year, actual energy cost savings against 2020 as the base year totalled 0.99% (as a cumulative total), or RUB 0.35 million (excluding VAT) in monetary terms and 636,442.05 GJ in physical terms, including a breakdown by Division/complex.
In 2021, JSC Khiagda continued to implement a project focused on the production of high-performance lighting solutions. The aim of the project is to replace low-efficiency light sources with high-performance LED light sources; this will help to reduce the negative environmental impact thanks to lower energy consumption and cut expenditure on the procurement of light sources (funds previously budgeted for the purchase of lighting products have been used to the purchase accessory components). The payback period of the project totals one year. Economic benefits from its implementation include the fact that the cost of lighting products manufactured in-house is 2.5 times lower than that of similar lamps available on the market.

Energy cost savings in 2019 and 2020 (against 2015 as the base year, excluding VAT) and in 2021 (against 2020 as the base year, excluding VAT)

<table>
<thead>
<tr>
<th>Division/complex</th>
<th>2019 RUB million</th>
<th>2020 RUB million</th>
<th>2021 RUB million</th>
</tr>
</thead>
<tbody>
<tr>
<td>JSC Atomredmetzoloto</td>
<td>197.19 (10.95%)</td>
<td>227.60 (12.64%)</td>
<td>23.24 (1.22%)</td>
</tr>
<tr>
<td>JSC Atomenergomash</td>
<td>138.07 (14.48%)</td>
<td>187.35 (19.65%)</td>
<td>31.11 (2.86%)</td>
</tr>
<tr>
<td>JSC Rosenergostatom*</td>
<td>95.94 (4.78%)</td>
<td>90.40 (4.86%)</td>
<td>12.74 (0.55%)</td>
</tr>
<tr>
<td>JSC Science and Innovations</td>
<td>71.29 (9.54%)</td>
<td>82.92 (9.01%)</td>
<td>8.56 (0.67%)</td>
</tr>
<tr>
<td>JSC RIR</td>
<td>56.88 (1.06%)</td>
<td>303.34 (5.67%)</td>
<td>32.33 (0.58%)</td>
</tr>
<tr>
<td>FSUE Atomflot</td>
<td>8.67 (6.04%)</td>
<td>8.69 (6.05%)</td>
<td>0.38 (0.20%)</td>
</tr>
<tr>
<td>Environmental Solutions</td>
<td>446.59 (18.74%)</td>
<td>570.99 (23.97%)</td>
<td>26.24 (1.24%)</td>
</tr>
<tr>
<td>NWO</td>
<td>613.82 (8.31%)</td>
<td>645.03 (10.57%)</td>
<td>86.68 (1.13%)</td>
</tr>
<tr>
<td>Other</td>
<td>1,285.87 (12.33%)</td>
<td>829.65 (7.95%)</td>
<td>132.12 (0.98%)</td>
</tr>
<tr>
<td>Total across ROSATOM</td>
<td>2,914.31 (9.7%)</td>
<td>2,945.97 (9.84%)</td>
<td>353.40 (0.99%)</td>
</tr>
</tbody>
</table>

Energy cost savings in 2021 by type of energy resources, GJ

<table>
<thead>
<tr>
<th>Energy source</th>
<th>2021 RUB million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat</td>
<td>308,402.64</td>
</tr>
<tr>
<td>Electricity</td>
<td>390,074.58</td>
</tr>
<tr>
<td>Other energy resources</td>
<td>-62,035.17</td>
</tr>
<tr>
<td>Total</td>
<td>636,442.05</td>
</tr>
</tbody>
</table>

* A reduction in savings in RUB million accompanying an increase in savings as a percentage (in 2020 compared to 2019) was due to the revision of indicators for the base year at some NPPs (Beloyarsk NPP, Kalinin NPP, Kursk NPP and Novovoronezh NPP).

2.3.3. Plans for 2022 and for the medium term

In order to achieve the energy conservation target of 1.0% set for 2022 under the DNPIC programme, the following differentiated energy conservation targets (against 2020 as the baseline) have been set and included in the KPI maps of executives of ROSATOM’s Divisions/complexes:

<table>
<thead>
<tr>
<th>Division/complex</th>
<th>Energy conservation targets for 2022 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>JSC Atomredmetzoloto</td>
<td>1.50</td>
</tr>
<tr>
<td>JSC Atomenergomash</td>
<td>2.00</td>
</tr>
<tr>
<td>JSC Rosenergostatom</td>
<td>0.30</td>
</tr>
<tr>
<td>JSC Science and Innovations</td>
<td>0.40</td>
</tr>
<tr>
<td>JSC RIR</td>
<td>1.00</td>
</tr>
<tr>
<td>FSUE Atomflot</td>
<td>1.00</td>
</tr>
<tr>
<td>Environmental Solutions</td>
<td>1.00</td>
</tr>
<tr>
<td>NWO</td>
<td>2.00</td>
</tr>
<tr>
<td>Other</td>
<td>from 0.60 to 4.10</td>
</tr>
</tbody>
</table>

In the medium term, ROSATOM will also continue to take steps to meet the requirements of the DNPIC programme until 2027:

- Reduction in energy consumption (under comparable conditions)

<table>
<thead>
<tr>
<th>Target (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2022</td>
</tr>
<tr>
<td>Against 2020</td>
</tr>
<tr>
<td>Against 2025</td>
</tr>
</tbody>
</table>

In addition, between 2021 and 2027, ROSATOM plans to:

- Develop and approve the Energy Conservation and Energy Efficiency Improvement Programme for the period from 2023 through 2027 in 2022;
- Monitor progress on scheduled energy audits in nuclear organisations;
— Monitor updates to Energy Conservation Programmes approved by organisations with energy costs exceeding RUB 50 million per year for the next five years following the completion of the current Programmes;  
— Assess the outcomes of energy conservation measures implemented by the organisations (assign industry ratings) on an annual basis;  
— Maintain the energy efficiency management and energy management systems implemented in the industry and continuously improve their performance;  
— Achieve additional synergy between energy conservation initiatives and industry-wide efforts to increase the Corporation’s level of maturity in the sphere of sustainable development;  
— Continuously improve the range of functions in the AEEMS, including updating the scope of reporting in the organisations.

2.4. BUSINESS EFFICIENCY

2.4.1. ROSATOM Production System

Key results in 2021:
— The scope of systematic RPS development included 39 organisations of the Corporation.  
— Over 100 production flows for ROSATOM’s key products were optimised between 2015 and 2021.  
— Over 150 benchmark sites and processing stages across 14 types of manufacturing operations and over 30 benchmarks across production support processes were developed as RPS benchmarks.

The ROSATOM Production System (RPS) is a lean manufacturing culture and a system for continuous process improvement to provide ROSATOM with competitive advantages globally. The RPS principles enable the Corporation to achieve one of its strategic goals: to reduce the production cost and the lead time by identifying and eliminating all types of losses in manufacturing and office processes and by improving the performance of each employee.

According to the ROSATOM Production System development concept, all organisations participating in the comprehensive development of the system are divided into three levels: the RPS Reserve, RPS Candidates and RPS Leaders. To date, organisations granted the status of an RPS Leader have created production benchmarks aligned with global best practices; these include benchmark process flows and sites where employees of other organisations can be trained. The best way to make optimised processes even more efficient is through digitisation. Accordingly, a new level has been introduced: the Lean Smart Plant.

Digitisation should provide additional benefits by reducing the lead time, improving inventory turnover, increasing labour productivity and equipment efficiency. It is intended that RPS Leaders will reach the Lean Smart Plant level within the next two years.

2.4.2. Results in 2021

RPS enterprises

Since 2015, a systematic RPS development programme is implemented in nuclear organisations: business goals are decomposed to the level of production sites; the manufacture of an enterprise’s core products (production flows) is optimised; training in RPS techniques is provided for employees, and incentive systems are introduced to encourage continuous improvement.

In 2021, the scope of systematic RPS development included 39 organisations of the Corporation.

Between 2015 and 2021, RPS enterprises optimised over 100 production flows for ROSATOM’s key products and created RPS benchmarks:
— Over 150 benchmark sites and processing stages across 14 types of manufacturing operations;  
— Over 30 benchmarks across production support processes (maintenance and repairs, logistics, planning, etc.).

The development and roll-out of RPS benchmarks continued in shop floor clubs established in 2020: Mechanical Assembly Operations, Multi-Product Machining and Design Organisations. In 2021, enterprises of partner companies that are members of the Association of Russian Production Systems joined the clubs.

Lean Smart Plant

The Lean Smart Plant/digital RPS enterprise is a new approach and a new level of RPS development that has been created and introduced in 40 nuclear organisations (seven Divisions). This approach is focused on improving the management of manufacturing operations through the application of RPS tools and Industry 4.0 technologies.

The transition to the digital RPS enterprise comprises three stages:
1. Establishment of RPS enterprises where process flows are organised and RPS benchmarks are created for manufacturing processes and production support processes.
2. Digitisation of core process architecture of the enterprises based on flexible digital work cells operating as a pull system; the use of an automated planning system and an information system for managing assembly lines, equipment maintenance and repairs.
3. Large-scale digitisation, which includes digital design, computer-aided and supercomputer engineering, industrial sensors and the industrial Internet, the use of virtual and augmented reality technologies, expert systems and artificial intelligence.

In 2021, over 60 innovative Lean Smart Plant projects were launched in the industry. They are unique among industrial corporations in Russia (ROSATOM’s organisations are the only ones to implement Industry 4.0 technologies along with the development of the production system). The approach can be tailored to any type of organisation and is applicable at all life cycle stages of the Corporation’s products (from an idea to decommissioning). All these projects have a considerable potential for roll-out in Russia.

In 2021, a number of RPS Leaders participated in the project, including JSC Afrikantov OKBM, JSC CMP, Petrozavodskmash (a branch of JSC AEM-Technology in Petrozavodsk), JSC Khiagda and JSC FSPC PC Start named after M.V. Protsenko. They took an active part in the testing of new qualitative criteria. These organisations managed to create the first digital RPS benchmarks for production support processes.

The Lean Smart Plant has helped to shorten the implementation cycle of RPS and IT projects to 12 months as they are now implemented as a single integrated project. It is also worth noting the unique speed of implementation of this approach: it was developed in 4Q 2020, and in 2Q 2021 it was approved and the Road Map for the Development of Lean Smart Plant Enterprises was developed. In 1Q 2022, the first five digital RPS benchmarks were accepted. It is expected that in 1Q 2023, the first organisations will be given the status of digital RPS enterprises.

RPS engineering

In 2021, ROSATOM continued to implement RPS engineering standards at construction sites of RPS enterprises in the industry. A new level of development was confirmed for five RPS construction benchmarks in the sphere of operational construction schedule management.

RPS construction projects were successfully implemented at ROSATOM’s major construction sites:

1. JSC JSC RIAR: optimisation of the construction schedule of the MBIR multipurpose fast neutron research reactor. Construction of the structures up to the +13,000 level.
2. JSC CONCERN TITAN-2: optimisation of the construction schedule of the 10UMA facility at Akkuyu NPP.
3. JSC ASE: pilot testing to develop efficient building technology.
4. JSC SCP: key 2021 milestones in the construction of the BREST-OD-300 reactor unit were completed on time.

Supplier development

In 2021, industry RPS experts contributed to the systematic development of over 30 suppliers from other industries using lean manufacturing approaches and tools. The development is based on the Uniform Industry-Wide Guidelines on the Development of the Production System of Suppliers of ROSATOM and its Organisations Using the Techniques and Tools of the ROSATOM Production System. In 2021:

- Seven organisations participating in systematic development efforts reached the highest level, Efficiency;
- ROSATOM successfully continued to engage major key suppliers from other industries in systematic development; in 2021, systematic cooperation was started with JSC TYAZHMASH (based in Syzran; the company’s products include cranes, locks and core catchers). Previously, cooperation with major (key) industry suppliers had been successfully piloted with a number of companies, such as LLC Corporations AK ESKM (based in Krasnodar and supplying electrical and thermal equipment, pipeline components, steel building structures and pressure vessels), and LLC Atomspetsservis (based in Volgodonsk and supplying heat exchangers, lifting equipment and pressure vessels).

Introduction of lean techniques in Russia’s social sector and industry

ROSATOM voluntarily shares its best management techniques and workflow organisation methods nationwide as part of the Efficient Region project and the Labour Productivity and Employment Support National Project. Introduction of the principles and tools forming part of the ROSATOM Production System enables a significant improvement in the efficiency of healthcare, education and utility systems and other sectors of the Russian economy.
In 2021, the Efficient Region project was underway in 30 regions, with the Chuvash Republic, the Ulyanovsk, Ivanovo, Tyumen and Tomsk Regions and the Chukotka Autonomous District joining the project during the year. Over 3,600 social and economic projects were implemented in the regions.

The concept of a benchmark was introduced in the Efficient Region project in 2019. It was decided to group best practices into three levels: federal, regional and local. In 2021, 81 benchmarks were validated in the following areas of social and economic life in the regions: public and municipal administration, education, healthcare, housing and utilities, employment centres, multi-service centres, social security, sports and industry.

In 2021, all seven prizes in the Lean Management Projects category of the Project Olympus competition in the sphere of professional project management in the public sector were awarded to projects implemented in the regions involved in the Efficient Region project.

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The End-to-End Flows in the Development of a Lean Personality were being actively developed as part of the Efficient Region project in 2021. This workstream is focused on continuously shaping and developing competences within the educational system that are required by employers. The end-to-end flows are supported by existing social clubs, such as the Club of Directors of Lean Schools and Kindergartens, the League of Lean Colleges and the Association of Lean Universities. In 2021, 11 end-to-end flows were being developed in five regions.

Russian Production Systems Partnership

In 2019, senior executives of ROSATOM and other major corporations held a meeting that resulted in the establishment of the Association of Production Systems, an unincorporated partnership (hereinafter referred to as the Partnership).

At year-end 2021, the Partnership comprised 10 corporate members.

Despite the restrictions necessitated by the COVID-19 pandemic, all members of the Partnership continued to actively cooperate and communicate in 2021. Their efforts were focused primarily on the following areas:

1. Visits of leading specialists in production systems in order to share experience;
2. Conferences of shop floor clubs;
3. Joint projects, including those focused on new businesses.

A total of four meetings of shop floor clubs of member enterprises were held with a focus on Mechanical Assembly Operations. Eight meetings of shop floor clubs of partner enterprises were held with a focus on Multi-Product Machining Operations.

Projects to fight the COVID-19 pandemic

In 2021, employees of JSC RPS, along with representatives of the Russian Ministry of Health, the Russian Ministry of Industry and Trade, the Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing (Rospotrebnadzor) and other federal executive agencies and authorised organisations, were involved in the intergovernmental working group on COVID-19 vaccination. The work were focused on two areas:

1. Reducing the end-to-end lead time from vaccine bottling to vaccination;
2. Increasing the throughput capacity of vaccination sites.

In the first focus area, ROSATOM, jointly with the Ministry of Health of the Russian Federation, the Federal Service for Surveillance in Healthcare (Roszdravnadzor) and the Ministry of Industry and Trade of the Russian Federation, developed and implemented measures to reduce the lead time three-fold.

As part of its efforts in the second focus area, the Corporation, jointly with the Ministry of Health of the Russian Federation, prepared temporary guidelines on the procedure for COVID-19 vaccination of the adult population, including recommended workflow charts for vaccination sites in order to ensure optimal performance. Benchmark vaccination sites compliant with the requirements of the guidelines were set up in Russian regions, with their throughput capacity increased to 360 people per shift to enable large-scale vaccination of the population against COVID-19.

In December 2021, a new joint project of the Ministry of Health, Development of Primary Care Models Underpinned by the Principles of Value-Based Healthcare, was launched in seven pilot regions.

Project implementation in ROSATOM’s new businesses

In 2021, ROSATOM’s Advanced Materials and Technologies Division started to implement RPS tools through the following RPS orders:

1. Improving equipment efficiency at LLC ALABUGA-FIBRE; this initiative is aimed at reducing the amount of time required to reload PAN fibre spools from 30 hours to 15.3 hours and reducing unscheduled equipment downtime from 17.6% to 14.0%;
2. Reducing the order lead time at LLC ZaryaD. Objectives: WIP reduction at all production stages from 16,500 to 7,000 units and the transition of production sites to one-shift operation.

During the fulfilment of these orders, the first RPS sessions attended by the Division’s executives were held in the organisations. The teams learnt about RPS tools and applied them at the production sites. During the year, four RPS sessions were held in LLC ALABUGA-FIBRE, LLC ZaryaD, JSC Prepreg-ACM and LLC Prepreg-Dubna.
2.4.3. Plans for 2022

ROSATOM has prioritised the following areas for 2022:

1. The Lean Smart Plant;
2. RPS engineering;
3. Supplier development;
4. Introduction of lean techniques in Russia’s social sector and industry;
5. Project implementation in ROSATOM’s new businesses.

Lean Smart Plant

The Corporation plans to expand the scope of the project to transition to the digital RPS enterprise (Lean Smart Plant). The innovative methodology integrates the RPS (Lean) and IT (Smart) approaches; it involves creating digital RPS benchmarks for production operations and processes and developing enterprises to ensure that they reach the level of digital RPS enterprises. RPS benchmarks will be replicated and the best practices will be shared through Shop Floor Clubs. Each club is scheduled to have six to seven working meetings; in 2022, the number of their members is expected to grow. The Chief Technology Officers’ Club was established in early 2022.

In 2022, ROSATOM plans to create at least 20 digital RPS benchmarks not only for production support processes, but also for production processes. The list of key projects scheduled for 2022 was presented by the heads of RPS and IT functions at an industry-wide meeting held in December 2021. In addition, during the event, a decision was made to update comprehensive road maps combining RPS and IT projects under the Lean Smart Plant approach.

RPS engineering

In 2022, ROSATOM plans to establish the Club of Technical Coordinators of Construction Projects to promote horizontal cooperation among construction project participants. This Club will review typical challenges and issues facing many construction firms. The shop floor club will enable construction companies to share experience with one another.

ROSATOM will continue to implement RPS engineering standards at construction sites of RPS enterprises in the industry and to develop RPS construction benchmarks for operational construction schedule management.

Supplier development

One of the objectives in 2022 is to develop new production systems in enterprises supplying the nuclear industry. It is expected that in 2022, the number of suppliers within the scope of systematic development initiatives will not decrease, and production systems will continue to be developed jointly with 28 to 30 enterprises in other industries.

The Corporation is constantly searching for new tools and reserves in the sphere of supplier development. For instance, in 2022, ROSATOM plans to pilot the Supplier Data Reliability Audit with a Production System Assessment Unit at the stage of announcing the outcomes of tendering.

Introduction of lean techniques in Russia’s social sector and industry

As part of the Efficient Region programme, the Corporation will continue to create benchmarks in all areas of social and economic life in the regions.

ROSATOM participates in the National Social Initiative in cooperation with the Agency for Strategic Initiatives, and in 2022, they will implement projects to address 12 real-life situations in 10 Russian regions.

The joint project of the Ministry of Health of the Russian Federation, Development of Primary Care Models Underpinned by the Principles of Value-Based Healthcare, will continue to be implemented in seven pilot regions. By the end of 2022, the Corporation intends to replicate the results achieved as part of the project in all Russian regions.

Focus areas of the partnership in 2022 will include participation in pilot projects under the new Lean Tourism model. ROSATOM plans to launch pilot routes in its organisations and in enterprises that are members of the Association of Production Systems.

In addition, agreement has been reached with a number of Russian companies to participate in the Lean Initiative competition and jointly provide grant funding for it in 2022.
Project implementation in ROSATOM’s new businesses

In 2022, the Umatex Division plans to place 14 RPS orders in five organisations in order to increase equipment productivity, reduce the loss of materials and develop new production operations.

One of the key objectives in 2022 is to establish an RPS function in the Division. A decision has been made to adapt the trajectory of comprehensive RPS roll-out, which ROSATOM has completed in 10-12 years, and to try to accomplish this task in three to five years.

The Corporation, jointly with JSC Rusatom Greenway, has launched an RPS project to build a production facility for the processing of polyethylene terephthalate waste into PET flakes. In 2022, ROSATOM plans to review project documents, develop layout concepts and take part in pre-commissioning.
ГЛАВА 3.
СОЦИАЛЬНЫЙ ОТЧЕТ
Dear colleagues and partners,

Today’s world is changing increasingly fast: we are witnessing the emergence of new priorities, challenges and solutions to technological, environmental and social issues. The global transformation is driving demand for highly skilled professionals, and as a result, the labour market is becoming more competitive. Employees are no longer an impersonal ‘resource’: they have become the key asset that is valuable to the company. A modern employer seeks to create an environment that supports employee development, helping employees to achieve ‘professional happiness’.

In 2021, despite the challenges posed by the pandemic, ROSATOM continued to make progress towards its strategic goal of becoming a leader in unlocking human potential, providing full support to its employees and creating a comfortable environment for work, professional development and personal growth.

We continue to focus on the health and safety of our employees. As a result of effective cooperation between ROSATOM, medical professionals of the Federal Biomedical Agency of Russia and local mayors, by the end of 2021, 87% of employees in all nuclear towns and cities had been vaccinated. The Corporation continued to actively assist its host towns and cities by providing vaccines and medical equipment, opening laboratories, supporting frontline healthcare workers and supplying hot meals to them, and delivering food products directly to the homes of war veterans. The Corporation spent more than RUB 2.6 billion on assistance to healthcare institutions.

In 2021, we also continued to build an ecosystem to support the development of engineering competences at all levels, from schoolchildren to ‘third age’ employees. Around 170,000 people were involved in the projects, including employees of the organisations and Divisions in the industry, schoolchildren and their parents, students, experts, and representatives of municipal administrations and universities from over 200 towns and cities and 70 regions across the country. As part of the ‘Mission: Talent’ initiative, we continued to actively assist its host towns and cities by providing vaccines and medical equipment, opening laboratories, supporting frontline healthcare workers and supplying hot meals to them, and delivering food products directly to the homes of war veterans. The Corporation spent more than RUB 2.6 billion on assistance to healthcare institutions.

In 2021, the number of educational contacts in the Corporation’s digital learning environment more than doubled compared to 2020 and reached 1,051,116. In 2021, training programmes covered 89% of employees in the industry (in the civilian sector). Furthermore, our educational programmes received recognition from the international academic community and won awards from the Global Council of Corporate Universities (GlobalCCU), the World Nuclear Exhibition (WNE) and the Chartered Institute of Personnel and Development (CIPD).

Throughout 2021, we continued to improve ROSATOM’s digital ecosystem, which enabled us to streamline and improve the efficiency of HR services and start to replace imported IT systems. ROSATOM has introduced online services such as the Employee’s Personal Account and a new chatbot, the Digital Assistant Mark, which are already available to over 80,000 employees in 75 organisations of the Corporation. In addition, in 2021, the Corporation launched a corporate social media platform, Rosatom LIFE, and continued the roll-out of the RECORD Mobile training platform, which is available 24/7 and enables employees to acquire new knowledge and competences. Currently, it contains over 1,600 items of content, including video tutorials and workshops, online courses and training sessions, and books.

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In order to strengthen ROSATOM’s position on the global nuclear technology market and to promote engineering education, we are building the necessary educational infrastructure for personnel training. A unique research and education cluster is being developed in the town of Sarov (Nizhny Novgorod Region). It will be centred around the National Centre for Physics and Mathematics (NCPM) established in collaboration with the Russian Government, Moscow State University, the Russian Academy of Sciences, the Joint Institute for Nuclear Research and the Kurchatov Institute. The aim of the project is to train world-class scientists specialising in physics and mathematics. The first world-class research results will be achieved as early as by 2025, and by 2030, the NCPM will begin experiments using unique ‘mega science’ research facilities. In 2021, MSU Sarov, the core university of the NCPM, was opened, and the first 50 students enrolled on courses in Applied Mathematics and Computer Science and Physics.

The Corporation continued to develop its corporate volunteering programme, with about 350 volunteer campaigns and social initiatives implemented during the year. The total number of volunteers at ROSATOM reached 5,500. The first inter-corporate volunteer university was launched with active support from the Corporation; over 250 employees from 15 companies participated in the project. We also give special attention to projects aimed at developing ‘green towns and cities’, which involve conducting clean-up days, collecting solid household waste, organising environmental flash mobs, lectures for children and students, environmental festivals, landscaping and other activities. Employees from the Corporation’s organisations regularly participate in blood donation campaigns.

For instance, in 2021, over 1,500 people joined the Pulsation project as part of the Industry-Wide Donor Month, and a total of more than 3,000 litres of blood were collected, which can potentially save 10,000 lives. In 2021, ROSATOM’s volunteering and CSR programme won major Russian awards in this field: Champions of Good Deeds, the Crystal Pyramid and the Investment Leaders Award.

ROSATOM continued to actively implement sustainable development projects. In December 2021, we took part in the second international Global Impact Conference, where Russian and foreign experts discussed the current challenges and the contribution of the younger generation to global transformation. The event resulted in the establishment of the Impact Team 2050, an international youth advisory board that will be tasked with promoting ideas and supporting projects in the sphere of sustainable development worldwide.

As part of our corporate social programme, we run projects to improve employees’ physical, emotional, social, professional and financial well-being. These include health awareness days, specialised medical consultations, sports competitions and much more. The biggest sporting event of 2021 was the Running Race of Nuclear Towns and Cities; its participants included over 9,000 employees and members of their families, as well as residents of 50 of ROSATOM’s host towns and cities in six countries.

ROSATOM traditionally supports employee initiatives, which enables us to provide employees with opportunities for fulfilling their potential. To do so, we establish dedicated Change Support Teams in nuclear organisations, which promote the development of competences of workers and engineers. Today, there are over 100 such teams comprising around 2,500 employees. 92 projects are being implemented in the industry, 43 of which were launched in 2021.

As a result of our efforts, in 2021, we were able to maintain the employee engagement rate at 84%. This shows that, regardless of the circumstances, we are able to promptly address employee needs, offer them the assistance they require, provide safe and comfortable working conditions and continue to develop ROSATOM.

The Corporation was once again among the leaders of the 2021 Russia’s Best Employers Ranking compiled by the HeadHunter recruitment platform. ROSATOM ranked first among industrial companies in three categories: Energy, Mining and Processing, Manufacturing, Commercial and Industrial Companies. The number of job seekers who voted for ROSATOM doubled year on year.

Our successes are a result of systematic efforts of a big, close-knit team in which every member makes their own personal contribution. I am sure that we will continue to go from strength to strength together.
**KEY RESULTS IN 2021**

— The average monthly salary totalled RUB 96,200 (up by 6.9% compared to 2020).
— The personnel turnover rate stood at 10%.
— The employee engagement rate stood at 84%, on a par with the best employers in Russia.
— 91.02% of members of the executive succession pool were appointed to new managerial positions.
— Over 380 employees of ROSATOM and its organisations received government awards, certificates of appreciation and acknowledgements from the President of the Russian Federation.
— Over 9,900 employees and veterans received industry awards.

**Awards**

— ROSATOM once again was declared the best Russian employer according to HeadHunter and topped two subrankings: the Corporation became an absolute leader among the largest employers with 5,000+ employees based on the assessment of efficiency of HR processes and employee loyalty and was named job seekers’ top choice among industrial companies in the following sectors: Energy, Mining and Processing; Manufacturing, Commercial and Industrial Companies.
— ROSATOM topped the annual ranking compiled by FutureDay, a company specialising in the recruitment of young professionals (in the Best According to Their Target Audience category), and ranked first among engineering companies in the Best Company Award ranking compiled by Changellenge.
— ROSATOM’s team won the WorldSkills Hi-Tech 2020 National Competition of Cross-Industry Skilled Professions for Workers in High-Technology Industries held in accordance with the WorldSkills methodology for the seventh time.
— ROSATOM won in the Leader of Change category of the contest focused on the development of women’s leadership programmes as part of the Third Eurasian Women’s Forum.
— ROSATOM’s Corporate Academy won the Gold Award in the Business Impact & Agility in Uncertainty category of the GlobalCCU Awards.
— ROSATOM’s Technical Academy won the Bronze Award in the Branding & Durability category of the GlobalCCU Awards.
— A project titled ‘ROSATOM for ROSATOM’ won a prize in the Skills and Knowledge Management category of the WNE Awards 2021.
— A project titled ‘Freediving in Digital Culture: Developing New Leaders’ was shortlisted for the CIPD People Management Awards in the Best Talent Management Initiative category.
— A project of ROSATOM’s Technical Academy aimed at preserving critical knowledge in the Engineering and Power Engineering Divisions won the Transformation Award from the KM Alliance Russian Professional Association of Knowledge Management Specialists and Experts.

**KEY EVENTS IN 2021**

— The MSU Sarov branch of Lomonosov Moscow State University was established; it will become a key component of the National Centre for Physics and Mathematics founded by ROSATOM, the Russian Academy of Sciences, the Russian Ministry of Science and Higher Education, Lomonosov Moscow State University and the National Research Centre Kurchatov Institute.
— The 6th AtomSkills 2021 Industry-Wide Competition, the world’s largest corporate professional skills competition held in accordance with WorldSkills standards, was held; its participants included over 1,100 specialists and experts from 28 Russian regions.
— ROSATOM launched the first ‘Mission: Talent’ Nationwide Accelerator with support from the Aby Educational Foundation and the Big Break Federal Project.
— The first Council of Nuclear Industry Juniors was established under the personal supervision of ROSATOM’s Director General Alexey Likhachev.
— ROSATOM’s team won the highest number of gold medals in the WorldSkills Hi-Tech 2021 competition by a wide margin.
— Over 5,500 people underwent training in volunteering as part of a project to involve the residents of Usolye-Sibirskoye in the social life of the town in 2021.
— A project of ROSATOM’s Technical Academy aimed at preserving critical knowledge in the Engineering and Power Engineering Divisions won the Transformation Award from the KM Alliance Russian Professional Association of Knowledge Management Specialists and Experts.

**3.1. RESPONSE TO THE PANDEMIC**

ROSATOM is exposed to significant risks and bears great responsibility; accordingly, the Corporation attaches great importance to safety matters, including occupational safety and health.

Early 2020 saw an outbreak of a novel coronavirus disease (COVID-19) around the world. In March 2020, the World Health Organisation declared the COVID-19 outbreak a pandemic; accordingly, the Government of the Russian Federation imposed restrictions in the country. ROSATOM took all necessary measures to prevent the spread of the novel coronavirus in a timely manner.
Management approach

In March 2020, ROSATOM and its organisations created two new governing bodies: crisis centres for preventing the spread of COVID-19 and an industry-wide analytical centre.

The crisis centres operate at all management levels; they promptly respond to risks posed by the spread of COVID-19, ensure safety in the course of operations, coordinate all preventive actions, monitor the epidemiological situation and make the relevant decisions if it deteriorates. To perform those functions, the crisis centres actively cooperate with municipal and regional governments, the Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing (Rospotrebnadzor) and the Russian Federal Biomedical Agency (FMBA).

The industry-wide analytical centre was created to assess risks and analyse the impact of the pandemic on the industry.

Safety at work

In 2021, ROSATOM continued to provide a safe working environment for employees in the industry.

To ensure operational continuity in the industry, the Corporation continues to provide backups for all key jobs and arrange backup shifts for operating personnel.

At the height of the pandemic, amid a high risk of a rise in COVID-19 cases, critical employees operating nuclear facilities were isolated at the Corporation’s health resort and rehabilitation centres.

Remote work

In 2021, ROSATOM continued to develop the practice of remote work in the industry. At the end of December 2021, 10.8% of employees in the civilian sector of the industry and 50.7% of employees of holding companies, headquarters and offices worked remotely. The number of business trips both in Russia and abroad was minimised; at the height of the pandemic, the share of employees sent on business trips did not exceed 1%.

Up to 90% of work meetings and conferences held online, and procedures were designed for notifying the attendees of face-to-face meetings if any of them were diagnosed with COVID-19.

Sanitary and hygienic procedures

The Corporation has established special sanitary and hygienic procedures for employees, including contactless thermometry, monitoring of the use of face masks and gloves, social distancing, the use of sanitisers, disinfection of office spaces, common areas, industrial facilities and vehicles, as well as separating the flows of people at the entrances and in production facilities.

Face-to-face work meetings, sporting, cultural and social events are held in full compliance with the above pandemic-related restrictions. Face-to-face events may be attended by employees who have been fully vaccinated against COVID-19 within the last six months.

Testing and vaccination of employees

In 2021, ROSATOM’s organisations actively continued COVID-19 PCR (polymerase chain reaction) testing and COVID-19 rapid antibody testing of employees.

Over 700,000 PCR tests and about 100,000 rapid antibody tests were performed, which enabled early diagnosis and timely identification and quarantine of contacts in order to prevent the spread of COVID-19.

A large-scale industry-wide vaccination campaign began in January 2021. As at 31 December 2021, over 260,000 employees (87%) were vaccinated.

Additional social benefits were provided to employees who received timely vaccination: an additional day of paid leave, additional sick pay if an employee fell ill within six months after vaccination, inclusion of sick leave days in the calculation of bonuses for the achievement of key performance targets, prioritised health resort treatment, subsidised vacation vouchers, and reimbursement for the cost of antibody testing.

To maintain a high level of herd immunity, large-scale booster vaccination against COVID-19 began in ROSATOM’s organisations in June 2021. As at 31 December 2021, the share of vaccinated employees, including those who received booster shots, reached 82%.

Communications

ROSATOM continues to conduct an intensive communications campaign to inform employees about the situation around the novel coronavirus disease in the world, the country, the industry and in ROSATOM’s organisations. During severe crises caused by the pandemic, ROSATOM’s Director General, executives of the Divisions and organisations posted weekly video messages to employees.
ROSATOM is conducting a large-scale awareness campaign to inform industry employees and the residents of nuclear towns and cities about the importance of COVID-19 vaccination as the primary measure to prevent severe illness. A weekly Digest on Herd Immunity is published with a focus on matters related to vaccination in the industry; meetings are held with experts from the FMBA of Russia, the Gamaleya National Research Centre for Epidemiology and Microbiology and Sechenov University, who answer employees’ questions. The COVID-19 telephone hotline and the mental health support hotline are still in operation.

In addition, regular webinars are held for employees; they cover topics such as preventing coronavirus and other seasonal diseases, remote work, self-discipline, stress management and professional burnout.

Information is posted on social media and the Rosatom LIFE platform, in the RECORD Mobile app, on the websites of ROSATOM’s organisations and in corporate media outlets.

Volunteering

In 2021, as part of response to the pandemic, ROSATOM’s employees joined the #WeAreTogether national campaign, with over 1,000 volunteers from the Corporation participating in the campaign across Russia. The support came in a variety of forms. In addition to humanitarian aid, this included the manufacture of masks made from natural materials, repairs to buildings and structures on garden allotments held by retirees, and the purchase of oxygen therapy equipment. Many volunteers were directly involved in fighting the pandemic by assisting doctors in hospitals.

Volunteers provided assistance in more than 40 towns and cities across Russia and processed a total of more than 11,000 requests. In addition, more than 19,500 families received food aid.

Despite the pandemic, the Corporation’s volunteers maintained the tradition of celebrating Victory Day and providing assistance to veterans of the Great Patriotic War, home front workers, former concentration camp prisoners and survivors of the Siege of Leningrad. 500 volunteers from the Corporation presented gift baskets to almost 3,500 war veterans. At the same time, special emphasis was placed on strict adherence to all safety protocols and social distancing rules.

In many of ROSATOM’s organisations, volunteer leaders regularly monitor the situation in a town or city and, if necessary, provide humanitarian aid to those in need and promote a culture of compliance with COVID safety protocols.

For details on assistance provided in nuclear towns and cities, see the section ‘Response to the Pandemic’ in the chapter ‘Report on the Development of Nuclear Towns and Cities’.

Plans for 2022 and for the medium term

In 2022, ROSATOM plans to continue to implement initiatives focused on:

— Providing a safe working environment and ensuring compliance with the appropriate pandemic response procedures depending on the current epidemiological situation;
— Vaccination and booster vaccination of employees in order to maintain the level of herd immunity of at least 80% of the actual number of employees on the payroll;
— Informing employees about the situation around the coronavirus disease and the need for timely booster vaccination in accordance with the current recommendations from the Ministry of Health of Russia.

3.2. HR POLICY

3.2.1. HR policy approaches and principles

ROSATOM implements a motivating HR policy that involves competitive salaries and an extensive benefits package (health insurance, corporate loan programmes, pension plans, health resort treatment and recreation, family programmes, etc.).

The HR policy is aimed at providing ROSATOM and its organisations with the required number of engaged employees having the required skills in a timely and cost-effective manner.

The principles of the HR policy are as follows:

— The areas and priorities of the HR policy must support the achievement of the Corporation’s strategic goals;
— Executives of the Corporation and its organisations and business units are responsible for employee performance;
— Social partnership aimed at aligning the interests of employees and employers;
— Prioritisation of a culture focused on results and continuous improvements in the Corporation and its organisations;
— Systematic training, development and promotion of employees of the Corporation and its organisations in the nuclear industry in accordance with strategic goals;
— Performance-based remuneration contributing to the achievement of strategic goals of the Corporation and its organisations;
— Employees of the Corporation and its organisations can express their opinions on the situation in the Corporation and its organisations, give and receive feedback on their performance to/from their executives, and obtain any information on the operations of the Corporation and its organisations, except for classified information.

**Code of Ethics**

ROSATOM has adopted a Code of Ethics and Professional Conduct for Employees. The Code of Ethics communicates corporate values and defines the relevant ethical principles of employee conduct when interacting with a wide range of external and internal stakeholders. The rules of conduct set out in the Code concern combating corruption, protecting resources, property and information, occupational health and safety, industrial and environmental safety, conflict prevention and resolving conflicts of interest, as well as maintaining the corporate image.

### 3.2.2. Key personnel characteristics

In 2021, ROSATOM and its organisations employed 288,500 people, including 24,700 people in foreign organisations, branches and representative offices.

#### Headcount by employee category

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Headcount, ‘000 people</th>
<th>% of the total headcount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executives</td>
<td>34.4</td>
<td>11.9%</td>
</tr>
<tr>
<td>Specialists</td>
<td>117.1</td>
<td>40.6%</td>
</tr>
<tr>
<td>White-collar workers</td>
<td>10.2</td>
<td>3.5%</td>
</tr>
<tr>
<td>Blue-collar workers</td>
<td>126.8</td>
<td>44.0%</td>
</tr>
</tbody>
</table>

#### Headcount by education level

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Headcount, ‘000 people</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees holding a university degree</td>
<td>163.9</td>
</tr>
<tr>
<td>Candidates and Doctors of Sciences</td>
<td>3.849</td>
</tr>
<tr>
<td>Average number of employees working under independent contractor agreements</td>
<td>0.277</td>
</tr>
</tbody>
</table>

The age of employees averaged 43.3 years (46.3 years for executives). 29.7% of employees were aged under 35.

#### Men and women accounted for 68% and 32% of the total headcount respectively.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Men, % of the total headcount</th>
<th>Women, % of the total headcount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executives</td>
<td>81.01%</td>
<td>18.99%</td>
</tr>
<tr>
<td>Specialists and white-collar workers</td>
<td>53.01%</td>
<td>46.99%</td>
</tr>
<tr>
<td>Blue-collar workers</td>
<td>78.44%</td>
<td>21.56%</td>
</tr>
</tbody>
</table>

#### New employees accounted for 18.07% of the total headcount.

#### Average headcount by business area, ‘000 people.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nuclear Weapons Division</td>
<td>91.28</td>
<td>90.03</td>
<td>87.80</td>
</tr>
<tr>
<td>Emergency preparedness units</td>
<td>2.54</td>
<td>2.59</td>
<td>2.68</td>
</tr>
<tr>
<td>Northern Sea Route Directorate</td>
<td>2.26</td>
<td>2.35</td>
<td>2.32</td>
</tr>
<tr>
<td>Mining Division</td>
<td>7.17</td>
<td>7.25</td>
<td>7.33</td>
</tr>
<tr>
<td>Fuel Division</td>
<td>22.11</td>
<td>21.95 (0.11)</td>
<td>21.96 (0.12)</td>
</tr>
<tr>
<td>Sales and Trading Division</td>
<td>1.95 (1.32)</td>
<td>1.92 (1.26)</td>
<td>1.86 (1.17)</td>
</tr>
<tr>
<td>Power Engineering Division</td>
<td>54.41 (0.47)</td>
<td>56.95 (0.78)</td>
<td>57.28 (1.01)</td>
</tr>
<tr>
<td>Mechanical Engineering Division</td>
<td>16.55 (1.72)</td>
<td>17.75 (1.85)</td>
<td>18.19 (1.78)</td>
</tr>
<tr>
<td>Advanced Materials and Technologies</td>
<td>0.86</td>
<td>0.90</td>
<td>1.17</td>
</tr>
<tr>
<td>Overseas Division</td>
<td>2.20 (0.58)</td>
<td>2.70 (1.09)</td>
<td>3.46 (1.45)</td>
</tr>
</tbody>
</table>
Division/complex/organisation | 2019 | 2020 | 2021
--- | --- | --- | ---
New businesses | 0.04 | 0.10 | 0.15
Process Control Systems and Electrical Engineering | 1.22 | 1.35 | 1.53
Engineering Division | 26.71 (8.0) | 31.66 (11.0) | 41.66 (19.18)
Environmental Solutions Division | 7.53 | 7.60 | 8.23
Innovation Management Unit | 8.94 | 9.10 | 9.16
JSC Rosatom Infrastructure Solutions | 3.10 | 3.03 | 3.51
Security units | 9.15 | 9.25 | 9.35
JSC Rosatom Healthcare | 1.47 | 1.45 | 1.46
Wind Power | 0.27 | 0.31 | 0.46
Administrative units | 8.60 | 7.80 | 8.95
Non-core assets | 0.02 | 0.02 | 0.01
ROSATOM, total | 266.40 (12.09) | 276.06 (16.09) | 288.5 (24.73)

ROSATOM’s organisational division names are listed in Table 1.

ROSATOM’s organisations operate in 56 Russian regions and employ a total of 275,100 people. ROSATOM’s organisations with the highest headcount are situated in the following regions:

- Moscow and the Moscow Region: over 56,000 people;
- Nizhny Novgorod Region: over 33,000 people;
- Rostov Region: over 29,000 people;
- Sverdlovsk Region: over 21,000 people;
- Saint Petersburg and the Leningrad Region: over 20,000 people.

ROSATOM’s organisations operate in 32 foreign countries, where they employ 24,700 people, with the highest headcount in the following countries:

- Bangladesh: 16,200 people;
- CIS countries (Belarus, Kazakhstan, etc.): 5,200 people;
- Turkey: 1,900 people.

3.2.3. Personnel costs and remuneration system

In 2021, personnel costs totalled RUB 443.78 billion, up by 11.7% compared to 2020.

Costs per employee per year increased by 6.8% from RUB 1,434,000 in 2020 to RUB 1,532,000 in 2021.

Structure of personnel costs, %

| | 2019 | 2020 | 2021 |
--- | --- | --- | ---
Payroll | 74.9 | 75.4 | 75.4 |
Insurance contributions | 21.1 | 21.0 | 20.6 |
Social and other expenses (including training) | 4.0 | 3.6 | 4.0 |

Remuneration system

ROSATOM’s current remuneration system:

- Provides competitive remuneration matching the level of remuneration in the best companies in Russia;
- Is result-based: the size of an employee’s salary is linked to their efficiency, professionalism and achievement of key performance indicators (KPIs).

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

The Corporation develops KPIs in accordance with the Methodological Guidelines on KPI Development and Application, the KPIs are approved by the Supervisory Board and cascaded from ROSATOM’s top management down to line managers in organisations.

In accordance with the requirements of the Integrated Industry-Wide Remuneration System and the Uniform Industry-Wide Performance Management Policy, the size of the annual bonus paid to employees depends on achieving KPI targets and reflects progress in achieving the key performance targets of the Corporation and its organisations.
In 2021, the average monthly salary in ROSATOM increased by 6.9% compared to 2020 and totalled RUB 96,200 per month. This was possible largely due to the ongoing improvement of labour productivity and operational performance, and cost control.

3.2.4. Executive succession pool

In order to ensure succession and train employees to be appointed to managerial positions, an executive succession pool (ESP) is being formed and developed in ROSATOM.

ESP members are included in the succession pool through the career and succession planning process. The ESP is divided into four levels in order to select development programmes that are best suited to the target positions of ESP members. The ESP level is determined based on the target position:

- ROSATOM's Assets and ROSATOM's Assets. Basic Level (top and senior executives);
- ROSATOM's Capital (middle-level executives);
- ROSATOM's Talents (promising specialists and junior executives).

Since the establishment of the executive succession pool, the number of its members has exceeded 5,400.

Number of ESP members with a breakdown by gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Share</td>
<td>Number</td>
</tr>
<tr>
<td>Men</td>
<td>2,884</td>
<td>79%</td>
<td>3,918</td>
</tr>
<tr>
<td>Women</td>
<td>765</td>
<td>21%</td>
<td>1,093</td>
</tr>
</tbody>
</table>

Appointments of ESP members to a new position, %

<table>
<thead>
<tr>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of ESP members appointed to vacant top and senior executive positions (top 30 and top 1,000 executives in the industry)</td>
<td>67.50</td>
<td>68.17</td>
</tr>
<tr>
<td>Share of ESP members among senior, middle-level and junior executives appointed to a new (management) position</td>
<td>74.36</td>
<td>79.65</td>
</tr>
</tbody>
</table>

A special feature of succession pool development programmes is their practical focus. Executives not only complete training modules, but also work on their own projects contributing to the achievement of the Corporation's strategic goals.

Training as part of ESP development programmes

<table>
<thead>
<tr>
<th>ESP level</th>
<th>Development programme</th>
<th>Key training topics</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior executives</td>
<td>ROSATOM's Assets</td>
<td>Shaping the Future, Virtuosos of Management, Communication in Times of Change, Marketing, Finance</td>
<td>324</td>
<td>368</td>
<td>391</td>
</tr>
<tr>
<td>Basic Level</td>
<td>ROSATOM's Capital</td>
<td>Strategy, Leadership and People Management, Change Management and Horizontal Interaction, Marketing, Finance</td>
<td>250</td>
<td>368</td>
<td>427</td>
</tr>
<tr>
<td>Middle-level executives</td>
<td>ROSATOM's Talents</td>
<td>Leadership and Project Management, Advanced Leadership Skills, Data Management, Situational Leadership</td>
<td>1,956</td>
<td>2,215</td>
<td>2,376</td>
</tr>
<tr>
<td>Junior executives</td>
<td>Total</td>
<td>4,330</td>
<td>5,011</td>
<td>5,465</td>
<td></td>
</tr>
</tbody>
</table>

GRI 103-2

Since 2018, the calculation of the indicator has changed: the promotion of succession pool members was assessed based on the number of ESP members appointed to new positions over the last three reporting years. In 2019 and 2020, the assessment focused on the share of promoted ESP members who had been included in the ESP in 2017 and 2018 respectively.
3.2.5. Successor assessment

In order to facilitate rapid competence development, which is one of the priorities of the Corporation’s HR policy, an innovative approach to assessing high-potential employees has been introduced in the Russian nuclear industry. As part of this approach, executives are involved in talent pool assessment and have a greater personal responsibility for developing succession plans and reducing the duration and cost of assessments. The methodology is based on the best practices adopted in major international companies and was piloted in 2018.

The methodology for assessing succession candidates involves the possibility of cross-functional or cross-divisional cooperation through the participation of executives in the assessment of candidates for other managerial positions in order to share experience and ensure that decisions are made objectively.

Succession candidates are assessed in terms of their commitment to corporate values, the relevant professional and managerial experience and knowledge, motivation and potential.

In 2021, 1,535 candidates for executive positions in 15 Divisions (92 organisations) were evaluated by executives of the organisations and holding companies.

3.2.6. Career counselling

To achieve ROSATOM’s 2030 Vision of Being the Best in Unlocking Employees’ Potential, in 2020, the Corporation launched a new service for employees: individual career counselling. Its aim is to assist employees in identifying their strengths, deciding on their next career move and initiating a career development discussion with their manager.

There are 54 active HR specialists in nuclear organisations that work as career counsellors. A retraining programme for HR specialists has been developed and piloted; it offers a fast and effective way to increase the pool of career counsellors in the industry.

Counselling is available both offline and online. Young specialists, managers and ESP members make up 77% of the service’s clients. In addition, the service provides support to employees going through a career crisis and helps them to shape their future career strategies.

In 2021, 1,045 consultations were held in more than 70 organisations in the industry. Following career counselling, 82 employees were promoted.

In 2021, the service was highly rated by employees (75% would recommend the service to their colleagues, and 89% are satisfied with the advice they have received).

3.2.7. Employee training

The development of competences and employee training is one of the major priorities of ROSATOM’s HR policy.

Training for specialists and executives in the industry is provided primarily by ROSATOM’s Corporate Academy and Technical Academy. Currently, both Academies are full partners of the Corporation in the implementation of strategic objectives; they implement projects directly relevant to prioritised areas of business development.

Programmes run by ROSATOM’s Corporate Academy are focused on training the participants of global projects, developing the executive succession pool, training entrepreneurial leaders responsible for developing new products, digital leaders and RPS Leaders.

The current portfolio of ROSATOM’s Corporate Academy comprises more than 500 training programmes. These include online and video courses, face-to-face and mixed programmes.

One of its primary goals is to create an ecosystem for human development to meet today’s challenges. During the year, ROSATOM held more than 4,000 training events. A total of more than 1.2 million people participated in training and development activities.

RPS Leaders, globalisation participants, ESP members, developers of new products, digital leaders and participants of functional competence development schools completed training in full. Projects were implemented to promote the employer brand among schoolchildren and students, recruit talented graduates, develop the corporate culture and safety culture, as well as the competences of workers and engineers in accordance with WorldSkills standards, etc.

ROSATOM’s Technical Academy specialises in continuing professional education and retraining of executives and specialists in the nuclear power industry in Russia and abroad. With its 55-year track record as a professional development institute in the nuclear industry, ROSATOM’s Technical Academy is an international knowledge-sharing platform and a centre for nuclear education that provides comprehensive training meeting the highest educational standards both for personnel in the Russian nuclear industry and foreign specialists who operate Russian-design NPPs.
The portfolio of ROSATOM’s Technical Academy includes more than 300 continuing professional education programmes that fully cover the demand for personnel training in nuclear and radiation safety, industrial safety, information security, occupational safety and health, NPP operation, construction and design, and physical protection. Comprehensive and up-to-date personnel training programmes in these fields enable the relevant categories of personnel to successfully pass qualification examinations and ensure efficient and safe operation of nuclear organisations.

Educational programmes on programming and IT systems that do not rely on imported technology have been launched to support import substitution and digital transformation in the industry. In 2021, 23,019 persons completed professional development programmes at ROSATOM’s Technical Academy meeting high educational standards. This included 4,298 people who completed training courses involving coaches’ visits to an industrial site, with practical training tools fully tailored to the needs of specific organisations.

Overall, 73% of employees across the industry were covered by training programmes in 2021 (89% in the civilian sector).

The number of training hours per employee averaged 42.27 hours (66.58 hours in the civilian sector).

The calculation is based on the actual number of employees on the payroll; based on the average headcount, the figure totals 43.75 hours per employee.

### Percentage of employees in the nuclear industry (in the civilian sector) who underwent training in 2021

<table>
<thead>
<tr>
<th>Employee category</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executives</td>
<td>15.0%</td>
</tr>
<tr>
<td>Specialists and white-collar workers</td>
<td>50.4%</td>
</tr>
<tr>
<td>Blue-collar workers</td>
<td>34.6%</td>
</tr>
</tbody>
</table>

### Gender

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>66.8%</td>
</tr>
<tr>
<td>Women</td>
<td>33.2%</td>
</tr>
</tbody>
</table>

### Average annual training hours per employee in the nuclear industry by category, hours

<table>
<thead>
<tr>
<th>Employee category</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executives</td>
<td>45.9</td>
<td>51.5</td>
<td>72.0</td>
</tr>
<tr>
<td>Specialists and white-collar workers</td>
<td>23.8</td>
<td>24.4</td>
<td>35.6</td>
</tr>
<tr>
<td>Blue-collar workers</td>
<td>28.2</td>
<td>31.3</td>
<td>44.3</td>
</tr>
</tbody>
</table>

### Training hours in the nuclear industry by employee category, hours

<table>
<thead>
<tr>
<th>Employee category</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executives</td>
<td>2,476,572.84</td>
</tr>
<tr>
<td>Specialists and white-collar workers</td>
<td>4,528,786.84</td>
</tr>
<tr>
<td>Blue-collar workers</td>
<td>5,616,322.25</td>
</tr>
</tbody>
</table>

### Personnel training for overseas customers as a business

Since 2018, the Corporation has been implementing an investment project to develop ROSATOM’s Technical Academy. The goal of the project is to launch an integrated export product, Training and Continuing Professional Education for Personnel Operating Nuclear Infrastructure, Contractor Personnel and Operating Personnel of Russian-Design Nuclear Plants under Construction Abroad, in order to increase industry profits and fulfill ROSATOM’s international obligations.

As part of the work to accomplish this goal, 168 new-generation instructors were trained who are fluent in English, have knowledge of the best training practices and the qualifications required for the supervisory and operating personnel of NPPs in operation.

To give greater focus to practical training, the sites of ROSATOM’s Technical Academy in Saint Petersburg, Novovoronezh and Obninsk have been equipped with state-of-the-art analytical simulators of the NPP control room; the Novovoronezh site has also been equipped with a full-scale simulator. All this has enabled ROSATOM to develop a top-quality educational product that is unique in the world.

As part of cooperation with international customers under contracts for NPP construction abroad, by year-end 2021, ROSATOM’s Technical Academy provided training for 2,165 people.
Personnel training for the Belarusian NPP was completed in full (631 people); this is the first power plant for which ROSATOM has provided comprehensive personnel training. A total of 675 people completed training to operate Rooppur NPP in the People’s Republic of Bangladesh (60% of the NPP personnel requirements); 349 people underwent training to operate Akkuyu NPP (Turkey) (29% of the NPP personnel requirements).

Currently, ROSATOM’s Technical Academy is providing training for 226 specialists working at three nuclear power plants: Rooppur, Akkuyu and El Dabaa NPPs.

In 2021, the Technical Academy generated RUB 1.46 billion in revenue from this business outside the scope of the Corporation.

In addition, other educational and methodological services of ROSATOM’s Technical Academy are also in demand on the open market; these include the training of non-operational personnel under programmes included in the product portfolio. In 2021, revenue from these services totalled RUB 134.9 million.

**Distance learning**

Despite a challenging business environment during the COVID-19 pandemic, ROSATOM managed to extensively develop distance and online learning formats, which enabled the Corporation to create a fully-fledged digital training environment. In 2021, the Corporation continued to develop distance and online learning formats. The share of distance learning in the industry reached 39%. 97% of training programmes run by the Corporate Academy and 67% of training programmes run by the Technical Academy were delivered online. By converting some compulsory training and job-specific training programmes to distance and online learning formats, ROSATOM avoided the risk of missing the deadlines for obtaining licences and work permits and ensured the continuity of its production processes.

Training is accessible for employees on any device anywhere 24/7 through the RECORD Mobile training platform. The RECORD Mobile platform comprises a mobile app and a web app. In 2021, users of the platform completed 1,051,116 training courses totalling 1,310,374 man-hours (which is twice as much as in 2020). The catalogue of the app contains over 1,600 units of educational content. A total of 124,223 users have signed in on the platform. These include 35,764 people who are active users (those who have completed at least eight hours of training during the year and log in every three months). On average, users open the app 1,660 times a day. The user satisfaction rating stands at 4.1 out of 5 points.

In order to develop managerial competences, ROSATOM continued to work on the Executive E-School. This is an industry-wide programme aimed at providing high-quality training for executives and their successors. As part of the project, in 2021, more than 130 lessons were prepared and uploaded to the RECORD Mobile training platform; 16,300 employees took lessons at the School; 10,400 lessons were successfully completed.

**Educational projects**

Over 150 young scientists completed training at ROSATOM’s science schools and as part of the Science and Innovation Leaders talent pool development programme; they also underwent training as science speakers as part of the Science Communicators programme.

In 2021, ROSATOM was systematically developing training in corporate functions: the Procurement, Logistics and Quality School, the Legal School, the HR School, the Project Management School; Accounting, Financial and Economic Analysis; Quality Management and Compliance Assessment, Measurement Assurance, Information Security, Asset Protection, Protection of State Secrets, and Physical Protection.

A total of over 10,400 people completed training at the functional schools.

For details on the Procurement, Logistics and Quality School, see the section ‘Procurement Management’ of the chapter ‘Strategic Report’.

In 2021, the amount of training provided under programmes aimed at developing a culture of safe behaviour (measured as the number of participants multiplied by the number of completed courses) totalled about 100,000 person-courses; 12 new training units were developed; 37 new in-house coaches were trained under safety culture programmes. 9,876 specialists completed professional training programmes focused on the safety culture; the 10th International Safety Culture School was attended by more than 100 participants from a number of countries, including Slovakia, France, Finland, Japan, Austria, Hungary and Turkey.

The Nuclear Agile industry club was launched for project managers from 150 organisations across the industry, including those in digital businesses.

**Training in digitisation**

To achieve technological leadership, ROSATOM continued to take steps to improve digital literacy among its employees, with the amount of training exceeding 201,500 person-courses.

More than 1,200 executives completed training focused on developing competences relevant to digital transformation. Joint programmes were launched with Moscow School of Management SKOLKOVO and Peter the Great St. Petersburg Polytechnic University: Digital Transformation Management and Digital Production Management.

A programme to assist end users in transitioning to domestically developed software covered 4,000 employees.
A digital quiz was held for more than 5,000 employees and students of ROSATOM’s core universities in order to test critical knowledge in the industry.

Online events focused on ROSATOM’s digital technological development initiatives and projects were attended by more than 1 million people, with more than 30,000 people participating in-person events.

Information security is a top priority of ROSATOM’s digitisation programme. In 2021, 922 IT specialists of the Corporation’s organisations completed professional training in information security, network and system administration at ROSATOM’s Technical Academy. To maximise the amount of practical training, ROSATOM uses a virtual classroom designed in-house and based on software that does not rely on imported technology. An in-house cyber range is being developed.

Building a continuous development ecosystem

The Corporation also continued to build an ecosystem for continuous development of engineering competences at each stage of the talent pipeline: ROSATOM’s Juniors for schoolchildren aged between 10 and 17, New Talents for students aged between 17 and 25, ROSATOM’s Professionals for industry employees aged between 18 and 50, and Power of Generations for industry employees aged 50+.

In 2021, around 170,000 people participated in events aimed at developing the ecosystem, including ROSATOM’s employees from 130 organisations and 17 Divisions across the industry, schoolchildren and their parents, students, experts, representatives of municipal governments and universities from over 200 towns and cities and 70 regions of Russia.

In 2021, 2,000 students from the Corporation’s partner educational institutions took a mock exam focused on the Corporation’s core competencies; their scores were among the highest in Russia. Engineers of the Corporation and ROSATOM’s organisations completed professional training in information security, network and system administration as part of the RO

Training as part of the achievement of strategic goals

In 2021, 17 industry competence centres specialising in production and technology development held more than 500 online and face-to-face training events, which were attended by 16,316 participants.

To achieve the strategic goals of reducing production costs and the lead time, the Corporation continues to provide training on the ROSATOM Production System (RPS), which helps to preserve and accumulate knowledge about lean manufacturing. In 2021, the scope of RPS training programmes exceeded 76,800 person-courses.

To achieve the strategic goal of being the best in unlocking employees’ potential, ROSATOM’s Corporate Academy, jointly with the Ayb Educational Foundation and the Big Break Project, organised the first ‘Mission: Talent’ Nationwide Accelerator of Solutions for Developing Human Potential. More than 350 participants from 46 regions of Russia presented their ideas and technological solutions in this area. During the Accelerator project alone, its participants conducted research and developed pilot initiatives involving more than 5,500 schoolchildren, students, teachers and adults. 100% of the finalists plan to implement their projects in 2022, receiving assistance from the Corporation. Implementation of local road maps titled ‘Mission: Talent’ continued in 19 of ROSATOM’s host towns and cities. Teams of the Corporation’s organisations and over 70 partner organisations in these regions held events involving about 20,000 employees, schoolchildren, students, teachers and parents. To achieve the goal of being the best in unlocking employees’ potential by 2030, each region has identified break-through solutions.

To support the industry in the achievement of the strategic goal of increasing the international market share, ROSATOM implements programmes aimed at the development of employees involved in international industry-wide projects. For instance, in 2020 and 2021, 1,244 people participated in Global Professionals, a comprehensive programme for the development of leaders and globalisation participants. Of these, 169 employees who communicate directly with overseas customers undergo training in a mixed format, and 1,075 people receive training remotely. Competences in the sphere of design and construction facilities are also important for the achievement of this strategic goal: in 2021, 2,887 specialists from the Corporation’s Divisions involved in the design and construction of nuclear facilities participated in professional training programmes. Strong emphasis is placed on the study of national legislation of partner countries in the field of design and construction to ensure the highest quality of design documentation. To do so, the Corporation invites international experts and professors to participate in the programmes.

Employees of the Corporation have been offered new opportunities to improve their English language skills: in 2021, employees of the Corporation have been offered new opportunities to improve their English language skills: in 2021, 5,000 people completed training under Rosatom English programmes (3,400 employees signed up to the platform; about 2,000 people completed or continue their training as part of long-term programmes).

To achieve the strategic goal of developing new products for the Russian and international markets, the Corporation continued to implement the programme titled ‘ROSATOM’s New Products’. In 2021, 81 participants underwent training as part of the programme. Following the completion of training, they presented 17 projects for review.

The scope of distance learning programmes in 2021 exceeded 8,000 person-courses.

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Development of the youth community in the nuclear industry

In order to encourage constructive youth initiatives, find and support young leaders and promote professional growth and self-fulfilment of young people, in 2021, the Corporation conducted an industry-wide survey titled ‘The Path of Youth in the Nuclear Industry’ among more than 2,000 young employees and line managers. The Corporation also organised the Forum of Youth Community Leaders and the Youth Congress of ROSATOM.

In addition, at the end of December 2021, an educational programme titled “Youth Community Leadership School” was launched in the industry. The project is aimed at forming a team of youth community leaders in ROSATOM’s divisions and organisations in order to promote systematic development of an integrated youth community across ROSATOM and enable young people to play a more active role in the implementation of industry-wide, federal and international initiatives.

The Corporation’s youth delegation participated in major federal and international forums: the European Nuclear Young Generation Forum (27-30 September, Spain) and the Russian Energy Week International Forum (15 October, Moscow).

A significant aspect of the support and development of the Corporation’s youth community is the development of student construction teams (SCTs) in the nuclear industry. In 2021, 1,800 students from Belarus and RUSCINER were involved in 145 student construction teams at construction sites of the Corporation in Russia and abroad. For the first time ever, ROSATOM organised three National Student Construction Projects at construction sites of FSUE Mayak Production Association (Ozersk, Chelyabinsk Region), JSC Siberian Chemical Plant (Seversk, Tomsk Region) and JSC SSC RIAR (Dimitrovgrad, Ulyanovsk Region).

Projects aimed at improving the efficiency of horizontal interaction between employees

In 2021, 180 industry executives participated in the ProPartnership online training marathon. The ProPartnership online course was completed by more than 4,200 employees. These educational projects are aimed at improving the efficiency of horizontal interaction in order to speed up decision-making and implementation in the industry. A corporate series on challenges related to interaction in the team and horizontal interaction tools that help to respond to them was filmed. All episodes are based on real-life cases in the industry.

For more details, see the Self-Assessment Report of ROSATOM’s Corporate Academy for 2021.38

3.2.8. International cooperation in education

ROSATOM is actively promoting Russian engineering education abroad to popularise it and strengthen the Corporation’s positions on the global nuclear technology market. ROSATOM is creating educational infrastructure required for personnel training in partner countries and is developing national nuclear education systems using Russian educational technology.

Foreign students study nuclear disciplines at Russian universities. Foreign students attend National Research Nuclear University MEPhI (NRNU MEPhI), as well as ROSATOM’s core universities and partner universities: Tomsk Polytechnic University (TPU), Saint Petersburg Polytechnic University, University of Chemical Technology of Russia, Moscow Power Engineering Institute, Far East Federal University, Ural Federal University, Moscow Institute of Physics and Technology, Moscow State University of Civil Engineering, Bauman Moscow State Technical University, Alekseev Nizhny Novgorod State Technical University and National University of Science and Technology MISIS. In 2021, about 2,200 foreign students from 65 countries, including Armenia, Vietnam, Rwanda, Bolivia, Turkey, Bangladesh, Jordan, Egypt, Algeria, Nigeria, Kenya, Kazakhstan, Congo, Ethiopia, Hungary, Serbia, Bulgaria, South Africa, Ghana and other countries studied at Russian universities.

In 2021, NRNU MEPhI running more than 10 programmes, Tomsk Polytechnic University, Saint Petersburg State University and Lomonosov Moscow State University (MSU) continue to successfully implement joint educational programmes with foreign universities in ROSATOM’s partner countries: Egypt, Bolivia, Brazil, Ghana, Armenia, Kazakhstan, Rwanda, Germany, Japan, Bangladesh and Serbia.

In 2019, NRNU MEPhI opened its first overseas branch in the Republic of Uzbekistan. In 2021, the Tashkent Branch of NRNU MEPhI successfully conducted the third enrolment campaign. 100 people passed entrance exams and enrolled as first-year students, with more than three applicants competing for each place. In the 2021/2022 academic year, 262 people are studying at the Branch as part of four Bachelor’s degree programmes supported through government grants of the Republic of Uzbekistan.

Developing mutually beneficial cooperation aimed at providing ROSATOM’s partner countries with highly skilled specialists, as well as creating efficient national infrastructure for managing and regulating the programme for the peaceful use of nuclear energy are a priority for ROSATOM.

In order to help to provide employment for graduates of Russian universities which are members of the Association of Universities called ‘Consortium of Core Universities of ROSATOM’, a number of career events are held to establish contact between foreign employers and graduates. These include ROSATOM’s Career Day for international students, which is attended by representatives of foreign organisations: nuclear energy programme implementing organisations (NEPOs), regulators, national atomic energy commissions and nuclear infrastructure organisations.

**38** The report is available at https://rosatom-academy.ru/documents/10256/ROSNU_zdruzho_2021_z.csv/108c35f4-35e5-4f1c-a7e9-03b238e26b9e
ROSATOM’s Technical Academy is the world’s only organisation that has concluded cooperation agreements and practical arrangements with four IAEA Departments: the Department of Nuclear Energy, the Department of Nuclear Safety and Security, the Department of Nuclear Sciences and Applications, and the Department of Safeguards.

Despite the challenges posed by the pandemic, in 2021, ROSATOM organised and held 68 international events attended by 1,095 participants from 64 countries. More specifically, to support ‘soft’ global expansion of Russian nuclear technologies through the transfer of nuclear knowledge, in 2021, ROSATOM’s Technical Academy delivered nine “Train the Trainers” courses for faculty members of foreign universities, which were attended by a total of 252 people from 37 countries. In addition, two specialised applied science events were held on the initiative of the Technical Academy in collaboration with the European Nuclear Education Network (ENEN) and were attended by 43 people from 11 countries.

3.2.9. Employees’ participation in external and industry-wide professional competitions

Leaders of Russia

Employees of ROSATOM and its organisations actively participate in the Leaders of Russia national management competition. Last year saw a record number of participants reaching the super finals of the Leaders of Russia competition: for the first time in the project’s history, 16 representatives of ROSATOM, including three young women, will compete for the highest award. 1,083 executives of the Corporation participated in Season 4 of the competition.

WorldSkills and professional events

Employees in the nuclear industry achieved impressive results in professional events and competitions.

ROSATOM’s team topped the medal table of the WorldSkills Hi-Tech National Competition of Cross-Industry Skilled Professions for Workers in High-Technology Industries held in accordance with the WorldSkills methodology for the seventh time.

260 representatives from 11 Divisions of ROSATOM, as well as students and professors of NRNU MEPhI took part in the competition.

The team members won a total of 34 awards: 21 golds, nine silvers and four bronzes. This is the highest medal count in the history of the competition. In the age group competition, the Corporation’s team competed across 24 competences and won 16 golds, five silvers and three bronzes. The Corporation’s team also ranked first in the Lean Manufacturing competence, which was represented for the first time in the 8th WorldSkills Hi-Tech National Competition in 2021. The Optimisation and Productivity Competition was also held for the first time.

The AtomSkills Industry-Wide Competition is the world’s largest corporate professional skills competition held in accordance with WorldSkills standards. In the reporting year, it featured contestants and experts from 16 of ROSATOM’s Divisions, specialists from a number of major industrial companies, as well as experts and students from more than 20 universities and educational institutions. A total of more than 1,100 specialists and experts from more than 30 regions of Russia took part in the competition. By 2021, the number of competences represented in the AtomSkills competition reached 37. In September, the team of ROSATOM and NRNU MEPhI competed in 10 out of 35 competences represented in the Digital Skills 2021 competition and won nine awards.

ROSATOM’s participation in competitions held in accordance with the WorldSkills methodology and awards won in 2021

<table>
<thead>
<tr>
<th>Competitions</th>
<th>Competences represented</th>
<th>Total medal count</th>
<th>Gold</th>
<th>Silver</th>
<th>Bronze</th>
</tr>
</thead>
<tbody>
<tr>
<td>WorldSkills Hi-Tech 2021. Main age group</td>
<td>24</td>
<td>34</td>
<td>21</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>WorldSkills Hi-Tech Skills of the Wise 2021 (aged 50+)</td>
<td>24</td>
<td>24</td>
<td>16</td>
<td>5</td>
<td>3</td>
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<tr>
<td>Total</td>
<td>58</td>
<td>37</td>
<td>14</td>
<td>7</td>
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Activities of Change Support Teams (CSTs)

The Corporation has a tradition of supporting ‘bottom-up’ initiatives and thus enabling talented employees to fulfil their potential. CSTs comprise proactive employees who implement projects to drive changes. Participation in the CSTs not only enables them to put their ideas into practice, but also provides an informal channel for prompt and direct communication with industry executives. In turn, this provides employees with new career opportunities and becomes an effective tool for developing future leaders at the local level. Projects initiated by employees as part of this movement have produced impressive results at the industry level, with one of the projects reaching the finals of the Person of the Year industry-wide recognition programme and another reaching the finals of the WeAreTogether federal competition.
ROSATOM's Person of the Year

In 2021, ROSATOM held the largest award ceremony in the history of the industry-wide recognition programme, ROSATOM's Person of the Year. For the first time ever, the award ceremony was held for the finalists of two years: 2019 and 2020. During a two-day off-site event held in Sochi, awards were handed out to 800 finalists in 130 individual and team categories. The event was held in full compliance with all the relevant safety protocols and the requirements of the Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing (Rosпотребнадзор).

3.2.10. Employee engagement

It is crucial for ROSATOM’s management to understand employee needs and respond quickly to feedback received from employees, especially in times of crisis.

In 2021, in addition to an employee engagement survey, ROSATOM conducted two pulse surveys (in June and October) to assess employees’ emotional state. The pulse surveys involved collecting feedback from employees on the level of their satisfaction with existing social benefits.

In 2021, the employee engagement rate in the industry remained at 84%, on a par with the world’s best employers.

According to the findings of the pulse survey held in October, 80% of employees in the industry felt that they were able to successfully accomplish their work-related tasks in the current environment, and 76% stated that they had fully accommodated to the measures and restrictions necessitated by the pandemic.

Changes in employee engagement rate in ROSATOM and its organisations between 2015 and 2021

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<tbody>
<tr>
<td>Rate</td>
<td>78%</td>
<td>77%</td>
<td>85%</td>
<td>80%</td>
<td>82%</td>
<td>84%</td>
<td>84%</td>
</tr>
</tbody>
</table>

Industry-wide Communication Days and Director’s Days

Throughout the year, ROSATOM was actively developing a project titled ‘New Opportunities Offered by Communication Days’ to enable every employee in the industry to ask the management a question and get a reply, to learn directly from the management about the current situation and the development strategy in the organisation and the industry as a whole. Over two years, the reach of the Communication Day online broadcasts expanded from 16,000 to 70,000 employees in 135 nuclear organisations, and a practice of sending replies directly to the employees who have asked the questions was introduced (previously, replies had been published as part of the general Q&A catalogue). Following the 2nd Communication Day held in 2021, 87% of employees expressed a positive opinion of the event, and 79% of employees who had submitted questions confirmed that they had received a reply.

3.3. OCCUPATIONAL SAFETY AND HEALTH; HUMAN RIGHTS

3.3.1. Occupational health and safety

Occupational health and safety management system

One of the fundamental priorities for ROSATOM is to protect the life and health of employees in the industry. Internal regulations adopted in ROSATOM and its organisations (primarily the Uniform Industry-Wide Policy on Occupational Safety and Health) are aimed at preventing workplace accidents and occupational diseases, systematically monitoring working conditions and occupational safety performance, ensuring the safety and protecting the health not only of employees of ROSATOM and its organisations, but also of employees of contractors and subcontractors involved in the operation of nuclear facilities. The requirements of the occupational health and safety management system (OHSMS) are binding on all employees and all persons who are on the premises of the Corporation and its organisations, in their buildings and structures.

Since 1999, ROSATOM has been involved in the Vision Zero international campaign and seeks to achieve a zero injury rate in nuclear organisations.

ROSATOM and its organisations recognise their responsibility for the safety of production processes, occupational safety and health, given that the rapid development of the nuclear power industry makes it crucially important to guarantee compliance with fundamental principles whereby priority is given to protecting employees’ life and health and enhancing the protection of people and the environment against radiation exposure.

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76 Engagement is an emotional and intellectual state encouraging employees to do their job to the best of their abilities. Employee engagement surveys have been conducted in the Russian nuclear industry since 2011 under the international methodology with assistance from an independent expert organisation. The engagement rate is defined as the share of engaged employees as a percentage of the total number of respondents.
ROSATOM’s Inspector General is in charge of safety and control of the use of nuclear energy for civilian and defence purposes by the Corporation's organisations.

The key principles underlying occupational safety initiatives of ROSATOM and its organisations include the following:

1. Giving priority to employees’ lives and health over operational performance;
2. Continuously improving performance and enhancing employees’ safety competences;
3. Planning and implementing measures aimed at reducing injury and occupational disease rates;
4. Systematically providing employees with state-of-the-art personal protective equipment to protect them against occupational hazards;
5. Disclosing material information on occupational safety and health initiatives;
6. Setting uniform occupational safety and health requirements aligned with Russian laws and global expertise in ROSATOM and its organisations;
7. Seeking to ensure that all employees of ROSATOM and its organisations are aware that compliance with occupational safety requirements is an integral part of their work.

Managing occupational safety and health risks

As part of the occupational health and safety management system, the Uniform Industry-Wide Guidelines on Occupational Risk Management in ROSATOM’s Organisations were adopted in 2020 in order to improve the performance of ROSATOM’s organisations in the sphere of occupational risk management within the occupational health and safety management system.

Occupational risks in ROSATOM’s organisations are managed as follows:

1. Identifying hazards in the workplace;
2. Assessing occupational risk levels in the workplace;
3. Developing measures to reduce occupational risk levels.

The Corporation adheres to the Uniform Industry-Wide Policy on Occupational Safety and Health, which stipulates the goals, key principles and obligations of ROSATOM in the sphere of occupational safety and health. Its principles underpin the occupational health and safety management systems used by ROSATOM’s organisations.

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*Safety means nuclear, radiation, industrial and fire safety, the safety of hydraulic structures, occupational safety and health, and environmental protection.*
The results of hazard identification are formalised in the organisation’s Safety Hazard Register. The occupational risk level is assessed by ROSATOM’s organisations for each identified hazard in the following order:

1. Assessing the level of occupational risk;
2. Assessing the acceptability of the occupational risk level (acceptable, tolerable, unacceptable).

An occupational risk assessment card is generated for each workplace.

Based on the occupational risk assessment results, the organisation develops an action plan to improve the effectiveness of existing and implement additional occupational risk management measures. The occupational risk management commission annually reviews the findings of the monitoring of occupational risk assessment and management activities in order to ensure that all measures at the planning and implementation stages have been implemented in full and on time. Based on the results of the annual review, a plan of corrective actions (measures) is formed, which is aimed at improving the effectiveness of occupational risk management.

ROSATOM has set up and operates a hotline to receive employees’ enquiries and reports concerning working conditions and occupational safety and health.

Accidents are investigated by commissions set up in ROSATOM’s organisations in accordance with the Labour Code and Decree No. 73 of the Government of the Russian Federation dated 24 October 2002. Depending on the severity of the accident, a government labour inspector, representatives of Rostekhnadzor (if the accident occurred at a hazardous production facility), executive authorities, insurance companies and the Social Insurance Fund take part in the work of the commission. Following the investigation, the commission draws up a form N-1 report (if the accident is related to production operations and is required to be registered and recorded in the organisation) or a free-form report (if the accident is not related to production operations and is not required to be registered or recorded in the organisation); based on the findings of the investigation, the organisation issues an order stipulating measures to prevent similar accidents.

The Fourth Industry-Wide Dialogue Forum titled ‘Nuclear Power and Industry Safety Day’ was held in October 2021. Following this event, resolutions were adopted to improve the occupational safety system based on the principles of injury prevention and a risk-based approach, including a Road Map for the Implementation of Safety Improvement Initiatives in the Nuclear Industry.

A new project was launched to develop a digital tool, an Integrated Industry-Wide Occupational Safety System, which is designed to automate and digitise occupational health and safety and occupational risk assessment processes.

**ROSATOM’s safety culture**

In terms of a safety culture, ROSATOM and its organisations focus on shaping and developing those characteristics of their operations and individual employee behaviour that help to maintain an acceptable safety level, protect people and the environment against the negative impacts of their operations and ensure that employees of the Corporation and its organisations are committed to safety as the main goal and are guided by fundamental safety principles.

In January 2020, ROSATOM adopted a Safety Culture Policy Statement of ROSATOM and Its Organisations. According to the Statement, ROSATOM views the safety culture as an integral part of the operations of its organisations and as safety-conscious behaviour of its employees.

The Policy is underpinned by the following key principles:

- Safety as a priority: decisions aimed at achieving economic and operational goals must always incorporate commitment to following safety rules;
- Leadership: executives at all levels should lead by example by demonstrating compliance with safety rules and commitment to safety; they should create an atmosphere of openness and trust in their team;
- High safety standards: ensuring full compliance of operations with legal and regulatory safety requirements;
- Personal accountability: both executives and employees are responsible, collectively and individually, for ensuring safety;
- Continuous improvement: continuously seeking ways to improve the management and leadership system to ensure safety; studying the known incidents and lessons learned; adopting Russian and foreign best practices; preventing violations by addressing their root causes;
- Openness and transparency: providing employees of the organisations, the public and the media with information on safety matters; cooperating on safety matters with federal executive agencies and executive bodies of constituent entities of the Russian Federation, Russian and international organisations specialising in the peaceful use of nuclear energy.
To create a system encouraging each employee to consciously behave in a safe way, and to prevent fatalities and serious injuries in nuclear organisations, ROSATOM has established the industry-wide Council for a Culture of Safe Behaviour\(^a\) (hereinafter referred to as the Council) chaired by the Director General of the Corporation and has launched a project titled ‘Development of a Culture of Safe Behaviour at ROSATOM’. The Council is made up of industry executives, representatives of the Russian Trade Union of Nuclear Power and Industry Workers and directors of the organisations included in the pilot safety culture development project. Nine organisations have joined the project, including representatives of the Nuclear Weapons, Mechanical Engineering and Fuel Divisions.

The objectives of the Council include approving a zero injury strategy aligned with the principles of the Vision Zero international campaign, reviewing the experience of Russian and foreign organisations in achieving a zero occupational injury rate and approving an action plan to ensure safe behaviour of employees at work, to encourage and disseminate best industry practices of developing a safety culture. The first meeting of the Council was held on 14 July 2021 and was attended by both Council members and invitees from nuclear organisations where the project is being implemented (chief engineers and their deputies; heads of occupational safety and health departments; heads of HR departments of the pilot organisations; employees involved in the project (project managers, coordinators, working group leaders, heads of pilot divisions, working group members); representatives of the Change Support Team and youth representatives; safety culture officers in the pilot organisations). The project involves actively using an employee engagement tool at all stages, from diagnostic assessment of maturity of the safety culture using interviews, focus groups, surveys and other techniques, to implementing road maps for selected areas in each organisation. Each organisation participating in the pilot project builds an employee training system focused on accident prevention and develops communications enabling a dialogue with employees and engaging them in a culture of safe behaviour.

On 14 July 2021, members of ROSATOM’s industry-wide steering board adopted a Safety Culture Declaration setting out the key principles of safe behaviour:

- ‘Be a leader’;
- ‘Speak up and take action’;
- ‘Assess the risks and act safely’;
- ‘Improve your qualifications’.

Starting from 2020, the Uniform Industry-Wide Guidelines on Occupational Risk Management in Nuclear Organisations are applied as part of the industry-wide occupational health and safety management system.

An Occupational Safety and Health Management System was introduced in the industry in 2009. It is an important element of mutual obligations taken on by ROSATOM, the Russian Union of Employers in the Nuclear Industry, Power and Science and the Russian Trade Union of Nuclear Power and Industry Workers. These obligations are set out in the Industry-Wide Agreement on Nuclear Power, Industry and Science for 2018–2020, which has been renewed for 2022. The Industry-Wide Agreement gives priority to the protection of employees’ lives and health (see the sections ‘Occupational Safety and Health’, ‘Employers, in cooperation with the trade union, and analyse employee morbidity, including the results of periodic medical examinations and sick leave. The findings of this analysis inform a comprehensive health improvement programme titled Health).

The Agreement also incorporates the opportunities provided by the new laws on special assessment of working conditions (SAWC) and establishes an additional mechanism for cooperating with the trade union in carrying out SAWC and analysing its findings. Leading organisations in the industry have undergone certification of compliance of their occupational safety and health management systems with the OHSAS 18001 international standard\(^a\).

The requirements of the occupational health and safety management system (OHSMS) are binding on suppliers and contractors operating at ROSATOM’s facilities. Contractors also undertake to comply with occupational safety and health legislation and to ensure compliance by their subcontractors. The Corporation does not impose any other occupational safety and health requirements on suppliers and contractors.

In 2019, the Russian nuclear industry joined the Vision Zero international campaign to achieve a zero occupational injury rate in its organisations. A Club of Safety Culture Leaders has been established in the nuclear industry to enable ROSATOM’s organisations to share experience and best practices in the field of industrial safety, employees’ safe behaviour and achieving the goals of the Vision Zero framework (the zero injury rate concept).

The Club’s mission is to combine our knowledge and global expertise and leverage them to help nuclear organisations in Russia create a strong safety culture, and to promote the principles of leadership and safe behaviour. Every year, ROSATOM’s Technical Academy hosts the International Safety Culture School. ROSATOM’s Corporate Academy is implementing a project to promote a culture of safe behaviour in nuclear organisations. The Corporation also holds annual Safety Days involving discussions of the status and development of its safety culture.

In 2021, ROSATOM’s Technical Academy provided training in occupational health and safety for 2,165 employees. 91% of training programmes were delivered at the sites of nuclear organisations, with practical tools fully tailored to practical needs at a specific site.

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\(^a\) See the sections ‘Occupational Safety and Health’ and ‘Social Policy’.

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Special focus is given to updating the programmes in a timely manner to align them with the requirements of applicable legislation and to maintaining a high proportion of practical training.

**Occupational safety and health performance**

One of the occupational safety objectives of ROSATOM’s organisations is to ensure occupational safety and provide safe working conditions for employees operating buildings, structures and equipment and working with radioactive materials, flammable and explosive substances.

Despite continuous preventive efforts focused on improving the workplace safety culture, in 2021, the total number of accidents in ROSATOM’s organisations increased by 28%; this included an increase in the number of serious injuries and fatalities.

There were a total of 15 fatalities, including 10 men and 5 women. The increase in the number of injured persons, including serious injuries and fatalities, was caused by two group road accidents. In one of the road accidents, 11 people were injured, with two people suffering serious injuries and eight people suffering fatal injuries. In the other road accident, all three victims suffered fatal injuries.

ROSATOM works continuously to ensure compliance with safety instructions issued by the Director General to prevent any injuries, regardless of their severity. In addition, based on statistics on injury rates, ROSATOM developed and started to implement the following:

- A plan of additional measures to ensure safety and prevent injuries in the course of construction, repairs, renovation and modernisation of nuclear facilities;
- An action plan to prevent injuries among employees in contractor organisations during construction and installation works at the sites of ROSATOM’s organisations.

**Injury rates**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of people injured in accidents</td>
<td>62</td>
<td>50</td>
<td>70</td>
</tr>
<tr>
<td>Number of fatalities</td>
<td>3</td>
<td>5</td>
<td>15</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injury frequency rate (FIR)</td>
<td>0.22</td>
<td>0.18</td>
<td>0.24</td>
</tr>
<tr>
<td>LTIFR*</td>
<td>0.10</td>
<td>0.09</td>
<td>0.08</td>
</tr>
<tr>
<td>Number of people newly diagnosed with an occupational disease</td>
<td>12</td>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>

GRI 403-9

Lost Time Injury Frequency Rate (LTIFR) = number of lost time injuries / man-hours worked × 1 million man-hours.

*The number includes people injured in accidents investigation into which was not completed in 2021.

GRI 403-9

Excluding man-hours in 49 organisations due to lack of data.

No data are available on man-hours worked or newly diagnosed occupational diseases in contractor organisations.
### Number of injured persons and injury factors

<table>
<thead>
<tr>
<th>Injury factor</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falling from a height</td>
<td>6</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Electric shock</td>
<td>0</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Falling on the premises (on the surface of the same level, with a difference in heights, etc.)</td>
<td>16</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Road accident</td>
<td>13</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>Impact of moving or scattering objects, structures or parts</td>
<td>9</td>
<td>9</td>
<td>4</td>
</tr>
<tr>
<td>Fall of an object on the victim</td>
<td>9</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Burns (thermal, etc.)</td>
<td>3</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Other (unclassified factors)</td>
<td>4</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Sports-related injury</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Animal bite</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Impact from physical contact/crushing</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>62</strong></td>
<td><strong>50</strong></td>
<td><strong>70</strong></td>
</tr>
</tbody>
</table>

A total of 70 people were injured in 2021, including 44 men and 26 women. This included 16 people who suffered serious injuries and 15 fatalities.

Causes of the accidents included:
- Non-compliance with road safety rules;
- Inadequate work organisation;
- Non-compliance with operational procedures;
- Design flaws and poor equipment reliability;
- Negligence on the part of the victims.

In 2019 and 2020, all fatalities were men.

Out of 15 fatalities in 2021, 10 were men and 5 were women.

### Changes in the number of injured persons

<table>
<thead>
<tr>
<th>Year</th>
<th>Total, including:</th>
<th>Serious injuries</th>
<th>Fatalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2019</td>
<td>62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2021</td>
<td>70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A total of six people were newly diagnosed with occupational diseases in 2021, including:
- Four people in JSC Atomredmetzoloto (PJSC PIMCU);
- Two people in JSC TVEL (JSC Siberian Chemical Plant).
The occupational disease risk remains high in PJSC PIMCU.

In 2021, the FR stood at 0.24 (as against 1.2 across Russia).

The main occupational hazards posing a high risk of occupational diseases include general and local impacts of vibration on the body and noise exposure affecting hearing.

The LTIFR targets are set individually for the Divisions, units and holding companies within the Corporation but do not exceed the baseline values.

<table>
<thead>
<tr>
<th>Division/complex/unit</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining Division</td>
<td>0.22</td>
<td>0</td>
<td>0.22</td>
</tr>
<tr>
<td>Fuel Division</td>
<td>0.02</td>
<td>0.02</td>
<td>0.05</td>
</tr>
<tr>
<td>Mechanical Engineering Division</td>
<td>0.14</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>Engineering Division</td>
<td>0.06</td>
<td>0.02</td>
<td>0.05</td>
</tr>
<tr>
<td>Power Engineering Division</td>
<td>0.04</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>Environmental Solutions</td>
<td>0.13</td>
<td>0.30</td>
<td>0.18</td>
</tr>
<tr>
<td>Nuclear Weapons Division</td>
<td>0.13</td>
<td>0.16</td>
<td>0.11</td>
</tr>
<tr>
<td>Innovation Management Unit</td>
<td>0</td>
<td>0.07</td>
<td>0.06</td>
</tr>
<tr>
<td>Total across ROSATOM</td>
<td>0.10</td>
<td>0.09</td>
<td>0.08</td>
</tr>
</tbody>
</table>

To reduce the injury rates in its organisations, the Corporation will implement measures focused on improving production processes, developing a safety culture and enhancing controls.

Occupational safety in contractor organisations

In recent years, there has been a downward trend in injury rates in contractor organisations. In 2021, the total number of injuries decreased, while the number of fatalities remained largely unchanged.

Average LTIFR values achieved in Divisions, units and holding companies within ROSATOM over the previous three years have been accepted as baseline (initial, to be improved) values for those Divisions, units and holding companies.

The LTIFR targets are set individually for the Divisions, units and holding companies within the Corporation but do not exceed the baseline values.

**LTIFR between 2019 and 2021**

<table>
<thead>
<tr>
<th>Division/complex/unit</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining Division</td>
<td>0.22</td>
<td>0</td>
<td>0.22</td>
</tr>
<tr>
<td>Fuel Division</td>
<td>0.02</td>
<td>0.02</td>
<td>0.05</td>
</tr>
<tr>
<td>Mechanical Engineering Division</td>
<td>0.14</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td>Engineering Division</td>
<td>0.06</td>
<td>0.02</td>
<td>0.05</td>
</tr>
<tr>
<td>Power Engineering Division</td>
<td>0.04</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>Environmental Solutions</td>
<td>0.13</td>
<td>0.30</td>
<td>0.18</td>
</tr>
<tr>
<td>Nuclear Weapons Division</td>
<td>0.13</td>
<td>0.16</td>
<td>0.11</td>
</tr>
<tr>
<td>Innovation Management Unit</td>
<td>0</td>
<td>0.07</td>
<td>0.06</td>
</tr>
<tr>
<td>Total across ROSATOM</td>
<td>0.10</td>
<td>0.09</td>
<td>0.08</td>
</tr>
</tbody>
</table>

To reduce the injury rates in its organisations, the Corporation will implement measures focused on improving production processes, developing a safety culture and enhancing controls.

**Occupational safety in contractor organisations**

In recent years, there has been a downward trend in injury rates in contractor organisations. In 2021, the total number of injuries decreased, while the number of fatalities remained largely unchanged.

The injury rate in contractor organisations is relatively low due to cooperation between the occupational safety functions of customer organisations and contractors, as well as stricter safety requirements for contractors performing work at the production sites in the industry.

**Average LTIFR values achieved in Divisions, units and holding companies within ROSATOM over the previous three years have been accepted as baseline (initial, to be improved) values for those Divisions, units and holding companies.**
Main causes of industrial injuries in contractor organisations in 2021

<table>
<thead>
<tr>
<th>Year</th>
<th>Inadequate work organisation</th>
<th>Violation of safety requirements and occupational safety instructions</th>
<th>Negligence on the part of the injured</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>6</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>2017</td>
<td>6</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>2018</td>
<td>6</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>2019</td>
<td>6</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>2020</td>
<td>6</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>2021</td>
<td>6</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

Injury factors, by number of injured persons

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Falling from a height</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Impact of moving parts</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Fall of an object on the victim</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Analysis of accident investigation records showed that the main causes of accidents included inadequate work organisation and violation of safety requirements and occupational safety instructions by the victims. This was due to shortcomings in the work of the management team during the preparatory phase of the work:

- Poor preparation of workplaces;
- Failure to comply with operational procedures;
- Shift assignments being issued without due regard to all safety requirements;
- Lack of executive supervision of work;
- Inadequate personnel training;
- Poor quality of designs and technical documentation (lack of a sufficient list of health and safety requirements).

3.3.2. Human rights

ROSATOM actively supports and complies with employment standards pursuant to the legislation of the Russian Federation, industry-wide and internal regulations, the Social Charter of the Russian Business and the Industry-Wide Agreement on Nuclear Power, Industry and Science.

The Industry-Wide Agreement on Nuclear Power, Industry and Science and ROSATOM’s internal regulations contain no provisions barring people from being employed in the industry on the grounds of gender, ethnicity, background, the level of personal wealth, marital or social status, position, age, place of residence, attitude towards religion, political opinions or membership of public associations.

The principles of ROSATOM’s Code of Ethics are aligned with regulations ratified by the Russian Federation, the Constitution of the Russian Federation and UN conventions, including those on human rights and anti-corruption. In 2020, the Corporation joined the United Nations Global Compact. ROSATOM is committed to complying with the Ten Principles of the United Nations Global Compact, including the principles pertaining to human rights.

Full name: Code of Ethics and Professional Conduct for Employees of ROSATOM.
The Corporation confirms its commitment to the principles of respect for human rights stipulated in the Universal Declaration of Human Rights and other UN documents, the Guiding Principles on Business and Human Rights, the OECD Guidelines for Multinational Enterprises and the Voluntary Principles on Security and Human Rights.

Commitment to ethical principles underlies ROSATOM’s corporate culture and covers all aspects, including:

— Respect for human rights (including labour rights, the rights of local communities and indigenous minorities, freedom of association and trade unions);
— Zero tolerance to and prevention of corruption and fraud;
— Commitment to fair competition rules;
— Legal compliance.

Rules of ethical conduct are applied to ROSATOM’s relations with business partners, suppliers and contractors through the following documents (including but not limited to):

— The Code of Ethics and Professional Conduct for Employees of ROSATOM;
— The Uniform Industry-Wide HR Policy;
— The Uniform Industry-Wide Guidelines on the Movement of Employees of ROSATOM and Its Organisations in Russia;
— The Uniform Industry-Wide Procedure for the Investigation of Reports on Corruption and Other Offences Received via the Hotline and Other Channels;
— The Uniform Industry-Wide Anti-Corruption Policy of ROSATOM and Its Organisations;
— The Industry-Wide Agreement on Nuclear Power, Industry and Science;
— Agreements with the trade union;
— ROSATOM’s Order on the Approval of the Uniform Industry-Wide Procedure for the Contract Activity Process, which establishes a procedure for the conclusion of all international contracts.

ROSATOM has established an Ethics Board, which is tasked with assessing compliance of actions taken by employees of the Corporation and its organisations with the Code of Ethics. Any employee in the industry may submit reports or enquiries to the Ethics Board. The Corporation’s Ethics Board is chaired by the First Deputy Director General for the Nuclear Power Industry, who is responsible for coordinating the Corporation’s activities across all aspects of compliance with ethical norms at the industry level. The Deputy Chair of the Ethics Board is the Deputy Director General for HR, who is in charge of coordinating the company’s human rights activities.

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.

Complaints and enquiries can be sent by mail or email to executives of the Corporation’s organisations, including the Director General. The complaints and enquiries are recorded on the day of receipt and are reviewed within the time frame prescribed by Russian laws; investigations are conducted if necessary. A system is being developed to monitor the handling of enquiries/complaints and replies to them.

Complaints/enquiries related to social and labour relations, including complaints/enquiries related to human rights, are reviewed jointly with a representative body acting on behalf of employees. At the highest level (that of the industry), complaints/enquiries are reviewed by the Industry-Wide Commission for Social and Labour Relations; at the Division level, they are handled by commissions for social and labour relations established in the Divisions; at the level of organisations, this function is performed by commissions for social and labour relations and collective bargaining agreements in the organisations.

In the reporting year, there were no reports of labour rights violations.

A human rights impact assessment involves a comprehensive review of complaints/enquiries to determine if they are valid (with documents and other sources supporting specific arguments attached to the reply) and assessing the accuracy of reported information by establishing the facts of the case. This also involves preserving the evidence of reported wrongdoings and protecting whistle-blowers and their personal data by implementing measures stipulated by Russian legislation.

Regular employee surveys enable ROSATOM to detect problems, including human rights violations, at an early stage and take the necessary steps to prevent them.

In 2021, new human rights training programmes were developed and delivered, including the following webinars, online training courses and learning tracks:

— The Role of Businesses in Respecting Human Rights (Corporate Human Rights Ranking);
— Gender Equality as Part of the Sustainable Development Agenda;
— Why Businesses and the Broader Society Need Gender Equality.

Adopted by the UN General Assembly on 10 October 1948.
The amount of training completed by employees of ROSATOM’s organisations under these courses in 2021 totalled 3,261.6 hours\(^89\). The amount of training under these programmes measured as the number of participants multiplied by the number of completed courses totalled 2,900 person-courses.

Key principles of the HR policy adopted in the industry include fairness, transparency and focus on results. Candidates are hired through a competitive process that includes interviews and tests. All employees complete special onboarding programmes. Employees are provided with opportunities for professional development and career advancement, participation in training and professional development programmes and training courses aimed at developing corporate competences throughout their employment.

The Corporation’s top priorities in the sphere of employment rights and human rights are to provide a workplace environment that poses no risks to employees’ lives or health, to promote a culture of safe behaviour, a risk-oriented approach and a responsible attitude to occupational health and safety, and to prevent all forms of abuse and violation of human dignity.

ROSATOM and its organisations support freedom of association, recognise employees’ inalienable right to collective bargaining and the right of each employee to collective representation of their interests, and respect employees’ right to membership in organisations aimed at safeguarding and promoting their interests.

ROSATOM and its organisations have adopted a responsible approach to respecting the rights and promoting the well-being of local communities in their regions of operation, cooperate with government bodies and treat local residents in their regions of operation with respect.

In 2022, ROSATOM plans to develop a Uniform Industry-Wide Policy on Human Rights, improve the performance of the Ethics Board and develop it as a tool for communication and cooperation, launch large-scale human rights training programmes for employees, and ensure that enquiries and complaints are handled more efficiently by monitoring the procedures adopted in the Corporation for recording complaints and enquiries and replies to them, using feedback mechanisms, preventing discrimination and reviewing the outcomes of the handling of complaints and enquiries on a quarterly basis.

For more details on collective bargaining agreements, see the section ‘Social Partnership in the Nuclear Industry’.

3.4. SOCIAL POLICY

3.4.1. Social policy approaches and principles

ROSATOM’s social policy is designed to:

- Make the Corporation more attractive as an employer;
- Engage and integrate young professionals and highly skilled specialists;
- Improve employee loyalty;
- Improve the efficiency of social expenditure.

3.4.2. Social programmes

Benefits provided to employees and retirees are aligned with the Uniform Industry-Wide Social Policy, which is based on standardised corporate social programmes.

The structure of corporate social programmes and the relevant expenses are determined on the basis of ROSATOM’s priorities in personnel management:

- Importance of maintaining health and a long working life;
- Protecting the health of people working in conditions that deviate from the standard conditions (which is why the bulk of funding is allocated for additional personal insurance and health resort treatment for employees);
- Paying attention to retired employees who had worked in the industry for a long time;
- A policy focused on promoting the development of mass sports, providing additional pensions, and supporting families with children, young professionals and people in need.

Compensation and benefits under corporate social programmes implemented by the Corporation are provided to full-time employees.

In 2021, expenditure on programmes aimed at maintaining employees’ health and promoting a healthy lifestyle accounted for 53% of total expenditure on social programmes.
As part of the Uniform Industry-Wide Social Policy, ROSATOM implements corporate social programmes focused on voluntary health insurance, voluntary insurance against accidents and illness, and health resort treatment for employees. Their main goal is to maintain and protect employees’ occupational health, including rehabilitation and health improvement after occupational diseases and accidents.

In 2021, about 80% of employees in the industry (230,000 people) had quick access to medical care covered by voluntary health insurance. More than half of employees in the industry (151,000 people) had insurance against accidents, i.e. were entitled to additional payments upon the occurrence of insurable events, which include not only workplace accidents but also non-occupational diseases.

In 2021, 66% of employees who needed health resort treatment based on the findings of a regular health check-up were given vouchers for health resort and rehabilitation treatment.

In August 2021, ROSATOM announced the results of its new sports project, ROSATOM’s Healthy Lifestyle Ambassador: 181 healthy lifestyle ambassadors from 43 towns and cities in three countries (Russia, Turkey and Kazakhstan) encouraged 3,839 employees in the industry to do sports on a regular basis; these employees did 530,293 hours of physical exercise and walked a total of 1.7 billion steps. In 2022, ROSATOM plans to develop this sports project under a new name, ‘ROSATOM’s Healthy Lifestyle Ambassador: Race of the Divisions’.

As the epidemiological situation remained challenging, in the reporting year, many events were held online. These included online workouts and warm-up exercises, two online chess championships, online checkers competitions, and an online ski race, whose participants included almost 2,000 employees and members of their families from 94 nuclear organisations located in 38 towns and cities of Russia. They ran a total of almost 9,000 kilometres.

In February 2021, Usoleye-Sibinskoye hosted a major sports festival, ATOM FEST 2021, which was attended by over 4,000 local residents.

For the second year in a row, the Corporation won in the Ready for Labour and Defence National Festival held among employee teams.

The biggest sporting event of 2021 was the Running Race of Nuclear Towns and Cities; its participants included over 9,000 employees and members of their families from 50 towns and cities in six countries (Russia, Belarus, Turkey, Hungary, Bangladesh and Egypt). They ran a total of 45,000 kilometres. The project won in the Sports and Healthy Lifestyle Support category of the 2020/2021 Best Social Projects in Russia National Competition.

An industry-wide sporting event, the Summer Nuclear Games 2021, was held in a new format for the first time. The finals in six sports were held in four Russian towns and cities, with over 500 participants from 12 Divisions. Employees of Akkuyu NPP (Turkey) participated in the event for the first time. Over three days, broadcasts of the Nuclear Games garnered over 176,000 views.

The Rosatom Triathlon Club was the biggest team participating in the triathlon festival in Sochi, with 12 employees reaching the finish line in individual races and two teams competing in a 226-kilometre relay race.

In 2021, ROSATOM continued to implement measures forming part of its programme developed in 2019 to support soon-to-retire employees of the Corporation and its organisations. As part of the programme:

- 489 soon-to-retire employees underwent health screenings;
- 450 employees were given vouchers for health resort treatment;
- 160 employees switched over to flexible working hours;
- 5,739 employees underwent training and retraining.

In 2022, ROSATOM plans to implement measures forming part of its programme developed in 2019 to support soon-to-retire employees of the Corporation and its organisations.

In August 2021, ROSATOM announced the results of its new sports project, ROSATOM’s Healthy Lifestyle Ambassador: 181 healthy lifestyle ambassadors from 43 towns and cities in three countries (Russia, Turkey and Kazakhstan) encouraged 3,839 employees in the industry to do sports on a regular basis; these employees did 530,293 hours of physical exercise and walked a total of 1.7 billion steps. In 2022, ROSATOM plans to develop this sports project under a new name, ‘ROSATOM’s Healthy Lifestyle Ambassador: Race of the Divisions’.

On 28 July 2021, a Cooperation Agreement was signed between the Ministry of Sports of the Russian Federation and the Autonomous Non-Profit Sports and Wellness Organisation Atom-Sport. This reflects the commitment of the nuclear industry to a healthy lifestyle and the development of mass corporate sports.
3.4.3. Support for industry veterans

Nuclear enterprises continue to pay great attention to veterans and retirees who worked in the industry for more than 20 years (over 112,000 people): in 2021, about 4,000 retirees were given vouchers for treatment at health resorts and wellness centres (worth a total of RUB 182 million); almost 73,000 retirees received financial assistance exceeding RUB 655 million, and about 19,000 retirees receive monthly supplements to state pensions (totalling RUB 194 million).

3.4.4. Social partnership in the nuclear industry

ROSATOM adheres to an Industry-Wide Agreement on Nuclear Power, Industry and Science for 2018–2020 (the Agreement), which has been renewed until the end of 2022. The Agreement is based on the established practice of social partnership in the nuclear industry and is aimed at implementing the Occupational Health and Safety Management System, the Integrated Standardised Remuneration System and the Uniform Industry-Wide Social Policy.

The Agreement has been drafted and is being implemented jointly with the Russian Trade Union of Nuclear Power and Industry Workers (RTUNPIW). 125,856 employees of ROSATOM’s organisations covered by the activities of the RTUNPIW, or 43.6% of the total headcount, are trade union members.

The Agreement gives priority to the protection of employees’ lives and health. Jointly with the trade union, employers maintain records of and analyse morbidity among employees, including based on records of periodic medical examinations and sick leave, and develop a comprehensive health improvement programme titled Health. The Agreement incorporates the opportunities provided by the legislation on special assessment of working conditions (SAWC). It also establishes an additional mechanism for cooperating with the trade union in carrying out SAWC and analysing its findings.

The Agreement underlies collective bargaining agreements concluded in nuclear organisations. The collective bargaining agreements support the implementation of the Agreement and regulate social and labour relations taking into account operational, technological and regional features of each organisation. The collective bargaining agreements cover 79% of employees in ROSATOM’s organisations.

For details on the implementation of the occupational safety and health policy, see also the section ‘Occupational Safety and Health; Human Rights’.

3.4.5. Cooperation with universities and recruitment of young professionals

Career events involving representatives of nuclear organisations are a traditional tool for promoting ROSATOM’s employer brand at core universities. In 2021, more than 100 organisations of ROSATOM took part in 27 job fairs at leading Russian universities, including in such cities as Saint Petersburg, Moscow, Tomsk, Nizhny Novgorod, Ekaterinburg, Ivanovo, etc. The total number of participants of these events exceeded 28,000 people.

In order to encourage promising young specialists to work in the industry and to generate interest in STEM disciplines and engineering professions among school and university students, ROSATOM actively participated in federal events and projects. The Corporation assisted in organising a student competition, Your Move; the Big Break Competition for Schoolchildren; events hosted by the Sirius Educational Centre and the Russian Znanie Society. The total number of participants of these projects exceeded 14.8 million people.

Specialised educational organisations training specialists for the nuclear industry form part of the Consortium of Core Universities of ROSATOM (18 universities specialising in disciplines relevant to the nuclear industry). National Research Nuclear University MEPhI (NRNU MEPhI) is the central university for the nuclear industry. Its alumni include six Nobel Prize winners.

In order to develop NRNU MEPhI as the key nuclear university, ROSATOM continued to implement a project titled ‘Development of the National Research Nuclear University between 2018 and 2022’, with funding provided annually by the Corporation’s organisations totalling RUB 720 million. The aim of the project is to make the training of high-skilled professionals in nuclear and related industries more efficient and strengthen the positions of the Corporation and NRNU MEPhI on the global nuclear technology market, including in countries where ROSATOM operates.

In 2021, the key focus areas of the project included developing the university’s infrastructure and facilities, career guidance, developing a talent pipeline for the civilian sector of the nuclear industry and the NWD, developing the university’s corporate culture, improving the employee training system to align it with the needs of a...
digital economy, promoting NRNU MEPhI's educational products abroad, creating an environment for efficient training, social and cultural adaptation of foreign students, creating an English-speaking environment at the university, etc.

As part of the project, in 2021, construction of the new NRNU MEPhI dormitory in Moscow and repairs to the dormitory of Snezhinsk Physics and Technology Institute of NRNU MEPhI in Snezhinsk were underway. ROSATOM also organised training and internship for foreign citizens from the Corporation's partner countries in various formats, received professional and public accreditation for educational programmes that are in demand in the nuclear industry, etc.

In 2021, a total of 1,574 students attended universities under arrangements with nuclear organisations. 6,732 university students undertook internships in nuclear organisations. Overall, more than 1,680 university graduates were hired, with more than 70% of them graduating from core universities (including branches of NRNU MEPhI). ROSATOM attracts the best students: in 2021, the grade point average of university graduates hired by the Corporation totalled 4.43 points. One in every three university graduates hired by ROSATOM had graduated with honours.

ROSATOM has prepared a forecast until 2030 for the industry's demand for specialists who have received university education or secondary vocational education. Organisations in the industry are expected to hire around 1,600 graduates of core universities per year on average, including around 750 graduates of NRNU MEPhI and its branches.

In 2021, one of the key results in the sphere of education for ensuring the national security of the Russian Federation was the opening of a branch of Lomonosov Moscow State University in Sarov (MSU Sarov). The initiative to establish MSU Sarov was focused simultaneously on two areas:

- The ‘quick start’: providing the necessary infrastructure, accomplishing legal and other tasks in order to start training the first 50 students as from 1 September 2021;
- Establishing a world-class university: construction of a state-of-the-art multifunctional campus, enabling the export of education focused on physics and mathematics.

Under the licence obtained in 2021 as part of the ‘quick start’, the physics and mathematics departments of MSU Sarov will provide training in the following disciplines: Physics (03.04.02), Applied Mathematics and Computer Science (01.04.02), Fundamental Computer Science and Information Technology (02.04.02).

As part of the ‘quick start’, classrooms with a total area of about 3,000 m² were repaired and equipped at MSU Sarov. Equipment required for the teaching and learning process was provided for nonlinear and adaptive optics laboratories and for the facility for conducting experiments as part of the practical course in physics.

Faculty members stay in a comfortable hotel, while students are provided with accommodation in 12 townhouses with an area of up to 120 sq. m, with each townhouse accommodating four to six people. High-speed Internet access has been provided across the campus of MSU Sarov.

In order to encourage competition for admission to MSU Sarov, steps were taken to attract applicants. Meetings were held with faculty members and students of leading universities in Moscow, Saint Petersburg, Kazan, Tomsk, Nizhny Novgorod and other cities. 123 students applied for admission to MSU Sarov, and following entrance examinations, 50 students were enrolled on five academic programmes in the following disciplines: Applied Mathematics and Computer Science (20 people), and Physics (30 people). The average score achieved by students in the entrance examinations matches the passing scores in the relevant departments of MSU in Moscow.

Classes at MSU Sarov are conducted by faculty members of MSU (Moscow) and by top experts from FSUE RFNC VNIIEF, mainly face to face. Students are allowed access to the industrial sites of FSUE RFNC VNIIEF for internship and communication with their research supervisors.

### 3.5. CORPORATE VOLUNTEERING

#### 3.5.1. ROSATOM’s approaches and principles of volunteering

In 2018, ROSATOM made an official decision to launch a corporate volunteering programme and develop an integrated system for planning and implementing volunteer initiatives.

The volunteering management system involves the development of projects simultaneously:

- Along the functional hierarchy: each Division and key nuclear organisations have a supervisor responsible for coordinating volunteer initiatives, while the overall strategy is developed by ROSATOM;
- As part of horizontal interaction between leaders of the volunteer movement at the local level and the sharing of experience between Divisions.
This system is based on the following principles:

- Alignment of projects with the needs of the region, taking into account the level of its social and economic development;
- Alignment with the Sustainable Development Goals prioritised by the organisation;
- Alignment with national development goals and regional practices;
- Alignment of initiatives with the mission and values of the organisation and expectations of key stakeholders;
- The focus of projects on providing long-term benefits to the region as a whole and improving the standard of living of a specific group of beneficiaries. These benefits must be clear and measurable.

The Corporation actively engages with the Russian volunteer community in order to study best practices, share its own expertise and communicate business needs to various governmental, non-governmental, commercial and non-profit organisations that directly or indirectly shape the development of corporate volunteering.

ROSATOM heads the Council for Sustainable Business Development, Corporate Social Responsibility and Volunteering of the Chamber of Commerce and Industry of the Russian Federation and is a member of the Coordination Council for ROSATOM heads the Council for Sustainable Business Development, Corporate Social Responsibility and Volunteering of the Chamber of Commerce and Industry of the Russian Federation and is a member of the Coordination Council for

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3.5.2. Prioritised areas of volunteer activity

As part of vertical management, a pool of industry-wide projects and standardised campaigns has been formed, and general guidelines have been prepared for all organisations in the nuclear industry.

In 2021, ROSATOM built a system to identify, support and develop employees’ volunteering practices; a comprehensive communications campaign was conducted in the industry media to promote the volunteering and corporate social responsibility (CSR) agenda; a training module was developed (it comprises over 100 hours of educational content focused on volunteering, the environmental culture and CSR); a two-day industry-wide online conference titled ‘Corporate Volunteering in the Nuclear Industry’ was held and was attended by 150 employees.

In order to develop CSR programmes, a specialised continuing professional education programme titled ‘Leaders of Social Change’ was developed in collaboration with Plekhanov Russian University of Economics. Over 100 employees in the industry have successfully completed the programme. In addition, the second Anatoly Alexandrov Corporate Social Responsibility and Volunteering Competition was held, with two new categories introduced in 2021: the Best CSR Programme and the Best Overseas Project. The competition became a winner of the national Investment Leaders Award.

The highlights of 2021 include projects to develop ‘green towns and cities’. They involved a range of activities, such as environmental clean-ups, plogging campaigns, the collection of municipal solid waste, environmental flash mobs, lectures for children and students, environmental festivals in ROSATOM’s host towns and cities, development and distribution of communication materials, landscaping, and making promotional products from recycled materials. Most activities also involved elements of gamification.

As part of volunteer initiatives, special focus is given to career guidance projects. Volunteers from among the Corporation’s employees engage not only with school and university students, but also with children from orphanages, disabled children and teenagers, as well as children from disadvantaged backgrounds. ROSATOM also piloted an initiative to conduct thematic educational activities for students from Bolivia, with more than 500 people participating in the project.

In addition, as part of probono initiatives, training is provided for non-profit organisations and small businesses to enable them to find new solutions and tools for development. This will certainly contribute to improving infrastructure and the standard of living in towns and cities.
Employees of nuclear organisations regularly participate in blood donation campaigns; this includes undergoing blood typing in order to join the bone marrow register. Blood donation campaigns are held regularly, with the number of donors increasing year by year.

In 2021, the Corporation produced more than 350 publications on volunteering and the environmental culture and posted them on a thematic page for employees in the industry; an awareness marathon focused on environmentally responsible behaviour was conducted for young people on the dobroinrussia public page. In addition, in 2021, ROSATOM partnered with the Association of Volunteer Centres to produce a course of lectures on environmental volunteering, which has been made publicly available.

As part of its cooperation with the business community, ROSATOM participated in more than 30 meetings of the Council for Sustainable Business Development, Corporate Social Responsibility and Volunteering under the Chamber of Commerce and Industry of the Russian Federation. ROSATOM actively engages with various non-governmental organisations to shape a common agenda on volunteering, CSR and sustainable development. The Council under the Russian Chamber of Commerce and Industry has developed a comprehensive programme to promote a social agenda at various levels. The development of a professional standard for CSR managers has been initiated.

In 2021, the Corporation's volunteering and CSR programme won major Russian awards: Champions of Good Deeds and the Crystal Pyramid. The Social Design Centre and the Grant Competition in Krasnokamensk won the Best Social Project in Russia Award. The Volunteering Development Centre in Snezhinsk was recognised as the best project at the Russian Energy Week; in addition, two projects implemented by ROSATOM's volunteers reached the final of the WeAreTogether International Award, with one of them (the Pulsation project to promote blood donations) winning the WeAreTogether Award.

3.5.3. Volunteer training

To improve the quality of corporate volunteering projects, the Corporation provides regular training for employees responsible for the development of this area. ROSATOM also holds thematic workshops for volunteers and leaders of the volunteer movement and conducts communication campaigns to stimulate employees’ interest in specific areas of corporate volunteering and environmental culture.

In 2021, ROSATOM launched the first-ever corporate volunteer university, which provided training in key competencies required by volunteers. 15 companies and more than 250 volunteers joined a three-month training course. In addition, four cross–corporate meetings were held jointly with other Russian and foreign companies to enable corporate volunteers to share their experience.

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3.5.4. Key projects implemented in ROSATOM

<table>
<thead>
<tr>
<th>Project objective</th>
<th>Project outcomes</th>
<th>Project team</th>
<th>Geographic coverage</th>
</tr>
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<tbody>
<tr>
<td>Addressing important social issues in the CATF of Snezhinsk and supporting professional development and self-fulfilment of volunteers and those who seek to help people, the town and the region on a voluntary basis</td>
<td>The Social Design Centre in Snezhinsk facilitates effective cooperation between non-profit organisations, volunteer associations and local government officials. In 2021, the Social Design Centre held 55 events involving a total of 360,000 local residents and project participants, with five partner enterprises involved in joint initiatives.</td>
<td>Volunteers from RFNC UNIITF</td>
<td>CATF of Snezhinsk and nearby towns and cities</td>
</tr>
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In addition, ROSATOM developed a series of educational events for local residents in its regions of operation and for young people with a focus on social leadership, entrepreneurship, volunteering and social entrepreneurship. The Corporation also produced communication materials to promote the environmental culture and responsible consumption.

Representatives of universities are involved in volunteer campaigns (for instance, more than 300 students of NRNU MEPhI take part in environmental field trips).

Grant competitions are held for non-profit organisations, educational institutions and volunteer communities. A grant competition was held in Usolye-Sibirskoye, with 57 applications submitted, and an educational programme was implemented.

Employees’ children are also involved in the environmental and volunteering agenda as part of family days (which are regularly attended by more than 200 children) and through special communication projects (the Clean Energy interactive game, which has been downloaded by more than 2,000 people; comic strips, posters and videos).

For details on volunteer campaigns run during the COVID-19 pandemic, see the section ‘Response to the Pandemic’. 
Pulmonary blood donation project. Encouraging employees in the nuclear industry and local residents in nuclear towns and cities to donate blood, its components and bone marrow.

Clean City project. Promoting the development of environmental culture among local residents of all ages, incorporating environmental topics into the educational system, developing convenient infrastructure and providing opportunities for local residents to participate in environmental projects, and encouraging employees and local residents to adopt environmental solutions and habits.

A comprehensive programme has been launched in the Corporation’s regions of operation with a focus on greening urban spaces and encouraging employees and local residents to adopt an environmentally friendly lifestyle. More specifically, this includes clean-up days, plogging campaigns, the collection of municipal solid waste (plastic, batteries, clothes, waste paper, etc.), environmental flash mobs, environmental lectures for adults, children and students, environmental festivals, development and distribution of communication materials on environmental conservation and responsible consumption, tree planting, making souvenirs and clothing items from recycled materials, etc. The majority of these activities involve game elements, whereby a participant scores points for performing a certain action producing a positive result; later the points can be traded for useful souvenirs. Several events were organised in cooperation with local residents and representatives of administrations and businesses in the host towns and cities. As part of the project, more than 3 tonnes of plastic packaging were collected and recycled; 10 tonnes of sorted waste were collected and recycled; 7.6 tonnes of waste paper were collected; over 1,000 kilograms of batteries were sent for recycling; the Environmental Taxi campaign was conducted for the first time; 11,300 tree saplings were planted; over 400 environmental awareness events were held for the residents of the regions; more than 100 clean-up days were conducted. Over 5,000 people were directly involved in the project; more than 500 news items were published as part of media coverage of the project. A cumulative points system was introduced to reward project participants for active participation in environmental activities in the city of Volgodonsk. The project’s target audience exceeded 400,000 people (residents of the host towns and cities).

As part of the project launched in partnership with the Medical Volunteers civil society group, in 2021, the Blood Centre of the FMBA of Russia collected more than 3,000 litres of blood and conducted awareness campaigns for employees in the nuclear industry, school and university students.

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As part of the project, catering arrangements in school canteens in the town were optimised; steps were taken to even out the workload of canteen personnel and produce a visual design of table-setting areas. Volunteers provided assistance to the Glazov registry office in separating the flows of people, halving the service wait time and developing tools to improve staff performance. In addition, the risk of a personal data leak during the service wait time has been eliminated. As a result of the project, the level of satisfaction with the quality of services provided to local residents increased from 60% to 90%.

Assistance in the automation of service provision by administrative agencies to local residents to improve the quality and speed up the provision of services.

In order to promote the development of the volunteer movement and generate new initiatives, it has been decided to hold the annual Anatoly Alexandrov Corporate Social Responsibility and Volunteering Competition.

The aim of the competition is to identify best practices, develop the system for managing social projects and volunteering, communicate the Sustainable Development Goals to employees, establish criteria for evaluating the effectiveness of social projects and proceed to form cross-divisional teams focused on specific thematic areas.

A total of 170 applications were submitted for the competition from all Divisions of ROSATOM and numerous organisations outside the scope of the Divisions. The total number of participants and their team members exceeded 750 people.

The winners were awarded prizes by Alexey Likhachev, ROSATOM’s Director General, at the award ceremony of the 2021 Person of the Year industry-wide recognition programme. He personally praised the most proactive employees who have been actively engaged in civic activities and have been making a major contribution to positive changes in society for years. Nine employees of nuclear organisations were awarded certificates for the implementation of important social projects.

The regulations on the competition were approved by Order No. 1-1/399-R of ROSATOM dated 8 July 2020.

3.5.5. Anatoly Alexandrov Corporate Social Responsibility and Volunteering Competition

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3.6. LONG-TERM PROJECTS IN THE SPHERE OF HR AND SOCIAL POLICY

Development of digital services for employees

ROSATOM continues to build a flexible digital infrastructure for employees in order to provide an environment for continuous development. It combines an integrated digital environment for professional development and personal growth, unlocking one’s potential and cooperation between teams with easy-to-use personal services providing support to employees throughout their professional career.

2021 saw the launch of a corporate social media platform, Rosatom LIFE. It is a new digital platform for communication and teamwork. Employees can create professional communities, find experts for their project teams, share knowledge, develop their network of colleagues and like-minded people, conduct surveys, learn news and share it with colleagues, manage both personal and team tasks and use the event calendar.

Rosatom LIFE is now available in more than 75 organisations. Since its launch, 23,000 employees have used the service, 255 communities have been created with 2,500 posts, and these figures are constantly growing. The user rating stands at 4.0 out of 5.

The Corporation completed the rollout of the Employee’s Personal Account, an online HR service for employees. Now employees can arrange vacations or business trips, request a certificate or a copy of their employment record book, see their income profile, etc. (the service comprises a total of 20 different functions) without any paperwork, in a single click, using an electronic signature. The service is available in 75 organisations; 80,000 employees have already used it. The user rating stands at 4.7 out of 5.

A new service, the Digital Assistant Mark, is a chatbot that is available in a mobile app. It enables employees to generate an online request and get a prompt response on popular services (remaining leave, a leave application or a business trip request, request a certificate or a copy of their employment record book, see their income profile, etc. (the service comprises a total of 20 different functions) without any paperwork, in a single click, using an electronic signature. The service is available in 75 organisations; 80,000 employees have already used it. The user rating stands at 4.7 out of 5.

As part of the Digital Recruitment project, the first integrated career portal of ROSATOM was developed (https://rosatom-career.ru), listing all vacancies in the Corporation available to external candidates and employees in the industry, as well as internships and youth programmes for students and graduates. A manager can use the Digital Recruitment service to submit an electronic recruitment request form and conduct a video interview with a potential candidate. Candidates fill out an online questionnaire on their personal account page and receive timely status updates concerning their interview. The service is available to 18,000 managers and 300 recruiters in 75 organisations. More than 2,000 vacancies have been posted on the career portal; the website is visited by about 1,200 candidates per day.

The scope of services provided by the industry-wide HR Service Centre is expanding year by year. As at 31 December 2021, the HR Service Centre provided services to 139 organisations in the industry with a total of 185,270 employees. In 2021, the HR Service Centre started to provide services to overseas branches of JSC ASE (1,589 people) and six overseas branches of organisations forming part of the Engineering Division in the People’s Republic of Bangladesh, with a total of 17,193 employees covered by the services.

The quality of services provided by the HR Service Centre reached 99.98%, while labour productivity grew by 3.8%. In 2021, the level of employee satisfaction with the HR function in the organisations serviced by the Centre stood at 84%.

In 2021, a pilot project of the HR Service Centre titled ‘Turnkey HR Department’ was completed in 20 organisations of the Fuel Division and covered 22,000 employees. The roll-out of the project was started in the Engineering Division.

In order to provide comprehensive services to employees, ROSATOM established Industry-Wide Competence Centres specialising in employment relations and the application of provisions of labour law on remuneration.

In 2021, the Centre once again won the 2021 Best Shared Services Centre in Russia and the CIS award in the Best Multifunctional Centre category.

Development and implementation of the employer brand promotion programme and an industry-wide career portal for university students and graduates

As part of the programme:

- A communication strategy targeted at digital professionals was developed to promote the employer brand;
- Over 400 HR and PR specialists in nuclear organisations received training in employer brand promotion;
- An online training course titled ‘ROSATOM’s Employer Brand’ was developed;
A project titled ‘ROSATOM’s Employer Brand Ambassadors’ was implemented. This included recruiting new participants (27 employees and 5 students, 137 participants in total), implementing a training programme focused on competences required to promote the employer brand online, and holding a strategy session of ROSATOM’s ambassadors as part of the Youth Congress hosted by ROSATOM;

Studies of the perception of ROSATOM’s employer brand were conducted by FutureToday among target universities, and by ECOPSY and Habr among IT specialists;

Steps were taken to promote ROSATOM’s employer brand online;

A special project titled ‘ITober’ was organised in career communities; it was a month-long thematic event for IT specialists (its coverage garnered 200,000 views);

ROSATOM launched a career portal for students and graduates; it was integrated into the industry-wide career portal for all job seekers.

Ensuring succession for critical senior management positions

In 2021, 148 members of the executive succession pool (‘ROSATOM’s Assets’ and ‘ROSATOM’s Assets. Basic Level’) completed the ESP development programme. A ranking was compiled following the completion of the two-year development programme; it is based on a number of parameters, such as performance, proactive behaviour and participation in the ROSATOM for ROSATOM programme.

A support programme continues to be implemented and an alumni club has been established for the members of the ‘ROSATOM’s Assets’ and ‘ROSATOM’s Assets. Basic Level’ programmes.

In 2021, the share of ESP members among those appointed to vacant top and senior executive positions totalled 70.37%.

The share of ESP members among those appointed to the positions of Chief Executive Officer and Deputy CEO for core operations in ROSATOM’s organisations stood at 65.63% and 79.03% respectively.

The career and succession planning process is a mandatory requirement and is applied in all key organisations in the industry, with succession plans prepared for critical positions.
REPORT ON THE DEVELOPMENT OF NUCLEAR TOWNS AND CITIES
Dear readers,

Technological development and a significant extension of the life cycle of ROSATOM's facilities pose a major challenge for us, as we need to provide skilled workers for a long and continuous production cycle and, crucially, provide them with comfortable living conditions and enable their self-fulfillment. People are our strategic capital, and we believe that one of the Corporation's key tasks is to facilitate the systematic development of our towns and cities and their residents at the national level.

Over the past few years, practical tools for providing support to nuclear towns and cities (agreements with regions, PSEDA, continuous training of management teams in towns and cities, implementation of social initiatives that help to maintain a high level of education, culture, public relations, etc.) have enabled us to maintain the competences of the population in nuclear towns and cities at a high level, create a favourable investment climate in nuclear CATFs, provide new opportunities for increasing business profitability and facilitate communication between municipal governments and local residents based on trust.

As we present the Report on the Development of Nuclear Towns and Cities, I would like to highlight the key results and events in 2021.

In the reporting year, ROSATOM continued to raise additional funds for the towns and cities where it operates. In 2021, funding for national projects in 25 of ROSATOM's host towns and cities totalled RUB 4,630.3 million.

In 2021, we continued to implement 22 projects and initiatives in nuclear towns and cities, ranging from initiatives to create a comfortable environment and national projects to communications and educational projects. More than 200,000 people in nuclear towns and cities are involved in projects being implemented in the industry.

17 out of 27 nuclear towns and cities (i.e. more than 60%) have been assigned an urban environment quality rating indicating a favourable urban environment.

The government model for supporting the development of nuclear technology has proved to be effective. There is a need to create a similar government model that would help accelerate the development of our towns and cities and thus promote technological development. We need to set clear goals in order to extend the planning horizon and to progress from addressing current challenges to strategic planning for the future. Given that the epidemiological situation and the political environment were unstable in 2020 and 2021, we had to constantly adapt and stay ahead of the curve, as our host towns and cities are key to innovative development of the nuclear industry and drive scientific and technological advancement in Russia.

Andrey Polosin
Head of Department for Liaison with Regions of ROSATOM

GRI 103-1
GRI 203-2
Implementations of agreements with regions. During the term of agreements that take into account the functioning of the consolidated taxpayer group, between 2013 and 2021 (inclusive), constituent entities of the Russian Federation additionally allocated RUB 23.9 billion from the tax payments of the Corporation and its organizations, including RUB 3.2 billion in 2021, to finance various measures promoting social, economic and infrastructure development of nuclear towns and cities.

Development of PSEDA. 132 resident companies were registered; 7,000 new jobs were created; direct investment totalled RUB 27.3 billion.

More efficient participation of municipalities in programmes and activities forming part of national projects. The municipalities of nuclear towns and cities are involved in programmes and activities forming part of nine National Projects. Between 2019 and 2021, RUB 12.983 billion were raised and spent.

Industry projects in nuclear towns and cities. ROSATOM’s Territory of Culture. 2021 marked the 15th anniversary of the launch of the project. Its reach exceeds 220,000 people per year, with 1,500 cultural events held over 15 years and 200 cultural institutions in 27 regions participating in the project. The top project is #10pesenatomnykhgorodov (‘10 Songs from Nuclear Towns and Cities’) with 1,000 participants and 40 million views.

ROSATOM’s School. Over 10 years, 350,000 children have participated in the project, and 30 ‘nuclear classes’ have been created in 23 nuclear towns and cities; 350 educational institutions are involved in the project, and the community of teachers and education experts numbers more than 2,700 people.

The ‘Glory to Creators!’ National Creativity Competition is a competition of video interviews with veterans of the nuclear industry and people who have contributed to the development of nuclear towns and cities filmed by schoolchildren. It has been run since 2016. The project covers 20 nuclear towns and cities, with 25,000 participants and 12,000 video interviews filmed.

1. Plans for the project to support the development of Usolye-Sibirskoye were progressing successfully.
2. Agreements were reached with the Government of the Russian Federation, the relevant federal executive agencies and Development Institutions on measures required to support the development of towns and cities with high science and technology potential.
3. The Decree of the President of Russia was drafted and signed to expand the Sarov Closed Administrative and Territorial Formation in the Nizhny Novgorod Region in order to promote its social and economic development.
4. Support was provided for the participation of nuclear towns and cities in national projects: 19 towns and cities won in a competition held by the Russian Ministry of Construction, Housing and Utilities (RUB 1.3 billion); funding totalled RUB 4 billion was raised.
5. A special government programme (a set of measures) is being developed in alignment with long-term urban development targets and measures to develop key sectors, such as healthcare, education, utility infrastructure and the urban environment, based on urban development strategies and master plans for the development of key regions.

RESPONSE TO THE PANDEMIC: SUPPORTING URBAN RESIDENTS

Pursuant to List of Instructions No. Pr-586 dated 28 March 2020 adopted following the address of the President of the Russian Federation in connection with the spread of the new coronavirus disease (COVID-19), measures were taken to prevent the spread of COVID-19 in the Corporation’s regions of operation and in nuclear organisations.

ROSATOM established effective communication with the FMBR of Russia and representatives of regional governments on a daily basis in order to coordinate the relevant activities and make concerted efforts to prevent the impact of the COVID-19 pandemic.

An action plan and a programme of restrictive measures were implemented to curb the spread of COVID-19. They had been developed with assistance from employees of municipal administrations, ROSATOM’s organisations, community liaison offices of ROSATOM’s Public Council, members of veteran councils, doctors and volunteers. The action plan includes:

- Regular public speeches by senior municipal officials, representatives of the Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing (Rospotrebnadzor) and healthcare institutions to provide up-to-date information on the COVID-19 situation in each specific region;
In 2021, 100% of the required medical equipment was purchased, including ventilators, CT scanners, X-ray machines, photofluorographic units, personal protective equipment and disinfectants, which made it possible to promptly deploy COVID hospitals in healthcare institutions affiliated with the FMBA of Russia with a total budget of more than RUB 2.6 billion.

For details on ROSATOM’s response to the pandemic, see the section ‘Response to the Pandemic’ in the chapter ‘Social Report’.

### 4.1. DEVELOPMENT PRIORITIES

The operations of ROSATOM’s largest organisations determine the social and economic climate in towns and cities where nuclear power plants are located, in closed administrative and territorial formations (CATFs) and priority social and economic development areas (PSEDAs). Therefore, the Corporation attaches great importance to improving the quality of life in nuclear towns and cities, promoting effective communication and cooperation with governments at all levels and with local communities, maintaining the talent pipeline and encouraging investments.

One of the key sustainable development objectives for ROSATOM and its organisations is to drive systematic improvement in the standard of living of employees and their families by promoting social and economic development in the regions where nuclear facilities are located.

Initiatives focused on the development of nuclear towns and cities are implemented by ROSATOM’s Department for Liaison with Regions (hereinafter referred to as the Department).

Key objectives of the Department are:

- To coordinate the activities and enable effective cooperation between the Department and non-governmental organisations, governments and the relevant departments of organisations operating in nuclear towns and cities;
- To involve non-governmental organisations and local governments in joint initiatives aimed at creating a favourable social and political climate in the regions where nuclear facilities are located, matching a new stage in the development of the nuclear industry; to switch from the policy of control to cooperation.

ROSATOM has fully implemented List No. MM-P13-2507kv of Instructions from the Prime Minister of the Russian Federation dated 30 March 2020. In order to prevent the spread of the new coronavirus disease (COVID-19), timely measures have been taken to enhance the capabilities of healthcare institutions of the FMBA of Russia and provide healthcare institutions affiliated with the FMBA of Russia in ROSATOM’s host towns and cities with the required medical and personal protective equipment.

In order to prevent the spread of COVID-19, the Corporation’s employees and 70% of local residents have been vaccinated.

ROSATOM improved the COVID-19 vaccination process and, jointly with the FMBA of Russia and representatives of regional governments, introduced the best practices to expand access to vaccines. This involved:

- Increasing the number of vaccination sites in public places, extending their operational hours to include weekends and forming mobile vaccination teams;
- Encouraging senior citizens to get vaccinated (cooperation with the Councils of Veterans);
- Organising at-home vaccination for people with limited mobility;
- Producing and distributing printed materials on the prevention of respiratory viral infections and on the importance of vaccination against COVID-19;
- Organising webinars and round-table discussions with healthcare professionals and employees with a focus on the importance of vaccination against COVID-19.

These measures helped to curb the spread of COVID-19. As a result of these efforts, 88% of ROSATOM’s employees and 70% of local residents have been vaccinated.

- Inspections of compliance with COVID prevention procedures in public facilities (shops, bars, nightclubs, catering facilities) and on transport;
- Reducing the number of municipal employees who are physically present in the workplace;
- Suspending large-scale sports events;
- Introducing an algorithm for switching educational institutions to distance learning;
- Informing urban residents (through the media, social media, instant messaging services, etc.) about the special features of COVID-19; providing leaflets for patients on the outpatient treatment of mild forms of COVID-19;
- Approving an algorithm for deploying additional inpatient and intensive care beds;
- Maintaining an emergency stockpile of drugs, vaccines, oxygen, tests, personal protective equipment and disinfectants;
- Engaging medical students and residents in the work of healthcare institutions;
- Introducing remote procedures at healthcare institutions (for prescribing drugs, monitoring patients, issuing sick leave certificates, filling in referral forms for disability examination);
- Forming mobile teams of healthcare specialists in order to reduce the load on primary healthcare providers;
- Organising flash mobs on social media in order to promote the vaccination campaign: #ПРИЯВИЛСЯ ("I’ve Got Vaccinated"), #ЯЗДОРОВ ("Be Healthy"), #Личный_пример ("Personal Example"), #Сделай_прививку_get a Book!");
- Forming mobile teams of healthcare specialists in order to reduce the load on primary healthcare providers;
- Introducing remote procedures at healthcare institutions (for prescribing drugs, monitoring patients, issuing sick leave certificates, filling in referral forms for disability examination);
- Producing and distributing printed materials on the prevention of respiratory viral infections and on the importance of vaccination against COVID-19;
- Organising webinars and round-table discussions with healthcare professionals and employees with a focus on the importance of vaccination against COVID-19.

Given the scale of its operations in Russia and abroad, the Corporation recognises its responsibility towards a wide range of stakeholders for protecting the environment, ensuring industrial and radiation safety, ensuring the safety and protecting the health of employees in the nuclear industry, contractors and the general public, and for operating in a manner promoting long-term sustainable development in its regions of operation.

For details on ROSATOM’s response to the pandemic, see the section ‘Response to the Pandemic’ in the chapter ‘Social Report’.

### GRI 103-1

Liaison with Regions (hereinafter referred to as the Department).

Initiatives focused on the development of nuclear towns and cities are implemented by ROSATOM’s Department for Liaison with Regions (hereinafter referred to as the Department).

Key objectives of the Department are:

- To coordinate the activities and enable effective cooperation between the Department and non-governmental organisations, governments and the relevant departments of organisations operating in nuclear towns and cities;
- To involve non-governmental organisations and local governments in joint initiatives aimed at creating a favourable social and political climate in the regions where nuclear facilities are located, matching a new stage in the development of the nuclear industry; to switch from the policy of control to cooperation.
The performance of the Department is assessed annually on the basis of KPI targets. The assessment is conducted by ROSATOM’s Director General. In 2021, all KPI targets were achieved.

In the age of information globalisation, the demands of residents of nuclear towns and cities are shifting to match the standard of consumption in large cities (including capitals), their services and standards of living. The world is changing, and towns and cities need to keep pace with this change; the more attractive they are as a place for people to live in, the higher their economic and social potential.

This is why ROSATOM, in cooperation with municipal governments and with support from the leaders of constituent entities of the Russian Federation, enhanced its approach to managing urban development and modernising urban spaces to create an attractive and comfortable urban environment.

In 2021, ROSATOM continued to support the participation of its host towns and cities in national and federal projects aimed at implementing Decree No. 474 of the President of the Russian Federation dated 21 July 2020 on the National Development Goals of the Russian Federation until 2030.

17 out of 27 nuclear towns and cities have been assigned the urban environment quality rating indicating a favourable urban environment. This means that more than 60% of nuclear towns and cities have a favourable urban environment.

Comprehensive support from ROSATOM enables nuclear towns and cities to implement projects to develop digital services and maintain a historically high level of education (including school education) and culture.

4.2 CONTRIBUTION TO THE IMPLEMENTATION OF NATIONAL PROJECTS

Funding for national projects in 25 of ROSATOM’s host towns and cities totalled RUB 4,630.3 million in 2021 (RUB 2,637.8 million in 2019, RUB 5,715.3 million in 2020). Furthermore, seven towns and cities saw a significant increase in the amount of funding, with the largest growth recorded in Novovoronezh, Krasnokamensk, Polyarnye Zori, Bilibino, Zelenogorsk, Tryokhgorny and Ozersk.

A total of RUB 12,883.4 million have been raised over three years, with the largest budget allocations given to Obninsk (RUB 4,469.3 million), Sarov (RUB 1,231.4 million), Seversk (RUB 886.7 million), Volgodonsk (RUB 759.8 million) and Ozersk (RUB 666.7 million).

<table>
<thead>
<tr>
<th>Name of national project</th>
<th>Number of towns and cities</th>
<th>Funding, RUB million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing and Urban Environment</td>
<td>24</td>
<td>5,445</td>
</tr>
<tr>
<td>Education</td>
<td>22</td>
<td>1,715.4</td>
</tr>
<tr>
<td>Ecology</td>
<td>6</td>
<td>1,288.3</td>
</tr>
<tr>
<td>Demographic Situation</td>
<td>21</td>
<td>3,001.4</td>
</tr>
<tr>
<td>Culture</td>
<td>19</td>
<td>300.2</td>
</tr>
<tr>
<td>Small and Medium-Sized Businesses</td>
<td>3</td>
<td>39.4</td>
</tr>
<tr>
<td>Safe and High-Quality Roads</td>
<td>6</td>
<td>1,114</td>
</tr>
<tr>
<td>Digital Economy</td>
<td>7</td>
<td>1.3</td>
</tr>
<tr>
<td>Healthcare</td>
<td>1</td>
<td>78.3</td>
</tr>
</tbody>
</table>

The following federal projects are of particular relevance for local residents:

<table>
<thead>
<tr>
<th>Project</th>
<th>Number of towns and cities covered by the project</th>
<th>Funding, RUB million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creating a Comfortable Urban Environment</td>
<td>23</td>
<td>3,494</td>
</tr>
<tr>
<td>Cultural Environment</td>
<td>18</td>
<td>285.8</td>
</tr>
<tr>
<td>Sports as a Way of Life</td>
<td>16</td>
<td>280</td>
</tr>
<tr>
<td>Modern School</td>
<td>14</td>
<td>1,380.4</td>
</tr>
<tr>
<td>Every Child’s Success</td>
<td>12</td>
<td>199.4</td>
</tr>
</tbody>
</table>
The number of towns and cities participating in the Education National Project increased significantly, from 12 (in 2019) to 22 (in 2021). Nuclear towns and cities actively participate in a number of federal projects, such as Every Child’s Success, Digital Educational Environment and Modern School.

In 2019, measures focusing on the transformation of the Volga River and Clean Water. Numerous activities are being carried out in Sarov as part of federal projects such as Environmental Improvement of the Volga River and Clean Water.

Methodology for improving the efficiency of participation of the regions where nuclear facilities are located in national projects

Using the methodology developed earlier by ROSATOM, active steps were taken in 2021 to enable more efficient participation of the towns in national projects being implemented in Lesnoy (Sverdlovsk Region) and Zarechny (Penza Region).

Dedicated working groups including representatives of local governments, the Department for Liaison with Regions and executive agencies of constituent entities of the Russian Federation selected measures to be prioritised both for the town and for the region as a whole that could also contribute to the achievement of national targets.

An important milestone was the approval by the Project Committee under the Government of the Sverdlovsk Region of an integrated road map for measures to be implemented in Lesnoy. Lesnoy was also selected by the Government of the Sverdlovsk Region as a pilot area for testing approaches to the implementation of national projects at the municipal level. In 2022, this work will be continued in other towns and cities in the Sverdlovsk Region.

In order to expand the coverage of towns and cities and increase their involvement in initiatives aimed at achieving national goals, in 2021, the relevant practical module was incorporated in the educational programme of the Volga River and Clean Water.

Numerous activities are being carried out in Sarov as part of federal projects such as Environmental Improvement of the Volga River and Clean Water.

Urban environment

Developing the urban environment involves a set of measures that address issues ranging from urban improvement to the development of digital urban services. These are comprehensive projects that involve the digitisation of services, modernisation of public spaces and an overall redesign of urban culture and help to improve the quality of life.

Between 2018 and 2021, nuclear towns and cities received methodological support focused on shaping and developing the urban environment. This included holding lectures and expert discussions, developing master plans for six projects in four towns and cities (Zelenogorsk, Zheleznogorsk, Novouralsk and Elektrostal) and preparing applications for the National Competition for Best Projects to Develop a Comfortable Urban Environment held by the Russian Ministry of Construction, Housing and Utilities. Four towns won the competition: Zheleznogorsk with the Linear Neutrino Park project; Udolmya with a project to landscape the park area along Venetianov Street; Lesnoy with a public space landscaping project covering the park area in residential district No. 5; Polyarnye Zori with the Northern Lights 2.0 Boulevard project. This enabled these regions to secure funding from the federal budget for the construction of comfortable park areas.

Greater Sarov project

On 24 August 2021, the President of the Russian Federation signed the Decree on the Inclusion of Some Areas of the Volgogradsky and Dzheynovsky Municipal Districts of the Nizhny Novgorod Region and the Temnikovsky Municipal District of Mordovia in the CATF of Sarov, which marked an important milestone for the Greater Sarov project in 2021. The decree establishes a special regime for the safe operation of organisations and facilities in the areas to be included in the CATF, which involves restrictions on the entry and permanent residence of individuals, an aircraft flight over these areas and other restrictions in accordance with applicable laws. Pursuant to Decree No. 491 of the President of the Russian Federation dated 24 August 2021 on the Transformation of the Sarov Closed Administrative and Territorial Formation in the Nizhny Novgorod Region, the Government of the Russian Federation has approved a list of transitional measures related to the transformation of the CATF of Sarov until 30 June 2022 (Order No. 2386-r dated 28 August 2021).
Social and economic development of Usolye—Sibirskoye

In order to provide comprehensive support for the development of Usolye—Sibirskoye, in March 2021, ROSATOM\(^{92}\) developed a project titled ‘Supporting the Development of Usolye—Sibirskoye’, which was then approved in September 2021. The project is scheduled to run until 2024.

The project combines measures aimed at determining and developing the town’s economic specialisation and industry-wide social initiatives covering Usolye—Sibirskoye since 2021 (ROSATOM’s School, ROSATOM’s Territory of Culture, educational projects of ROSATOM’s Corporate Academy, etc.).

Results in 2021:

— Large-scale cultural events were held in Usolye—Sibirskoye; support was provided for urban initiatives, and steps were taken to facilitate participation and involvement of local residents;
— Training was provided for municipal government officials;
— A draft strategy for a new chemical industry hub in Usolye—Sibirskoye was developed in cooperation with the Government of the Irkutsk Region and the business community;
— A programme for social and economic development of the town was prepared, and an order of the Government of the Russian Federation is being drafted;
— Solutions were developed to secure funding for urban infrastructure and the urban environment from the federal budget, and projects to be implemented later are being discussed.

Raising funds for infrastructure facilities in Usolye—Sibirskoye

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Amount, RUB million</th>
<th>Implementation timeframe, years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road infrastructure</td>
<td>1,174.2</td>
<td>2022–2024</td>
</tr>
<tr>
<td>Development of utility infrastructure</td>
<td>2,795.1</td>
<td>2022–2024</td>
</tr>
<tr>
<td>Development of the urban environment</td>
<td>2,206.6</td>
<td>2022–2024</td>
</tr>
<tr>
<td>Housing</td>
<td>1,655.2</td>
<td>2022–2023</td>
</tr>
<tr>
<td>Major repairs of the children’s ward of the Usolye municipal hospital</td>
<td>143.1</td>
<td>2021–2023</td>
</tr>
</tbody>
</table>

In 2022, ROSATOM plans to obtain approval for the programme for social and economic development of Usolye—Sibirskoye from the Government of the Russian Federation, obtain approval for the strategy for creating the new chemical industry hub from the Governor and the Government of the Irkutsk Region, and continue to implement the corporate project to support the development of Usolye—Sibirskoye.

Between 2022 and 2024, ROSATOM plans to implement the programme for social and economic development of the town and develop the new chemical industry hub in Usolye—Sibirskoye.

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\(^{92}\) In accordance with Order No. 189-rp of the President of the Russian Federation dated 30 July 2020.
4.3. CONTRIBUTION TO THE ECONOMY

4.3.1. Improving the management of nuclear towns and cities

Agreements on urban and regional development

The Corporation enters into cooperation agreements with constituent entities of the Russian Federation to support their participation in the development of nuclear towns and cities and implementation of investment programmes and projects.

As part of implementation of the agreements, in 2021, programmes were approved to promote social and economic development of nuclear towns and cities. They had been developed by municipalities in coordination with ROSATOM’s organisations.

Following competitive procedures, municipalities concluded contracts worth RUB 3,041.7 million. As at 31 December 2021, RUB 3,125.5 million was allocated to local budgets from the budgets of constituent entities of the Russian Federation under existing agreements, with RUB 2,651.6 million spent (85% of the total allocations). The work started in 2021 (mainly on capital construction projects) will be continued in 2022.

Implementation of agreements in 2021 and financing of initiatives, by expenditure item

<table>
<thead>
<tr>
<th>Funding, by focus area</th>
<th>2021, RUB million</th>
<th>Share in total funding, %</th>
<th>2013–2021, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital construction (renovation)</td>
<td>965.1</td>
<td>30.9</td>
<td>35.4</td>
</tr>
<tr>
<td>Major repairs of infrastructure facilities (housing and utilities)</td>
<td>972.4</td>
<td>31.1</td>
<td>10.3</td>
</tr>
<tr>
<td>Landscaping</td>
<td>378.4</td>
<td>12.1</td>
<td>18.9</td>
</tr>
<tr>
<td>Major repairs of residential buildings and buildings of state-funded organisations</td>
<td>490.6</td>
<td>15.7</td>
<td>15.6</td>
</tr>
<tr>
<td>Support for education, culture and sports programmes</td>
<td>90.1</td>
<td>2.9</td>
<td>6.8</td>
</tr>
<tr>
<td>Support for small and medium-sized enterprises</td>
<td>28.7</td>
<td>0.9</td>
<td>4.4</td>
</tr>
<tr>
<td>Providing support to local budgets to maintain the financial stability of housing and utility organisations</td>
<td>200.2</td>
<td>6.4</td>
<td>8.6</td>
</tr>
<tr>
<td>Total</td>
<td>3,125.5</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The Corporation continues to prepare for the signing of cooperation agreements (supplementary agreements, protocols) with constituent entities of the Russian Federation which provide for their involvement in the development of ROSATOM’s regions of operation and facilitate the implementation of investment programmes and projects as part of ROSATOM’s business strategy, as well as the implementation of measures aimed at achieving the goals set in Decree No. 474 of the President of the Russian Federation dated 21 July 2020 on the National Development Goals of the Russian Federation until 2030.

In 2021, the Corporation signed agreements with the governments of the Tver Region, the Ulyanovsk Region and the Chukotka Autonomous District and protocols on the implementation of agreements with the governments of the Voronezh, Murmansk, Rostov, Sverdlovsk, Smolensk and Kursk Regions.

Fifth Forum of Towns and Cities with High Science and Technology Potential in Russia

The Fifth Forum of Towns and Cities with High Science and Technology Potential in the Russian Federation was held in Moscow on 25 and 26 August 2021. The Forum was organised by ROSATOM. The Forum focused not only on nuclear towns and cities, but also on towns and cities within the sphere of responsibility of major Russian companies.

Participants of the Forum agreed on the need for systematic development programmes for towns and cities with high science and technology potential, which develop essential services and products for major Russian corporations. Following the Forum, a Memorandum of Cooperation was signed with deputies of the State Duma of the Russian Federation. In addition, a decision was made to form a working group under the new lower house to address the development of the towns and cities where large high-technology companies operate. The group is expected to draw up a government programme aimed at stimulating the development of regions with science and technology potential.

Smart City platform

ROSATOM contributes to the development of both nuclear towns and cities and other municipalities by improving the efficiency of urban management through the application of the Lean Smart City technological solution. This project is managed by JSC Rusatom Infrastructure Solutions. The Smart City digital platform is designed to improve the efficiency of urban management. By the end of 2021, digital services forming part of the Smart City platform had been rolled out in 36 towns and cities, including 18 of ROSATOM’s host towns and cities. Overall, more than 600,000 people across the country used the Smart City services in 2021.
In 2021, ROSATOM joined programmes to digitise regional and municipal segments of federal systems and their components based on an integrated digital platform of the Russian Federation, GosTech, and on the Federal State Information System Integrated Information Platform of the National Data Management System.

This included launching a project in the town of Glazov to develop urban digital applications for the benefit of and with assistance from local communities in order to reduce the digital divide by making digital services more accessible to the public, small and medium-sized businesses.

The Centre of Professional Management Communities at the Regional and Municipal Level is being developed pursuant to an order from Deputy Prime Minister Dmitry Chernyshenko. The Centre covers over 500 municipalities and promotes horizontal cooperation aimed at developing digital products and addressing issues related to communication with federal and regional governments; it also formulates mandatory requirements for products developed at the federal and regional level.

In addition, in 2021, JSC Rusatom Infrastructure Solutions launched the Digital Water Supply and Sewerage System, a new product for managing the water supply system, and piloted it in Glazov.

In 2022, the Corporation plans to launch the Digital Heat Supply product.

Management training in nuclear towns and cities

The Department of Management of Science-Intensive Sectoral and Regional Projects of NRNU MEPhI (Department No. 95) runs a number of educational programmes aimed at retraining management teams consisting of representatives of local governments and employees of enterprises that play a central role in the economy of nuclear towns and cities. In 2021, the department completed a retraining programme titled ‘Management in the Context of Digital Economy’ (March to December, consisting of 6 modules, 36 hours each). A total of 306 certificates were issued in 2021.

In addition to these programmes, the following face-to-face and online training programmes were launched in 2021:

- The second cohort of participants of the Management in the Context of Digital Economy retraining programme participated in the following events:
  - A training session on face-to-face communication held by Vitold Yasvin, Doctor of Psychology;
  - A gamified training session on crisis management titled ‘The Bunker: Nuclear and Viral Threats’;
  - A tour of NRNU MEPhI;
  - A team-building training session: a Foresight Fleet titled ‘Vision of the Future of Nuclear Towns and Cities’;
  - Communication events held as part the Fifth Forum of Towns and Cities with High Science and Technology Potential.

- School for Leaders programme

The programme is targeted at representatives of the nuclear industry, senior municipal officials and representatives of local governments. Its aim is to improve core management competences.

The training programme was launched in 2020. In 2021, a set of training videos was developed and recorded for senior officials of ROSATOM’s host towns and cities. More than 100 senior municipal officials of ROSATOM’s regions of operation participated in the project.

Priority social and economic development areas (PSEDA) in CATFs in the nuclear industry. PSEDA status in 2021. Development prospects

Priority social and economic development areas (PSEDA) are created in order to preserve the competences of nuclear towns and cities and maintain a high level of social and economic development. JSC ATOM-TOR is a management company tasked with managing PSEDA in CATFs where ROSATOM’s nuclear facilities are located. JSC ATOM-TOR also provides comprehensive information support to resident companies and investors.

On 14 September 2021, the Government of the Russian Federation adopted a resolution to approve the rules for granting federal subsidies to Joint-Stock Company ATOM-TOR for the funding of its operations. JSC ATOM-TOR and the Russian Ministry of Economic Development concluded an agreement on the granting of federal subsidies totalling RUB 100 million to cover the costs incurred by the management company as part of its operations in 2021. In 2021, as part of its operations as a management company, JSC ATOM-TOR concluded four contracts for the planning of the PSEDA in Seversk, Snezhinsk, Sarov and Novouralisk. It also placed orders for front-end engineering design for the PSEDA in Novouralisk and for the preparation of designs and cost estimates for the PSEDA in Zarechny.
In 2021, the management company held the first presentations to showcase the investment potential of CATFs where ROSATOM operates and where it is legally possible to create PSEDAs, namely the CATFs of Zelenogorsk (Krasnoyarsk Territory) and Tryokhgorny (Chelyabinsk Region). Discussions titled ‘Nuclear Towns and Cities. Partnership for Regional Development’ were held online on 14 and 21 December.

In order to achieve the goals of creating PSEDAs in nuclear CATFs, the management company ATOM-TOR regularly cooperates with federal government bodies, governments of constituent entities of the Russian Federation, municipal governments, regional development institutions and business associations. For instance, representatives of JSC ATOM-TOR participate as experts in the work of the Ministry of Economic Development of the Russian Federation and committees under the State Duma of the Russian Federation.

PSEDA status in 2021

In 2021, the management company ATOM-TOR started to provide support to four more PSEDAs created in the single-industry towns and cities where ROSATOM operates: Glazov in the Udmurt Republic, Dimitrovgrad in the Ulyanovsk Region, Usolye-Sibirskoye in the Irkutsk Region and Krasnokamensk in the Zabaykalsky Territory.

The management company is a competence centre providing comprehensive support to potential investors and resident companies in PSEDAs at all project stages, from the submission of an application to the start of production. The management company supervises the construction and operation of infrastructure facilities, accepts land plots and buildings and transfers them to resident companies. Thus, the company acts as a one-stop service centre for resident companies and investors and provides a permanent channel of communication with governments at all levels and enterprises playing the key role in the economy of nuclear towns and cities in addressing both current challenges and strategic tasks.

Within less than three years, the systematic approach to engaging with businesses has enabled a significant increase in the number of PSEDA residents in closed nuclear towns and cities from two resident companies in early 2019 to 68 resident companies at year-end 2021.

Pursuant to resolutions of the Government of the Russian Federation, in order to preserve the competences of nuclear towns and cities and maintain a high level of social and economic development, PSEDAs have been created in eight out of 10 CATFs where ROSATOM operates, in six regions of the Russian Federation: Sarov in the Nizhny Novgorod Region, Ozersk and Svinthok in the Chelyabinsk Region, Zheleznogorsk in the Krasnoyarsk Territory, Lesnoy and Novouralsk in the Sverdlovsk Region, Zarechny in the Penza Region, and Severn in the Tomsk Region. To date, PSEDAs have not yet been created in the CATFs of Zelenogorsk (Krasnoyarsk Territory) and Tryokhgorny (Chelyabinsk Region).

At year-end 2021, the total actual capitalisation of projects run by resident companies exceeded RUB 1.216 billion, and 765 jobs were created.

In 2021, resident companies paid RUB 373.163 million to budgets of various levels.

Furthermore, in 2021 alone, ATOM-TOR signed agreements with 25 resident companies on operations in priority social and economic development areas, including on eight industry projects.
Implementation of projects in PSEDAs

**PSEDA in Seversk, Tomsk Region**

The preferential area in Seversk is the leader in terms of the number of resident companies and investments among all PSEDAs in the nuclear industry. 17 companies are implementing projects here, with investments projected to total RUB 13.059 billion. The companies will create 766 jobs. The resident companies have already invested RUB 682 million and created 285 new jobs for local residents.

Two large industry-wide environmental projects have been launched in the PSEDA in Seversk, with total investments of over RUB 10 billion:

- Construction of a state-of-the-art facility in the Tomsk Region for the processing of hazard class 1 and 2 waste generated as a result of business operations of the region (JSC RG Western Siberia). The business plan of the project stipulates investments exceeding RUB 6.5 billion and the creation of about 200 new jobs for the residents of Seversk. The Western Siberia Environmental Technology Park is being developed as part of the Infrastructure for the Management of Hazard Class 1 and 2 Waste Federal Project, which forms part of the Ecology National Project. The site will form part of operational and logistics infrastructure that will help to overcome the shortage of industrial waste processing capacities in the country;

- Construction of a depleted uranium processing facility (Aurora Chemicals). Investment in the project is expected to exceed RUB 4.3 billion. The facility for the processing of depleted uranium hexafluoride (DUHF) into anhydrous hydrogen fluoride (AHF) with a capacity of up to 18,000 tonnes of DUHF is planned to be built at two sites of the Isotope Separation Plant and the Sublimation Plant of JSC SCP (a company forming part of the Fuel Division). The start of production is scheduled for December 2025.

**PSEDA in Novouralsk, Sverdlovsk Region**

A total of 14 resident companies are implementing projects in the PSEDA in Novouralsk, four of which received the resident status in 2021. Investments in the projects are expected to total RUB 4.098 billion, with plans to create 1,018 jobs. The actual figures stand at RUB 73.4 million and 260 new jobs. Furthermore, in 2021, the resident companies paid RUB 33.81 million in taxes to budgets of all levels.

Medtekhnologii-N is taking steps to launch the production of automatic microbiological analysers in the PSEDA in Novouralsk; they will be used for diagnosing dangerous infectious diseases such as sepsis and bacteremia. Financial investment by the resident company will total RUB 251 million, and 48 new jobs will be created.

In addition, a resident company representing the nuclear industry, LLC CentroTech Research and Production Association (an organisation of the Fuel Division in Novouralsk, Sverdlovsk Region), is taking steps to launch the second and third projects in the PSEDA in Novouralsk. The projects involve launching the production of hydrogen electrolyzers and electrochemical generators (ECGs) as part of the strategic programme for hydrogen energy development. The PSEDA resident will also set up an additive manufacturing centre. The company will invest a total of more than RUB 330 million and will create more than 200 jobs for local residents.

**PSEDA in Zarechny, Penza Region**

The PSEDA in Zarechny attracted the largest number of resident companies in 2021. Seven companies obtained the resident status, with investment totalling about RUB 339 million and over 120 new jobs to be created.

4.3.3. ROSATOM’s impact on other areas of development in nuclear towns and cities

ROSATOM’s organisations make significant contributions to budget revenue in nuclear towns and cities. The Corporation is a major taxpayer in Russia. In 2021, it paid RUB 249,253 million budgets of all levels.
Additional tax payments to the budgets of constituent entities of the Russian Federation totalled RUB 78.2 billion in 2021.

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Payments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>71.5</td>
</tr>
<tr>
<td>2020</td>
<td>78.2</td>
</tr>
</tbody>
</table>

**4.4. SOCIAL DEVELOPMENT**

Improving the standard of living in towns and cities is one of the top priorities of ROSATOM’s strategic agenda.

**ROSATOM’s School**

The project titled “ROSATOM’s School” is aimed at providing children with first-class education regardless of where they live, while preserving and developing the unique character of municipal education systems. On 17 April 2021, ROSATOM’s School celebrated its 10th anniversary. During this period, 350,000 children have participated in the project, and 30 ‘nuclear classes’ have been created in 23 nuclear towns and cities. 350 educational institutions are involved in the project, and the community of teachers and education experts numbers more than 2,700 people.

In 2021, part of the project, systematic support was provided for the initiatives of participating towns and cities in a number of traditional and new areas:

- Designing effective education models for preschoolers and schoolchildren;
- Introducing effective techniques to support the implementation of the Federal State Educational Standard (FSES) for general education levels;
- Encouraging active involvement of parents and the local community in the activities of educational institutions;
- Supporting children’s talent development models implemented in the towns and cities participating in the project;
- Supporting the work of teachers and educational institutions designing modern digital didactics;
- Reviewing the outcomes of the project in participating towns and cities over the past 10 years.

A wide range of measures was implemented in each of the project’s focus areas in 2021.

**Designing effective education models for preschoolers and schoolchildren**

A mobile application ‘Russia Begins Here’ was developed. It enables children and adults to work together to develop a value-based understanding of such concepts as ‘Motherland’, ‘one’s birthplace’, ‘compatriot’, ‘citizen of the country’.

The mobile application was tested in a distributed manner in 10 towns and cities participating in the project, and the first version was presented during the finals of the Big Break federal competition.

On 13 November 2021, the first AR object designed by children using a special application was demonstrated at Artek during the finals of the Big Break National Competition for Schoolchildren. The design created by schoolchildren from Novouralsk was recognised as the best.

**Generating employment through NPP construction**

The construction and commissioning of nuclear facilities, including NPP power units, create new jobs, as organisations often hire employees from local communities. For example, as construction work progressed at Rooppur NPP, about 20,000 local residents were employed in 2020 and 2021.

The construction of the Belarusian NPP has become a major infrastructure project providing employment to thousands of people both at the plant itself and in organisations that are servicing it.

**Employment in key NPP construction projects in 2021, persons**

<table>
<thead>
<tr>
<th>NPP</th>
<th>Actual headcount, including contractors</th>
<th>Including employees recruited from local communities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kurk NPP-2 (Russia)</td>
<td>8,267</td>
<td>7,529</td>
</tr>
<tr>
<td>Belarusian NPP</td>
<td>3,687</td>
<td>1,900</td>
</tr>
<tr>
<td>Rooppur NPP (Bangladesh)</td>
<td>25,969</td>
<td>20,794</td>
</tr>
<tr>
<td>El Dabaa NPP (Egypt)</td>
<td>1,503</td>
<td>1,348</td>
</tr>
<tr>
<td>Paks NPP (Hungary)</td>
<td>298</td>
<td>206</td>
</tr>
</tbody>
</table>

Employees who are nationals of the countries where the NPPs are being built.

For the Kurk NPP-2 project, figures in the columns ‘Including employees recruited from local communities’ indicate the number of employees who are Russian nationals.
As part of the competition programme of ROSATOM’s School, a competition was held among teachers introducing effective techniques and education methods into the teaching and learning process. More than 100 teachers from 17 towns and cities participating in the project took part in the competition. Ten of them became winners and will leverage their experience to conduct practical training for interested teachers from 22 participating towns and cities in 2022.

Introduction of effective techniques to support the implementation of the FSES for general education levels

Over 50 events were held remotely for students in the Atom Class Network of ROSATOM’s School, which involved more than 4,000 schoolchildren.

The events are aimed at developing the formats and content of subject-oriented teaching of students in mathematics, physics, chemistry, biology and computer science and at developing students’ transferrable skills such as teamwork, the ability to leverage up-to-date knowledge, process information, communicate successfully, etc.

Involving parents and the local community in the activities of educational institutions

In 2021, as part of a system-wide event for parent volunteers titled ‘A Grown-Up Start-Up’, over 100 parent initiatives were identified to improve the educational system in schools and kindergartens in the towns and cities participating in ROSATOM’s School. The parent initiatives will be supported throughout 2022.

In the spring of 2021, an online competition programme titled ‘The Whole Family with ROSATOM’s School’ was launched for families living in the towns and cities participating in ROSATOM’s School. During the lockdown, parents and children developed learning content that was posted on the Internet. As a result, more than 500 families of pre-schoolers and schoolchildren demonstrated their life hacks for supporting their children’s educational progress and shared their ideas online.

Supporting the work of teachers and educational institutions designing modern digital didactics

In 2021, the second online competition programme for teachers titled ‘We Are ROSATOM’s School’ was held in the NON-School NON-Lessons category, more than 40 teachers demonstrated new approaches to the digitisation of educational concepts. In the Digital Teacher Internships category, over 30 teams of teachers conducted virtual methodological workshops for all comers. The winners of the online competitions held demonstration lessons for all comers as part of the Spring Methodological Marathon, which has already become a tradition.

Supporting children’s talent development models in the towns and cities participating in the project

In the reporting year, over 60 events were held in a variety of areas: the AtomMEDIA festival of children’s media creativity, the Project School, the Snowy Cartoons festival for preschooolers, the Spaceball Championship for Preschoolers, the Engineering and Technology Festival, the Metadisciplinary Academic Competition, as well as a wide range of competitions for preschoolers and schoolchildren.

A total of over 20,000 children and over 300 educational institutions from all 22 towns and cities participating in the project took part in the events. The models used in these events are being rolled out in the towns and cities as formats for their own municipal initiatives aimed at developing children’s talents.

More than 200 children who demonstrated their talents in these events took part in the Industry-Wide Shifts for Gifted Children from ROSATOM’s Host Towns and Cities at the Oryolok Russian Children’s Centre and the Arket International Children’s Centre.

From 17 April through 17 May 2021, the Days of ROSATOM’s School were held in 22 towns and cities participating in the project as part of the celebration of its 10th anniversary. This was a real marathon of events held across the country, from Kamchatka to Kaliningrad. Several hundred thousand participants were held, with several thousand participants in the host towns and cities and online, and interviews were conducted with people who shared their success stories as part of the project, which were presented in visual form by the towns and cities in videos.

ROSATOM’s Territory of Culture

2021 saw the 15th anniversary of the launch of a programme titled ROSATOM’s Territory of Culture. On 29 November 2006, the Federal Atomic Energy Agency Rosatom (now State Atomic Energy Corporation Rosatom) and the Ministry for Culture and Mass Media of the Russian Federation (now the Ministry of Culture of the Russian Federation) signed a cooperation agreement on the development of cultural initiatives. Over 15 years since the conclusion of the Agreement, more than 1,500 events of various types have been held in 25 nuclear towns and cities. Activities under the programme are organised in cooperation with cultural institutions in nuclear towns and cities (over 220 institutions). A network of communities has been formed across various focus areas in the sphere of culture.

In 2021, more than 100 events were held as part of the programme.
Due to the spread of the coronavirus disease (COVID-19), the activities of cultural institutions were restricted across the country. Nevertheless, creative teams were able to take part in federal events:

— The Novouralsk Music, Drama and Comedy Theatre won the Jury’s Special Award for Unconventional Repertoire Thinking in the Golden Mask National Theatre Competition;
— The Malachite amateur folk dance ensemble won the Future of Russia National Culture and Arts Award in the Stylised Folk Dance category;
— The Rodnichok folk dance ensemble won in the Traditions category of the Russian Festival and Competition of Amateur Ensembles held as part of the Culture National Project (the prize awarded as part of the Culture National Project totalled RUB 2 million).

During the lockdown, ROSATOM focused on developing online activities:

— Educational webinars for employees and executives of cultural institutions;
— Online concerts of performing artists from Moscow featuring performers from nuclear towns and cities, which were broadcast both on the official YouTube channel of ROSATOM’s Territory of Culture and in virtual concert halls created in nuclear towns and cities participating in the Culture National Project. The project garnered a total of more than 60,000 views.

**Musical Competition for the Cup of ROSATOM’s Territory of Culture**

The project was held in several stages throughout 2021. From 25 February through 25 March, potential participants could submit their applications. This was followed by the qualifiers and the quarter-finals, and starting from 30 August, a series of semi-finals and finals was held in each league. Almost 150 professional and amateur groups (both autonomous/independent and those affiliated with municipal cultural institutions) comprising at least two participants aged 18 or older took part in the event and competed against their peers in one of three categories, or so-called ‘leagues’: vocal, instrumental and dance.

The Vocal League featured vocal groups that competed in different genres, such as pop, rock, folk, rap and R&B music, and performed unaccompanied or accompanied by instruments or recorded music. The Instrumental League featured only instrumental groups performing music in any style, from academic/classical and jazz to ethnic and electronic music. The Dance League featured only dance groups competing in any styles, including European and Latin ballroom dances, breakdancing and hip-hop, jazz funk and house. The competition will culminate in a showdown between the finalists of all three leagues, who will compete for the Super Cup in Moscow. The event is scheduled for 2022.

The contests between groups from different towns and cities were broadcast on the YouTube channel of ROSATOM’s Territory of Culture. Winning groups were chosen by viewers through an open online vote. The tournament winners were awarded money prizes, as well as the league championship trophies.

**Competition of digital products**

In the reporting year, 42 applications were submitted for the competition. Its aim is to encourage cultural institutions to create their own online products in order to form an online community centred around the institutions.

**Living Paintings educational project**

As part of the project, 40 ‘living paintings’ were created in the reporting year and were viewed by over 100,000 people. The project was inspired by works by Bakst, Renoir, Munch, Matisse, Deyneka, Degas and other artists. Professional and amateur groups of all ages were offered an opportunity to take part in the project. They chose a painting from the proposed list and prepared a dance performance based on the style and subject of a particular painting. A professional film crew went to nuclear towns and cities to make videos.

The video series is posted on the social media pages of ROSATOM’s Territory of Culture and on other websites. Additional video materials of the project will include behind-the-scenes footage to be posted on the project’s YouTube channel, which will reveal the secrets of how the Living Paintings were created to the viewers.
Digest of ROSATOM’s Territory of Culture

Nine news reports were prepared, which garnered a total of about 6,000 views.

The Digest covers newsworthy events in the sphere of culture, arts and creativity in nuclear towns and cities, as well as events on the Russian media agenda, which includes cultural institutions and their employees in nuclear towns and cities. The Digest also announces the forthcoming highlights of the cultural calendar in nuclear towns and cities.

Issues of the Digest created at the confluence of TV news and video blogging are posted on the social media pages of ROSATOM’s Territory of Culture. The presenter of the project is Victoria Prokhorova, a resident of the CATF of Sarov.

Running Book educational campaign of the library community

In 2021, in addition to libraries in nuclear towns and cities, almost 700 libraries with various specialisations across the country, from Kaliningrad to Vladivostok, joined the Intellectual Running Race. The total number of participants of the campaign (including librarians, volunteers and respondents) exceeded 35,000 people.

In 2021, the Running Book continued to combine the idea of intellectual growth with enthusiasm for sports and a healthy lifestyle. The 2021 spring running race was timed to coincide with a major literary anniversary, namely the 200th anniversary of the birth of Fyodor Dostoevsky, while the Running Book 2021 in autumn was focused on the Olympic Games. Along the routes of the running race, the participants tested the knowledge of passers-by about the history of the Olympic Movement, various sports, famous Russian and international athletes and their records, the Olympic Games in Ancient Greece and nowadays.

As part of the project, ‘book runners’ (librarians and volunteers) travel along dedicated routes that are posted in advance on the websites of the relevant institutions and on their community pages on social media. The route covers squares, streets, mini-parks and places of interest in the host towns and cities. The participants interview passers-by to test their general knowledge, including knowledge of the nuclear industry. Those respondents who have given a correct answer receive a book, another thematic gift or an invitation to the library from ‘book runners’. The campaign has been run since 2018.

Music Academy of Nuclear Towns and Cities under the auspices of Yuri Bashmet

Due to COVID-related restrictions, the project activities were held online. In the first half of 2021, there were online and offline master classes and qualifying rounds for the Academy and the Children’s Symphony Orchestra of Nuclear Towns and Cities. More than 120 children studying at music schools in nuclear towns and cities took part in the project.

Children’s Symphony Orchestra of Nuclear Towns and Cities

The grant project involves forming a combined children’s symphony orchestra in the CATF of Novouralsk. The orchestra comprises gifted children selected through a competitive process in 18 of ROSATOM’s host towns and cities located in 10 Russian regions: the Voronezh, Tver, Sverdlovsk, Moscow, Chelyabinsk, Tomsk, Nizhny Novgorod, Penza and Kurilk Regions, and the Krasnoyarsk Territory.

The project included a series of master classes by leading professors from the Gnesin Russian Academy of Music, the Moscow State Conservatoire, the Music College under the Moscow Conservatoire and the Central Music School and by concert soloists and orchestral musicians, including members of the Novaya Rossiya State Symphony Orchestra. In addition, a special repertoire was built up; rehearsals were held under the guidance of mentors, and a final concert was given; guidelines were developed for teachers at art schools, and extensive video materials were prepared for further use in training programmes.

Art Location arts symposium

In 2021, a symposium on painting titled ‘Art Location: The Image of Nuclear Towns and Cities’ was held in 10 towns and cities in ROSATOM’s CATFs. The works created during the symposium became part of ROSATOM’s collection of paintings and were added to the catalogue of achievements of our compatriots in the sphere of visual arts. These works were published as an album and were showcased in a large-scale travelling exhibition, with 52 artworks forming its core.
In 2021, the Single Coordination Centre ‘Kindness. Centre. ROSATOM’s Culture Volunteers’ was launched for the first time, with grant support provided by the Russian Association of Volunteer Centres. The volunteer leaders attended the ‘We Are Together!’ Russian Volunteer Forum. The Volunteer Day is celebrated worldwide every year on 5 December. To celebrate this holiday, Russia has been holding the We Are Together International Forum for Civic Participation since 2015. The 2021 Forum was held from 2 December through 5 December in the Moscow Manege under the auspices of UNESCO and with support from ROSATOM acting as the General Partner of the Forum. The Forum was attended by leaders of the non-profit sector, sustainable businesses and the media industry from across Russia and abroad. The business programme included over 100 strategy sessions, discussions and workshops. Participants of the Forum include representatives of the community of culture volunteers from nuclear towns and cities.

In 2021, five creative theatre laboratories were held in nuclear towns and cities. From 20 through 22 December 2021, artistic directors of nine theatres in nuclear towns and cities in Central Russia, the Ural region and Siberia attended a three-day workshop in Moscow. The educational marathon for theatre representatives from ROSATOM’s host towns and cities was held in the capital of the Theatre at Nations. The aim of the marathon is to improve the professional skills of theatre staff and introduce them to new opportunities, techniques and practices.

‘Glory to Creators!’ National Creativity Competition

The ‘Glory to Creators!’ National Creativity Competition is a communication project involving both senior citizens and young people. Its goal is to preserve the memory of the residents of ROSATOM’s host towns and cities who have contributed to the development of the nuclear industry. The competition is focused on schoolchildren, who are the authors of the works submitted for the competition, and veterans who have made a contribution to the development of the nuclear industry and establishment of ROSATOM’s nuclear towns and cities. One of the most important goals of the competition is to maintain continuity between different generations. At the beginning of every academic year, the Parades of Creators are held in nuclear towns and cities, featuring the heroes and authors of creative works. The works are stored and updated on the competition website and covers over 80% of their residents. The flagship event provides a holistic framework for ROSATOM’s social projects aimed at building a single team (involving a host town or city, ROSATOM’s organisation and local residents) and improving the social well-being of the population.

In 2021, the competition programme included three focus areas: the competition of social projects, the Urban Project competition and the Day of Nuclear Towns and Cities.

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Best Municipal Practices project

In 2021, 109 applications were submitted for the competition. Eight practices won the competition. The winners chosen by the competition panel were awarded diplomas and money prizes. Other participants were awarded certificates confirming their participation in the competition.

The competition has been held every year since 2017 in 27 nuclear towns and cities. Since the launch of the competition, a total of 420 practices and initiatives focused on social and economic development have been submitted; over 20 training events have been held for leaders of municipal practices, and 27 practices have been declared winners and received financial support.

Citizen of ROSATOM’s Country project

The key objective of the project is to enable effective communication between governments and the public to promote the development of 27 nuclear towns and cities. Information is posted on the official portal of the project and is made available via the GSR mobile application, which serves as permanent discussion platforms for the community of proactive citizens. The media platforms of the project contain both news items and background information on current events in the towns and cities.

In 2020 and 2021, about 150 online quizzes were held using the Grazhdanin Strany ROSATOM (“Citizen of ROSATOM’s Country”; GSR) application, with more than 25,000 participants.

The project has been run since 2016. The mobile application was launched in 2019.

Social Design: Accelerator of Social Projects

In 2021, representatives of 14 nuclear towns and cities took part in the project, with introductory sessions, intensive and pitch sessions and project presentations held in each town and city. Over 220 social projects were presented as part of the Accelerator. About 80 best social projects received financial support in the form of grants.

Since the launch of the Accelerator in 2019, over 2,000 people have participated in the project.

Atomic Quiz

In 2021, the quiz was held online at atomdiktant.ru.

About 8,000 people registered on the project website, including over 5,500 residents of nuclear towns and cities. The residents of Zelenogorsk, Desnogorsk, Lesnoy and Balakovo showed the greatest interest in the quiz. More than 4,300 people successfully completed the quiz and were awarded a diploma.

The aim of the quiz is to promote awareness about the nuclear industry and stimulate interest in it among the residents of both ROSATOM’s host towns and cities and other Russian towns and cities.

The quiz consists of 30 closed-ended questions with varying levels of difficulty.

The correct answers to the quiz questions were published on 28 September, the Nuclear Industry Worker’s Day.

School: Third Age – the Whole World Ahead

In 2021, two guidelines and a brochure titled ‘Recommendations for At-Home Rehabilitation after COVID-19’ were developed. More than 400 people took part in the project.

In 2020, 10 video lessons were developed, recorded and subsequently presented to project participants in electronic form on tablet computers. In 2021, the programme included 11 sessions held in mixed formats (online and offline).

The project has been run since 2019 in six nuclear towns and cities.

School: Youth and Digitisation

In 2021, the training was provided online in two stages: Stage 1: Online Business Pre-Accelerator. Stage 2: Online Business Development Accelerator. Presentation of projects to the competition panel. In 2021, the competition was won by a young entrepreneur from Novouralsk who designed a mobile application called ‘Knowledge in Your Pocket’.

The project is aimed at involving young people in business, searching for and preparing digital projects and supporting young talents.
Atomic Workout

In 2021, eight nuclear towns and cities took part in the project, and about 5,500 people participated in more than 50 competitions.

The project finals were held in Glazov. The runners-up were from Novouralsk, and an athlete from Glazov won the top prize.

The project has been run since 2018.

Environmental awareness project

In 2021, seven electronic guides were prepared on various environmental topics; eight webinars were held on relevant environmental awareness issues; environmental profiles of nuclear towns and cities were prepared and published, and 94 environmental news digests were published.

The project has been run since 2019.

The Atomic Workout project is designed to promote a healthy lifestyle by offering local residents an accessible way to exercise and do sports in the courtyards, parks and sports grounds near their homes.

The tournament programme includes power workout competitions, prize contests with spectators, a workshop and a show programme by the Russian Street Workout Federation.

The project is designed to provide information and methodological support for fostering an environmental culture.

The Atomic Workout project is provided by the Atomic Transport Company JSC.

For details on environmental protection and the Corporation’s environmental impacts, see the chapter ‘Safety Report’.

4.5. WORK OF ROSATOM’S PUBLIC COUNCIL AND COMMUNITY RELATIONS

ROSATOM’s Public Council was established in 2006 as a collective expert body tasked with providing support for communication and cooperation between the Corporation’s organisations and individuals, non-profit organisations, regional and local governments in Russia and abroad.

The Public Council includes representatives of the Corporation, the scientific community, non-governmental and environmental organisations. The Council members work on a pro bono basis. The Public Council is chaired by ROSATOM's Director General.

The work of the Public Council is governed by the Regulations on ROSATOM's Public Council, as well as by the Constitution of the Russian Federation, universally recognised principles and norms of international law, federal laws and other regulations of the Russian Federation.

Key areas of work of the Public Council include:

- Organising annual meetings of ROSATOM’s representatives with government bodies and the general public represented by international and Russian civic organisations;
- Implementing socially important projects in nuclear towns and cities;
- Publishing and circulating research and popular science publications on the peaceful use of nuclear energy;
- Arranging visits to Russian and overseas nuclear facilities in order to study experience in the field of nuclear and radiation safety, environmental protection, engagement with regional and local governments and community relations.

The Public Council acts as a public advisory board under the programme titled ‘Development of Technical Capabilities, Technology and Scientific Research in the Use of Nuclear Energy in the Russian Federation until 2024’.

As part of virtual meetings, members of the Public Council led by ROSATOM's Director General performed nine public reviews of various areas of the programme ‘Development of Technical Capabilities, Technology and Scientific Research in the Use of Nuclear Energy in the Russian Federation until 2024’, as stipulated by Decree No. 270 of the President of the Russian Federation dated 16 April 2020 on the Development of Technical Capabilities, Technology and Scientific Research in the Use of Nuclear Energy in the Russian Federation, as well as federal projects forming part of the programme.
In 2021, ROSATOM’s Public Council held two in-person and nine virtual meetings.

In the reporting year, there were five commissions under the Public Council:

— The Healthcare Commission;
— The Regional Development Commission;
— The Environmental Commission;
— The Commission on the Russian Arctic and the Northern Sea Route;
— The International Affairs Commission.

In 2021, ROSATOM’s Public Council focused on the following topic areas.

Healthcare Commission

As part of the Right to Health project, which is aimed at involving the general public in improving the quality of healthcare services, 12 regional action groups of the Healthcare Commission were established in the towns and cities where ROSATOM operates.

Experts of the Commission developed proposals for improving healthcare in ROSATOM’s host regions and presented the opinion of the public and the professional community at more than 20 meetings with federal, regional and local governments.

An operating model was developed for municipal public platforms focused on healthcare. Comprehensive training was provided for 40 public experts. Two up-to-date methodologies were developed for public oversight in the field of healthcare. Oversight activities were conducted in two stages in 12 towns and cities. Plans for 2022 include continuing the implementation of the Right to Health project and public oversight activities in the sphere of healthcare management.

Environmental Commission

The Environmental Commission actively assisted in organising over 50 events involving the general public and in conducting public reviews of ROSATOM’s project implementation. In order to improve transparency and public oversight and raise environmental awareness among local communities, in 2021, the Environmental Commission conducted public monitoring of the system for permanent isolation of RAW and for ensuring that its storage is safe for local residents and the environment.

Regional Development Commission

Forming an expert community and establishing an expert agenda is a vital prerequisite for successful implementation of spatial and regional development models in the current environment. In 2021, two meetings were held with academics and industry researchers to discuss the prospects of sustainable development of nuclear towns and cities. Approaches to the work of the Commission were defined for 2022. They can be generally described as the Knowledge Community. They involve leveraging collective mechanisms and points of convergence for the expert community whose members have, among other things, practical experience and empirical knowledge across a variety of human activities such as business, philosophy, design, ecology and economics, in order to identify areas for the development of nuclear towns and cities.

Commission on the Russian Arctic and the Northern Sea Route

In 2021, the Commission was headed by Vyacheslav Fetisov, UN Goodwill Ambassador, Chairman of the All-Russian Society of Nature Protection, Deputy of the State Duma of the Russian Federation. The Commission was actively involved in preparing proposals and recommendations for providing a sustainable basis for integrated social and economic development of the Russian Arctic. The programme of the 26th UN Climate Change Conference (COP26) included a series of round-table discussions held on the initiative of Vyacheslav Fetisov: Energy Transition, Sustainable Finance, and Sustainable Development of the Arctic Region.

International Affairs Commission

In 2021, the Commission prepared and submitted comments to the sixth chapter of the draft report of the international Intergovernmental Panel on Climate Change (IPCC) focused on energy systems and their interactions with the UN Sustainable Development Goals for the 26th UN Climate Change Conference (COP26).
Community liaison offices of ROSATOM’s Public Council

Community liaison offices of the Public Council serve as a platform for dialogue with the general public, civic associations, regional and local governments, professional associations and nuclear organisations. The community liaison offices operate in 14 nuclear towns and cities in 12 constituent entities of the Russian Federation.

In 2021, key tasks of the community liaison offices of the Public Council included:

- Providing a discussion platform and setting up communications;
- Working with governing bodies in towns, cities, organisations and regions;
- Stakeholder engagement and crisis management;
- Monitoring public sentiment;
- Shaping media coverage and engaging with the media;
- Performing the function of a civic watchdog in the regions;
- Taking part in projects run by the commissions of the Public Council;
- Arranging socially important events focused on the development of ROSATOM’s host regions and the relevant projects.

In the reporting year, over 3,200 requests and enquiries were submitted by individuals to the community liaison offices; in 93% of cases, a positive resolution was achieved. In 2021, the topic of ROSATOM’s Public Council received 2,300 mentions; expert publications in federal and regional media garnered 558,000 views.

In 2022, ROSATOM’s Public Council is expected to:

- Conduct public oversight activities and public reviews in focus areas of the commissions under the Public Council;
- Set up new expert clubs specialising in focus areas of the Public Council in constituent entities of the Russian Federation;
- Cooperate with the All-Russian Society of Nature Protection;
- Develop the concept of an environmental transparency standard for the nuclear industry;
- Increase the number of commissions and community liaison offices in nuclear towns and cities.
ГЛАВА 5.
ОТЧЕТ ПО БЕЗОПАСНОСТИ
Dear readers,

I would like to present ROSATOM’s Safety Report, which contains information on the Corporation’s efforts aimed at ensuring nuclear and radiation safety, industrial and fire safety and protecting the environment in 2021.

The scope of the Corporation’s business expands year by year, as ROSATOM assumes control over new industrial operations that are often challenging in terms of safety. In this context, regular public disclosure of accurate data on safety performance provides compelling evidence of consistent efforts to ensure safety in the industry and is a strong argument in favour of public acceptance of the Corporation’s operations in its host regions.

Despite the coronavirus pandemic, in 2021, ROSATOM worked towards its production goals as planned and in compliance with all safety requirements. The imposed restrictions necessitated a shift to remote communication, which, in turn, helped to speed up managerial decision-making and encouraged all employees to adopt a more responsible approach and focus more closely on safety matters.

The data provided in this report confirm the high level of safety of nuclear technology, which encourages the roll-out of existing best corporate practices in safety management to other non-nuclear businesses of the Corporation. The accident-free operation of nuclear power plants and non-nuclear power generation facilities, nuclear fuel cycle organisations, the Nuclear Weapons Division and other industrial enterprises in 2021 was made possible due to the hard work and dedication of a large number of industry managers and specialists.

The implementation of a set of industry-wide safety measures in ROSATOM’s organisations produced the following key results:

- There were no deviations in the operation of nuclear facilities rated above level 0 on the International Nuclear and Radiological Event Scale (INES);
- Limits on radiation exposure or man-made radiation contamination of sites were not exceeded;
- Radionuclide content in various components of the environment (air, water, soil, vegetation, etc.) did not exceed reference levels;
- Government functions related to the registration of hazardous industrial facilities were performed in full, and the safe operation of these facilities was ensured.

Measures forming part of the Federal Target programme on Nuclear and Radiation Safety for the period from 2016 through 2020 and until 2030 (FTP NRS 2) are being implemented successfully and on schedule. In 2021, ROSATOM continued to prepare and decommission facilities posing nuclear and radiation hazards, including the shut-down NPP power units, to remove SNF from NPP sites and research institutes, and to build RAW and SNF handling facilities. In 2021, 905.12 tonnes of SNF were removed from Russian nuclear facilities, and 81.88 tonnes were reprocessed. The share of reprocessed SNF totalled 14.8% of the annual SNF generation volume in the Russian Federation. Radiation-contaminated sites with an area totalling 175,400 m² were rehabilitated. The Corporation gained its first experience in the decommissioning of a nuclear icebreaker as the Sibir icebreaker was decommissioned in the reporting year. At year-end 2021, all targets under FTP NRS 2 were achieved, with progress in the achievement of the main goal of FTP NRS 2 totalling 29.1%, as against the target of 27.4%.

Environmental monitoring is carried out to assess environmental safety performance and improve the environment; its findings make it possible to plan and implement measures aimed at minimising the negative environmental impact. Special focus is given to radiation monitoring in the locations of nuclear facilities operated by organisations in the industry. For this purpose, ROSATOM operates a radiation monitoring system and implements specific projects, such as radiation and environmental monitoring of the Yenisei River floodplain.

I believe that information provided in this report will be of interest and relevance to specialists and local communities in those regions where nuclear organisations make a significant contribution to social and economic development.
Key results in 2021:
- No events rated at level 1 or higher on the INES scale were detected.
- The injury frequency rate and the lost time injury frequency rate (LTIFR) stood at 0.24 and 0.08 respectively (for details, see section 3.3.1).
- Individual radiation risk was calculated for 65,116 people using the IRAW system.
- A total of 905.12 tonnes of SNF were removed from nuclear facilities in the Russian Federation.
- 81.88 tonnes of SNF were reprocessed.
- Reprocessed SNF accounted for 14.8% of the total volume of SNF generated in the Russian Federation during the year.

Key events in 2021
In 2021, there were no events classified as an ‘accident’ or ‘incident’ at ROSATOM’s industrial facilities.

The statutory limit on radiation exposure of employees was not exceeded in 2021.

The number of violations detected by supervisory authorities at potentially hazardous nuclear facilities in 2021 decreased by 18.42% as compared to the findings of previous inspections.

5.1. Nuclear and Radiation Safety

Key results in 2021:
- No events rated at level 1 or higher on the INES scale were detected.
- Individual radiation risk was calculated for 65,116 people using the IRAW system.

5.1.1. Nuclear and radiation safety management system

ROSATOM focuses on the effective exercise of powers and performance of functions related to managing the use of nuclear energy, as determined by the laws of the Russian Federation, with safety and environmental protection as the top priority. This task is addressed by various divisions of ROSATOM and its organisations using all key government and non-governmental regulation mechanisms.

Nuclear and radiation safety management functions are performed by the following divisions of ROSATOM:
- The General Inspectorate plays a leading role in shaping the government policy on nuclear and radiation safety, takes measures to ensure the safety of nuclear facilities and monitors safety in ROSATOM’s organisations;
- The Nuclear and Radiation Safety, Licensing and Permitting Department ensures that personnel and equipment are ready to respond to emergencies at nuclear facilities and monitors the implementation of emergency prevention measures;
- The Directorate for Public Policy on Radioactive Waste, Spent Nuclear Fuel and Nuclear Decommissioning plays a leading role in the management of government programmes aimed at addressing nuclear legacy issues;
- The Technical Regulation Department updates the system of technical specifications for the safe use of nuclear energy.

5.1.2. Nuclear and radiation safety at nuclear facilities

In 2021, ROSATOM ensured safe and steady operation of nuclear organisations. There were no incidents involving radiation leaks. Limits on employee radiation exposure were not exceeded.

No licences were revoked in the nuclear industry.

In 2021, due to the deteriorating epidemiological situation and the risk of spread of COVID-19, some of the targeted inspections organised by the General Inspectorate and other divisions of the Corporation were carried out remotely.
The safety status of nuclear facilities is assessed based on the number and scale of recorded deviations in their operation, which are benchmarked against the IAEA International Nuclear and Radiological Event Scale (INES). Events on the scale are rated at seven levels: the upper levels (4–7) are termed ‘accidents’, while the lower levels are ‘incidents’ (2–3) and ‘anomalies’ (1). Events that have no safety significance are classified as below scale, at level 0. Events that have no safety relevance are classified as ‘out of scale’.

**Nuclear power plants**

Over the years, no events rated at level 1 or higher on the international INES scale have been detected at Russian nuclear power plants.

In 2021, there were 34 deviations rated at level 0 and out of scale. JSC Rosenergoatom performed a thorough analysis of all deviations. Their causes were identified: most of the deviations were caused by failures of thermal and electrical equipment due to manufacturing defects which had not been detected during the installation and adjustment of the equipment. In accordance with the INES Scale User’s Manual, the Company rated each event that had occurred and developed corrective measures to prevent similar failures in the future. This approach has helped to reduce the number of deviations in NPP operation over the last few years.

### Changes in the number of deviations in NPP operation according to the INES scale

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total, including</td>
<td>33</td>
<td>42</td>
<td>38</td>
<td>24</td>
<td>34</td>
</tr>
<tr>
<td>Level 0 and out of scale</td>
<td>33</td>
<td>40</td>
<td>38</td>
<td>24</td>
<td>34</td>
</tr>
<tr>
<td>Level 1</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Nuclear research facilities**

In 2021, there were no nuclear, radiation or technical accidents at nuclear research facilities in ROSATOM’s organisations; no incidents rated higher than level 0 on the INES scale were detected.

Deviations were caused by the unstable operation of thermal equipment due to power supply disruptions in standalone power systems supplying the electrical load of nuclear research facilities.

### Changes in the number of deviations in the operation of nuclear research facilities

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total, including</td>
<td>3</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Level 0 and out of scale</td>
<td>3</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

**Marine nuclear propulsion units**

There were no violations of safe operating limits or conditions for propulsion units of nuclear-powered vessels in 2021; the radiation level remained within permitted limits. No events rated higher than level 0 on the INES scale were detected.

### Changes in the number of deviations in the operation of marine nuclear propulsion units

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total, including</td>
<td>11</td>
<td>16</td>
<td>0</td>
<td>5</td>
<td>22</td>
</tr>
<tr>
<td>Level 0 and out of scale</td>
<td>11</td>
<td>16</td>
<td>0</td>
<td>5</td>
<td>22</td>
</tr>
</tbody>
</table>

Most deviations in the operation of marine nuclear propulsion units were due to leaks in the pipe systems of steam generators. The recorded deviations did not affect the performance of voyage orders by the vessels.

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* Level 1 and 0 deviations do not pose a risk to employees operating the facilities, the local population or the environment.
5.1.3. Physical protection of nuclear facilities

The security and physical protection of ROSATOM’s facilities posing nuclear and radiation hazards and of nuclear and radioactive materials used and stored by ROSATOM, including during their transportation, complies with Russian legislation and the Convention on the Physical Protection of Nuclear Material and is aligned with the recommendations of the International Atomic Energy Agency.

In 2021, ROSATOM continued to improve the regulatory and methodological framework in the sphere of physical protection and security (including anti-terrorism security) of nuclear facilities.

As part of the work to improve the regulatory framework, ROSATOM, in cooperation with the Federal National Guard Service, developed two local regulations on physical protection and security of nuclear facilities.

Pursuant to the instructions of the National Antiterrorism Committee, the Corporation issued two orders to ensure anti-terrorism security and developed guidelines for the managers of nuclear facilities for which security areas with a special legal regime have been established.

Pursuant to Decree No. 876 of the Russian Government dated 29 August 2014, lists of ROSATOM’s facilities (premises) subject to anti-terrorism protection were updated and approved by the relevant order.

Statutory and local regulations drafted by ROSATOM have enabled the development of uniform industry-wide approaches to physical protection and security (including anti-terrorism security) of nuclear facilities.

In 2022, ROSATOM plans to draft a decree of the Russian Government on amending the Rules for Physical Protection of Nuclear Materials, Nuclear Facilities and Nuclear Material Storage Sites, obtain approval from the relevant federal executive agencies and submit the draft decree to the Russian Government. The Corporation also plans to further improve its regulatory and methodological framework for physical protection and anti-terrorism security of nuclear facilities.

The main mechanisms for ensuring physical protection and anti-terrorism security are as follows:

- Monitoring of the physical protection and anti-terrorism security of ROSATOM’s facilities (premises) by the relevant departments;
- Ensuring the reliable operation of existing physical protection and security equipment at facilities, as well as its scheduled modernisation and improvement;
- Strict compliance with the requirements of federal and industry-wide regulations.

As part of departmental monitoring, in accordance with the Consolidated Plan of Inspection Activities, 11 inspections of the physical protection of nuclear materials, nuclear facilities and nuclear material storage sites were conducted in 2021 in the Corporation’s organisations. This included inspections of their anti-terrorism security status.

In 2019 and 2020, 12 and 8 inspections respectively were conducted as part of departmental monitoring.

The findings of all inspections were documented in reports; progress is being monitored on corrective measures to eliminate the deficiencies identified in the course of inspections and implement the recommendations from the commissions.

Due to the threat of the entry and spread of the new coronavirus infection (COVID-19) in 2021, targeted inspections forming part of departmental monitoring in five of ROSATOM’s organisations did not involve site visits by the Corporation’s employees; instead, they were conducted by security specialists of these organisations.

Proposals have been prepared to conduct inspections of physical protection as part of departmental monitoring at 12 nuclear facilities in 2022. The proposals have been included in the Consolidated Plan of Inspection Activities for 2022 approved by order of the Corporation.

In 2021, ROSATOM continued to enhance the information system for monitoring the status of the system for physical protection of ROSATOM’s facilities posing nuclear and radiation hazards. Six new workstations for security analysts at nuclear facilities were remotely connected to the information system. In 2021, ROSATOM launched a redesign of software for the information system as part of the import substitution policy. The work will be continued in 2022.

According to the data provided by ROSATOM’s organisations for 2021:

- As part of the Corporation’s approved programmes, efforts continued to improve physical protection and security equipment at facilities posing nuclear and radiation hazards. All physical protection and security equipment is fully operational; its maintenance is carried out as scheduled. New equipment (that has been in operation for less than 10 years) accounts for 74% of all physical protection equipment at nuclear facilities (73% and 74% in 2019 and 2020 respectively);
- Scheduled work was carried out to maintain automated security systems for transportation installed in control centres and special vehicles (railway cars, special motor vehicles and vessels) and replace equipment that had reached the end of its specified service life.
Measures were organised and implemented in full to ensure the physical protection and anti-terrorism security of facilities (premises) of nuclear organisations.

Measures taken in cooperation with the Federal Security Service of Russia, the Federal National Guard Service and the Ministry of Internal Affairs of Russia made it possible to prevent unlawful acts against nuclear facilities.

In 2021, as in the previous years, there were no violations of access control or internal security regulations at ROSATOM’s facilities resulting in the theft of nuclear materials, terrorist acts or sabotage at nuclear facilities.

5.1.4. Emergency preparedness

In order to ensure the safe operation of the nuclear industry and protect employees, the local population and regions against the possible effects of accidents (emergencies), ROSATOM operates an emergency prevention and response system (EPRS), which is a functional subsystem forming part of the integrated state system for emergency prevention and response (ISSERP).

As at 31 December 2021, 66 emergency response teams had undergone certification and were in a state of readiness in the Corporation, including 15 professional and 61 volunteer teams. They comprise a total of 2,831 emergency response workers.

In order to ensure practical preparedness of EPRS management bodies, personnel and equipment to respond to emergencies at nuclear facilities, 762 operational training exercises were conducted in 2021, including 18 command post exercises, 16 tabletop exercises and 438 emergency drills.

In the reporting year, the needs of organisations in the industry for special cargo transportation were fully met. All shipments of nuclear materials, radioactive substances and products made from them fully complied with established requirements. An industry-wide automated system for safe transportation of radioactive substances (ASST-RS) was deployed. Work was continued to produce and upgrade special vehicles and equip them with modern automated security systems.

5.1.5. Industry-Wide Radiation Monitoring System

The Industry-Wide Radiation Monitoring System (IRMS)97 is in operation in the Russian nuclear industry as a functional subsystem of the Integrated State Automated Radiation Monitoring System (ISARMS) in Russia. The IRMS includes:

- The departmental information and analysis centre (DIAC), which integrates data from local radiation monitoring systems at facilities posing nuclear and radiation hazards, including the findings of on-site subsurface condition monitoring (OSCM) and information from the industry-wide automated radiation monitoring system (IARMS);
- 30 local radiation monitoring systems operating in ROSATOM’s organisations included in potential radiation hazard categories 1 and 2.

The local radiation monitoring systems in ROSATOM’s organisations perform regular radiation monitoring in buffer areas and radiation control areas, including:

- Continuous automated monitoring of the gamma radiation dose rate through the ARMS (a total of 417 monitoring stations are integrated into the IARMS, including 106 stations located at industrial sites and 311 stations in buffer areas and radiation control areas);
- Periodic monitoring of the gamma radiation dose rate using portable and mobile equipment, dosimeters, radiometers and spectrometers, as well as on-site monitoring of the annual gamma radiation dose in buffer areas and radiation control areas using accumulating dosimeters (1,124 stations monitoring the gamma radiation exposure dose rate/ambient dose equivalent rate (EDR/ADER) that are not part of the IARMS, and 63 monitoring routes where the gamma radiation EDR/ADER and contamination with alpha and beta particles are measured);
- Periodic monitoring (using portable, mobile and fixed equipment) of radionuclide content in various components of the natural environment: in the lowest layer of the atmosphere, atmospheric precipitation, soil, surface water bodies into which liquid effluents are discharged and hydrologically connected water bodies, bottom sediments, aquatic organisms, groundwater, vegetation, as well as in locally produced food products and fodder. For this purpose, 2,869 monitoring stations and 1,415 OSCM wells were used in 2021.

In 2021, local radiation monitoring systems performed 191,620 measurements (not including IARMS data received automatically); radionuclide content in various components of the environment in buffer areas and radiation control areas of ROSATOM’s organisations did not exceed reference levels.

97 Pursuant to Article 20 of Federal Law No. 170-FZ of 21 November 1995 on the Use of Nuclear Energy, ROSATOM performs state radiation monitoring in the Russian Federation in the locations of nuclear facilities owned by operators with respect to which ROSATOM exercises government control over the use of nuclear energy.
In order to promptly respond to any changes in radiation levels in the locations of 31 facilities posing radiation hazards, automated radiation monitoring systems integrated into the industry-wide system (IARMS) are in operation. Real-time data (on the gamma radiation dose rate and meteorological parameters) recorded by the system are transmitted to the crisis response centre (Private Institution Situation and Crisis Centre of ROSATOM). Real-time data from radiation monitoring stations in buffer areas and radiation control areas of ROSATOM’s organisations are available at: www.russianatom.ru.

In 2021, radiation levels in the areas where ROSATOM’s organisations are located were within the range of natural background radiation.

The analysis of radiation monitoring findings over at least the last decade suggests that normal operation of nuclear facilities has no significant impact on radiation levels.

Amid the ongoing development of the nuclear industry, the government and society have heightened expectations for the safety of technologies used in the industry. One of the ways to improve safety is to enhance the quality and reliability of environmental monitoring. ROSATOM has adopted the IRMS development programme for the period from 2021 through 2030, which will enable the Corporation to expand the IRMS system and improve the accuracy of real-time data on radiation levels in the areas where nuclear facilities are located.

5.1.6. Industrial safety

As at 31 December 2021, ROSATOM’s organisations operated 725 hazardous industrial facilities.

<table>
<thead>
<tr>
<th>Hazard class</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6</td>
<td>7</td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>32</td>
<td>32</td>
<td>33</td>
</tr>
<tr>
<td>3</td>
<td>282</td>
<td>276</td>
<td>287</td>
</tr>
<tr>
<td>4</td>
<td>477</td>
<td>397</td>
<td>396</td>
</tr>
<tr>
<td>Total</td>
<td>737</td>
<td>712</td>
<td>725</td>
</tr>
</tbody>
</table>

In 2021, as part of efforts to ensure compliance of the industrial safety management system with new mandatory requirements, ROSATOM made amendments to the Uniform Industry-Wide Guidelines on the Establishment of an Industrial Safety Management System in ROSATOM’s Organisations and continued to manage the risk of accidents at hazardous industrial facilities controlled by the Corporation. Calculations of metrics used to assess the probability of potential negative consequences of non-compliance with industrial safety requirements at hazardous industrial facilities controlled by the Corporation show that the level of risk of accidents is acceptable.

All equipment used at hazardous industrial facilities of ROSATOM’s organisations undergoes timely technical inspection and industrial safety assessment. Pursuant to the law on compulsory third-party liability insurance for the owner of a hazardous facility for potential damage from an accident at a hazardous facility, ROSATOM arranges compulsory insurance.

Personnel operating hazardous industrial facilities have undergone a comprehensive industrial safety certification and are provided with special clothing and personal protective equipment of appropriate quality.

In 2021, there were no events classified as an “accident” or “incident” at ROSATOM’s industrial facilities.

Plans for 2022 include further improvement of the industrial safety management system, including the development of a uniform procedure for ensuring compliance of hazardous industrial facilities with federal industrial safety rules and standards. ROSATOM plans to organise a meeting on industrial safety matters with representatives of holding companies of its Divisions/incubated businesses and functional organisations via video conferencing (to discuss current matters related to industrial safety) and hold an annual R&D workshop on industrial safety (to provide training and inform about the latest developments in the sphere of legal regulation). In the course of industrial safety inspections, special focus will be given to hazard class 4 facilities, as it is at these facilities that the largest number of violations of mandatory requirements are detected.
5.1.7. Fire safety

The fire situation at ROSATOM’s facilities is stable.

In 2021, there were no fires at facilities under construction in the industry. There were 12 fires at facilities operated by ROSATOM. No harm to the life or health of personnel was caused, and there were no violations of the limits or conditions of safe operation of the facilities.

The cost of the damage totalled RUB 281,200.

5.1.8. Radiation exposure of employees

Ionising radiation is an occupational hazard specific to ROSATOM’s organisations. Radiation safety criteria for personnel are laid down in the Radiation Safety Standards (NRB-99/2009), the Basic Sanitary Rules of Radiation Safety (OSPORB-99/2010) and other regulations. Most nuclear organisations provide workplace conditions that fully meet the requirements set out in these documents.

Average annual effective radiation dose for employees

As at 31 December 2021, 65,116 people (group A personnel) in ROSATOM’s organisations were under individual radiation exposure monitoring. This number increased by 0.15% compared to 2020 but decreased by ~5% over the last 10 years.

In 2021, the average annual effective radiation dose for ROSATOM’s employees totalled 1.44 mSv. The average annual effective radiation dose for employees has been declining over the past 10 years (down by ~15% compared to 2012).

The statutory limit on radiation exposure of employees was not exceeded in 2021. There were no persons with a total effective dose of more than 100 mSv over five consecutive years (from 2017 through 2021). The annual exposure limit of 50 mSv was not exceeded.

In the structure of radiation exposure of employees, the share of employees with doses ranging between 2 mSv and 20 mSv tends to decrease (from ~27% in 2012 to 20% in 2021).
Individual radiation risks

Individuals exposed to ionising radiation in the course of their work are at risk of damage to their health (are exposed to radiation risk) when performing their jobs. During planned occupational exposure, the main radiation health risk is an increased incidence of cancer. The likelihood of developing cancer due to occupational exposure depends not only on the rate of absorbed dose accumulation but also on other factors, such as gender, age at the time of exposure, age reached, etc. These dependencies, which have been formalised in the form of mathematical models, are used in the IRAW system to inform the assessment of individual radiation risks incurred by ROSATOM's employees during occupational exposure.

The IRAW system has been created by ROSATOM jointly with the Russian Scientific Commission on Radiological Protection. The underlying technology gained international recognition following the publication of an IAEA Technical Document (TECDOC) titled ‘Assessment of Prospective Cancer Risks from Occupational Exposure to Ionising Radiation’ (hereinafter referred to as the IAEA Technical Document) in December 2021. Based on the IAEA Technical Document and the findings of long-term monitoring of radiation risks of group A personnel using the IRAW system, ROSATOM is developing an industry-wide system for managing individual radiation health risks to employees associated with planned occupational exposure. This will make it possible to optimise radiation protection of personnel in both planned and emergency exposure situations by forming emergency response teams taking into account the individual radiation risks of their members.

In 2021, individual risk was calculated for 65,116 people, or 100% of the total number of group A employees. The vast majority of group A employees work in the conditions of acceptable occupational risk. For 748 people (1.15% of the total number of employees included in the IRAW system), individual risk exceeded the standard value of 10⁻³. The high-risk group comprises mainly industry veterans, whose average age exceeds 60 years.

Over the past three years, the average individual radiation risk across ROSATOM did not exceed 6.5% of the standard value, and the maximum individual risk has been decreasing steadily.

Changes in the key indicators of the IRAW system in ROSATOM, %

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of employees in the negligible and acceptable occupational risk areas</td>
<td>98.92</td>
<td>98.83</td>
<td>98.85</td>
</tr>
<tr>
<td>Share of employees in the high-risk group</td>
<td>1.08</td>
<td>1.17</td>
<td>1.15</td>
</tr>
<tr>
<td>Share of employees in the industry undergoing individual radiation exposure monitoring and included in the IRAW system</td>
<td>99.8</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Individual radiation risks of personnel, relative units

<table>
<thead>
<tr>
<th>Division/complex/unit</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Engineering Division</td>
<td>9.0 \times 10⁻³</td>
<td>9.3 \times 10⁻³</td>
<td>9.6 \times 10⁻³</td>
</tr>
<tr>
<td>Mechanical Engineering Division</td>
<td>4.0 \times 10⁻³</td>
<td>3.9 \times 10⁻³</td>
<td>3.9 \times 10⁻³</td>
</tr>
<tr>
<td>Fuel Division</td>
<td>2.5 \times 10⁻³</td>
<td>2.5 \times 10⁻³</td>
<td>2.6 \times 10⁻³</td>
</tr>
<tr>
<td>Mining Division</td>
<td>2.8 \times 10⁻³</td>
<td>2.8 \times 10⁻³</td>
<td>2.9 \times 10⁻³</td>
</tr>
<tr>
<td>Nuclear Weapons Division</td>
<td>4.4 \times 10⁻³</td>
<td>4.4 \times 10⁻³</td>
<td>4.5 \times 10⁻³</td>
</tr>
<tr>
<td>Environmental Solutions</td>
<td>3.8 \times 10⁻³</td>
<td>3.7 \times 10⁻³</td>
<td>3.7 \times 10⁻³</td>
</tr>
<tr>
<td>Science and Innovations</td>
<td>7.4 \times 10⁻³</td>
<td>7.4 \times 10⁻³</td>
<td>7.2 \times 10⁻³</td>
</tr>
<tr>
<td>Engineering and Construction</td>
<td>1.6 \times 10⁻³</td>
<td>9.6 \times 10⁻³</td>
<td>1.7 \times 10⁻³</td>
</tr>
<tr>
<td>Rusatom Healthcare</td>
<td>2.0 \times 10⁻³</td>
<td>1.9 \times 10⁻³</td>
<td>1.9 \times 10⁻³</td>
</tr>
<tr>
<td>Northern Sea Route</td>
<td>4.8 \times 10⁻³</td>
<td>4.7 \times 10⁻³</td>
<td>3.8 \times 10⁻³</td>
</tr>
<tr>
<td>Total across the Corporation</td>
<td>6.1 \times 10⁻³</td>
<td>6.2 \times 10⁻³</td>
<td>6.4 \times 10⁻³</td>
</tr>
</tbody>
</table>

Outcomes of inspections by supervisory authorities

The number of violations detected by supervisory authorities at potentially hazardous nuclear facilities in 2021 decreased by 18.42% as compared to the findings of previous inspections. Supervisory authorities inspected 65 organisations of ROSATOM and conducted 97 routine inspections, including ongoing monitoring, with 67 inspections conducted by commissions. 43% of inspections conducted by supervisory authorities in 33 organisations and their branches revealed no issues.

Organisational measures taken to reduce the number of violations at potentially hazardous facilities produce positive results.
In 2021, nuclear and radiation safety inspections were conducted at 142 nuclear facilities; following 87 routine inspections, at 90% of the facilities no violations were detected that could affect their safe operation.

Summary of measures in the sphere of accreditation, expert certification, standardisation and technical regulation. Main outcomes of standardisation activities in 2021

Pursuant to Articles 8 and 10 of Federal Law No. 317-FZ of 1 December 2007 on State Atomic Energy Corporation Rosatom, as well as Decree No. 669 of the Government of the Russian Federation dated 12 July 2016 on Approval of the Regulations on Standardisation with Regard to Products (Work, Services) Subject to Requirements for the Safe Use of Nuclear Energy, as well as Processes and Other Subjects of Standardisation Related to Such Products, in 2021:

1. Amendments were made to the Standardisation Programme of ROSATOM98;
2. The following documents were approved:
   - 44 national standards;
   - 2 provisional national standards;
   - 11 standards of ROSATOM.

ROSATOM approved the Regulations on the Main Standardisation Organisation (MSO) in the Use of Nuclear Energy for Personal Protective Equipment (JSC Rosenergoatom)99.

In order to address the special characteristics and needs of the nuclear industry when developing and updating standardisation documents, ROSATOM’s organisations are involved in the work and are members of 41 national technical committees for standardisation and one project technical committee for standardisation, and are observers on two technical committees for standardisation.

The secretariat of the Technical Committee of the International Electrotechnical Commission (IEC) on Nuclear Instrumentation (IEC/TC 45) has been assigned to the Russian Federation. ROSATOM supports the activities of JSC VNIIAES (Russian Research and Development Institute for Nuclear Power Plant Operation), the primary organisation in charge of the IEC/TC 45 secretariat. As part of IEC/TC 45, the following standardisation activities were carried out in 2021:

- The secretariat prepared and circulated a document for comment on the new version of the IEC/TC 45 Strategic Business Plan;
- Proposals for developing and updating four draft standards were reviewed;

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Violations</th>
<th>Violations Affecting Safe Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>698</td>
<td>128 (90%)</td>
</tr>
<tr>
<td>2019</td>
<td>580</td>
<td>14 (10%)</td>
</tr>
<tr>
<td>2020</td>
<td>255</td>
<td>14 (10%)</td>
</tr>
<tr>
<td>2021</td>
<td>496</td>
<td>14 (10%)</td>
</tr>
</tbody>
</table>

Number of violations detected by safety regulators during routine inspections conducted by commissions at potentially hazardous facilities between 2018 and 2021

5.1.9. Functioning of systems for technical regulation, standardisation, compliance assessment, and ensuring the uniformity of measurement

In 2021, all nuclear facilities operated reliably and safely with no violations of safe operating limits or conditions, including in terms of the safety of operating personnel and local residents.

There were no deviations in the operation of nuclear facilities classified according to the International Nuclear and Radiological Event Scale (INES).
— 28 draft standards were reviewed; comments on six draft standards were prepared; 
— Nine IEC standards and one amendment to an IEC standard were published.

The Russian Federation is a full member of the Technical Committee of the International Organisation for Standardisation (ISO) on Nuclear Energy (ISO/TC 85). In 2021, experts from ROSATOM's organisations and TC 322 were engaged in the following standardisation activities under ISO/TC 85:
— 52 draft standards and one draft amendment to a standard were reviewed; 
— 11 proposals for developing and updating standards were analysed; 
— 11 ISO standards were published under ISO/TC 85 in 2021.

The Russian Federation is a full member of the Technical Committee on Additive Manufacturing (ISO/TC 261). Experts from an organisation of ROSATOM (specialists from LLC RusAT are official representatives of the Russian Federation on the ISO/TC 261 technical committee) participated in the following standardisation activities under ISO/TC 261 in 2021:
— Six draft standards, two draft technical reports and one draft technical specification were reviewed, and comments on two draft standards were prepared; 
— Six proposals for developing and updating standards were analysed.

Three ISO standards were published under ISO/TC 261 in 2021.

During the Russian Standardisation Week International Technology Forum (Saint Petersburg, 13–15 October 2021), the Russian Federal Agency for Technical Regulation and Metrology (Rosstandart) awarded the development team of JSC VNIAES (the main standardisation organisation for nuclear power plants) for practical contribution to the establishment and operation of the standardisation function in enterprises (organisations) of the defence industry; in addition, a representative of LLC RusAT (the main standardisation organisation for additive manufacturing) was awarded a certificate of appreciation from the Russian Organisation for Quality as an award nominee that has made a significant practical contribution to the development of standardisation as quality infrastructure.

Amendments were made to the consolidated list of documents on standardisation containing information about the documents (sections of documents) on standardisation whose application is mandatory. The updated consolidated list of standardisation documents is available on ROSATOM's official website.

Information about compliance assessment activities

Mandatory product certification
To ensure the safety of nuclear facilities, in 2021, certification bodies and testing laboratories accredited in the use of nuclear energy continued to perform the certification of various products subject to requirements for the safe use of nuclear energy and intended for operation (use) at nuclear power and nuclear industry facilities.

As at 31 December 2021, there were eight certification bodies accredited in the use of nuclear energy.

Following the certification conducted in 2021, 405 compliance certificates were issued (there are no targets for the issuance of certificates).

Evaluation of technical documentation
As at 31 December 2021, there were 24 expert organisations operating in the industry.

In 2021, expert organisations issued 917 expert opinions on the compliance of technical documentation with mandatory requirements and approved 784 amendments to technical documentation.

Certification testing
As at 31 December 2021, there were six main materials science organisations that assess compliance in the form of tests (certification testing).

In 2021, 662 certificates were issued for new welding technologies; three certificates were issued for non-destructive testing systems, and one certificate was issued for new materials.

Certification of personnel performing non-destructive and destructive testing of metal
Pursuant to federal standards and rules on the use of nuclear energy NP-071-18 Rules for Assessing Compliance of Products Subject to Requirements for the Safe Use of Nuclear Energy and Processes for Product Engineering (Including Surveys, Manufacture, Construction, Assembly, Adjustment, Operation, Storage, Transportation, Sales, Dismantling and Disposal), as at 31 December 2021, 13 documents on personnel certification in accordance with the GOST R

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100 Orders of ROSATOM No. 1/110-P dated 4 February 2021; No. 1/198-P dated 12 February 2021; No. 1/278-P dated 10 March 2021; No. 1/641-P dated 7 July 2021; No. 1/650-P dated 9 July 2021; No. 1/769-P dated 12 October 2021.

50.05.11-2018 standard were developed and came into force. Three bodies were authorised to perform competency verification in accordance with the GOST R 50.05.11-2018 standard.

In the reporting year, 9,826 personnel certification procedures were performed.

Information on the accreditation of certification bodies and testing laboratories (centres) and certification of accreditation experts

Accreditation of certification bodies and testing laboratories and certification of accreditation experts are carried out as part of public services provided by ROSATOM pursuant to Federal Law No. 210-FZ of 27 July 2010 on the Provision of Public and Municipal Services and Decree No. 612 of the Government of the Russian Federation dated 20 July 2013 on Accreditation in the Use of Nuclear Energy.

In 2021, ROSATOM received 140 requests for the provision of government accreditation services in the use of nuclear energy (seven requests were subsequently withdrawn by the applicant) and issued 29 accreditation certificates (following initial accreditation and/or reissue).

The following decisions were made:

— To grant accreditation to eight organisations (one certification body and seven testing laboratories (centres);
— To deny accreditation to seven organisations (one certification body and six testing laboratories (centres);
— To expand the scope of accreditation of nine organisations;
— To reduce the scope of accreditation of 10 organisations;
— To refuse to expand the scope of accreditation of one organisation;
— To refuse to reduce the scope of accreditation of 12 organisations;
— To reissue the accreditation certificates for three organisations that had complied with instructions;
— To renew the accreditation certificate for one organisation that had complied with instructions;
— To deny one organisation the provision of a government service involving the confirmation of compliance by the accredited entity with instructions to address the identified instances of non-compliance;
— To invalidate the accreditation certificates of two organisations.

31 scheduled inspections were carried out in 2021. Based on the findings of the inspections, ROSATOM issued instructions to six inspected organisations and, accordingly, suspended six accreditation certificates. To date, in four instances, instructions have been carried out, and the competency of accredited entities has been verified; in one instance, instructions have not been carried out, and one accreditation certificate has been invalidated.

Overall, as at 31 December 2021, ROSATOM accredited (as a cumulative total since the start of provision of the relevant government service by ROSATOM):

— 8 certification bodies;
— 59 testing laboratories (centres) (certificates issued to three of them are currently suspended).

In 2021, ROSATOM received 29 requests for the provision of government services involving the certification of experts on accreditation in the use of nuclear energy and issued three expert certificates.

The following decisions were made:

— To grant certification to three accreditation experts (one expert on the accreditation of certification bodies and two experts on the accreditation of testing laboratories (centres); 
— To deny certification to five applicants (three in the field of accreditation of certification bodies and two in the field of accreditation of testing laboratories (centres));
— To deny the verification of competency to one expert on the accreditation of testing laboratories (centres);
— To invalidate five expert certificates.

As at 31 December 2021, ROSATOM granted certification to a cumulative total of 41 accreditation experts, including 13 experts on the accreditation of certification bodies and 28 experts on the accreditation of testing laboratories (centres).

Information about the accredited entities and the persons who underwent certification is available on ROSATOM’s official website.

Proper organisation and the high quality of accreditation and certification of experts enabled ROSATOM to avoid any appeals from applicants, accredited entities or persons seeking the status of accreditation experts in 2021.

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102 The information is available at: http://www.rosatom.ru/about/technicheskoe-regulirovanie/akkreditatsiya-v-oblasti-ispolzovaniya-atomnoy-energii-/.
Summary of measures supporting the functioning of the system for ensuring the uniformity of measurements

Regulatory framework underlying the system for ensuring the uniformity of measurements in the use of nuclear energy

Pursuant to Order No. 456 of the Ministry of Industry and Trade of Russia dated 11 February 2020 on Approval of Requirements for the Content and Design of National Calibration Hierarchies and Local Calibration Hierarchies, Including Their Development, Approval and Revision, Requirements for the Documentation of Initial Certification and Regular Certification of Standards of Measurement Used in Government Regulation of the Uniformity of Measurements, the Form of the Certificate for a Standard of Measurement, Requirements for the Documentation of Rules for the Maintenance and Use of a Standard of Measurement, the Form of the Notification of Inapplicability of a Standard of Measurement, Order of ROSATOM No. 1/17-NPA dated 21 December 2020 on Approval of the Procedure for the Certification of Standards of Measurement in the Use of Nuclear Energy was registered (registration No. 63319 dated 30 April 2021).


ROSATOM’s standards were developed and adopted, setting out:
— Requirements for metrological supervision in the nuclear industry (STO 95 12072-2021: Metrological Supervision in the Use of Nuclear Energy. Principal Provisions and Procedures);
— Requirements for metrologically relevant software (STO 95 12073-2021: Software Used for Measuring. Principal Requirements);
— Requirements for the evaluation of measurement capabilities in the nuclear industry (STO 95 12074-2021: Evaluation of Measurement Capabilities. General Provisions).

Information system and expert activities aimed at ensuring the uniformity of measurements in the use of nuclear energy

Pursuant to Order No. 2037 of the Ministry of Industry and Trade of Russia of 10 October 2014 on Approval of the Procedure for the Organisation and Maintenance of Sections of the Federal Information Fund for Ensuring the Uniformity of Measurements on the Use of Nuclear Energy, a total of 272,756 entries concerning measurement techniques (methods), standards of measurement, measuring instruments of the approved type and information on calibration testing of measuring instruments were made in the section of the Federal Information Fund for Ensuring the Uniformity of Measurements on the use of nuclear energy (as at 31 December 2021).

In accordance with the Procedure for Mandatory Metrological Evaluation in the Use of Nuclear Energy (approved by Order No. 1659 of the Ministry of Industry and Trade of Russia dated 29 May 2017), mandatory metrological evaluation of 14 draft national standards and technical specifications developed for the use of nuclear energy was carried out in order to include them in the consolidated list of documents on standardisation; in addition, metrological evaluation of 43 draft standards and technical specifications applied in the use of nuclear energy was carried out.

Establishment of the Calibration System at ROSATOM

A Calibration System for the Use of Nuclear Energy was established (pursuant to Order of ROSATOM No. 1/10-NPA dated 31 December 2013 on Approval of Metrological Requirements for Measurements, Standards of Measurement, Reference Standards, Measuring Instruments, Their Components, Software and Measurement Techniques (Methods) Applied in the Use of Nuclear Energy).

As part of the System, a core organisation of the metrological calibration service was established and is operating (Order of ROSATOM No. 1/356-P dated 10 April 2018).

In 2021, the competency of one organisation of ROSATOM was verified; three calibration techniques were developed, and metrological evaluation of two calibration techniques was carried out.

Interlaboratory comparisons (ILCs)

As part of the system of interlaboratory comparisons, ILCs of mechanical properties of metal samples and ILCs of dimensions, weight and radiometric measurements were carried out. In 2021, a total of 272,756 entries concerning measurement techniques...
Inspection of the condition and use of measuring instruments, compliance with metrological rules and standards, and evaluation of measurement capabilities

ROSATOM's organisations carry out annual inspections of the condition and use of measuring instruments, standards of measurement, measurement, testing and monitoring techniques (methods), reference standards, certified items, testing equipment, standard reference data, tolerance monitoring instruments, compliance with metrological rules and standards (metrological supervision) and evaluation of measurement capabilities in measurement and testing laboratories.

In 2021, metrological supervision was performed in 23 organisations, and measurement capabilities were assessed in 46 laboratories of ROSATOM's organisations.

Based on the findings of metrological supervision, in the reporting year, a consolidated report was prepared for submission to the Russian Federal Agency on Technical Regulation and Metrology (Rosstandart) as part of federal supervision.

Activity of the standard reference data service in the use of nuclear energy (SRDNE)

Pursuant to Decree No. 596 of the Russian Government dated 20 August 2001 on Approval of the Regulations on the National Service of Standard Reference Data on Physical Constants and Properties of Substances and Materials, the following reference data were certified:

- Thermal physics and thermal hydraulics of molten lead;
- Reference data on neutron physics: plutonium, neptunium and curium isotopes;
- Reference data on materials science: short-term mechanical properties of steel and steel swelling;
- Thermodynamic properties of liquid metals: lithium/lead eutectic, caesium;
- Updated data on properties of radionuclides produced as a result of uranium and plutonium decay;
- Reference data in the field of radiation measurements: a database of reference data on gamma standards was created.

Pursuant to Order No. 737-r of the Government of the Russian Federation dated 19 April 2017 on Approval of the Strategy for Ensuring the Uniformity of Measurements in the Russian Federation until 2025, in 2021:

- The draft Concept of Development of the SRDNE for the Period from 2021 through 2027 was reviewed and approved by the commission on the certification of reference data in the use of nuclear energy;
- Recommendations on metrology titled ‘National Measurement Assurance System. Estimates of Uncertainty/ Error in Model Dependence Parameters Assessed Based on Matched Measurements’ approved by ROSATOM and Rosstandart were issued;
- A methodological guide titled ‘Reference Data Evaluation’ was developed and approved.

5.1.10. Plans for 2022

With regard to the regulatory framework underlying the system for ensuring the uniformity of measurements in the use of the nuclear energy, the Corporation plans to:

1. Update Order of ROSATOM No. 1/14-NPA dated 9 December 2020 on Approval of the List of Measurements Subject to Government Regulation Aimed at Ensuring the Uniformity of Measurements and Performed as Part of Activities Involving the Use of Nuclear Energy, and the Relevant Mandatory Metrological Requirements, Including Measurement Accuracy Indicators (registered with the Ministry of Justice of Russia on 30 December 2020, registration No. 61929);
2. Issue national standards on metrological evaluation of technical documentation in the use of nuclear energy and on the establishment of metrological requirements for automated process control systems applied in the use of nuclear energy.

Plans concerning the information system and expert activities aimed at ensuring the uniformity of measurements in the use of nuclear energy include:

1. Modernisation of the information system for maintaining the section of the Federal Information Fund for Ensuring the Uniformity of Measurements in the Use of Nuclear Energy;
2. Development of technical specifications and launch of a project to build an integrated industry-wide system, Metrology, to provide a digital platform for metrological support in the nuclear industry.

In addition, plans for ILCs in ROSATOM’s organisations include ILCs in the sphere individual radiation exposure monitoring, specific activity of gamma-emitting radionuclides in water solutions, and measurements of mechanical properties of materials used in the nuclear industry.
5.2. RAW AND SNF MANAGEMENT AND DECOMMISSIONING OF FACILITIES POSING NUCLEAR AND RADIATION HAZARDS

Key results in 2021:
— All targets of FTP NRS 2 were achieved; progress in the achievement of the Programme’s main goal totalled 29.1% (as against a target of 27.4%).
— Five facilities posing nuclear and radiation hazards were decommissioned.
— One nuclear icebreaker was decommissioned, and eight reactor compartments from dismantled nuclear submarines were placed in long-term storage.

5.2.1. Outcomes of the Federal Target Programme on Nuclear and Radiation Safety for the period from 2016 through 2020 and for the period until 2030

In 2021, active work continued as part of the implementation of the Federal Target Programme on Nuclear and Radiation Safety for the period from 2016 through 2020 and for the period until 2030 (FTP NRS 2), including:
— Decommissioning industrial uranium-graphite reactors at FSUE Mining and Chemical Plant and JSC Pilot Production and Demonstration Centre for Decommissioning of Uranium-Graphite Nuclear Reactors and preparing for the decommissioning of the BR-10 research reactor at JSC State Scientific Centre of the Russian Federation Lepynsky Institute for Physics and Power Engineering (IPPE);
— Decommissioning facilities forming part of the radiochemical plant at FSUE Mining and Chemical Plant, building No. 802 at JSC Angarsk Electrolysis Chemical Plant, disused buildings and structures at the radiochemical plant and liquid radioactive waste storage sites at FSUE Mayak Production Association, and Reservoir 17 ‘Staroye Boloto’ (‘Old Marsh’) of FSUE Mayak Production Association;
— Maintaining the Techa Cascade of Reservoirs in a safe condition in accordance with the developed Strategic Master Plan for Addressing Issues Related to the Techa Cascade of Reservoirs;
— Preparing the shut-down power units at JSC Rosenergoatom’s NPPs (Novovoronezh, Leningrad, Bilibino and Beloyarsk NPPs) for decommissioning;
— Ongoing construction of SNF and RAW management infrastructure at Leningrad, Smolensk and Kursk NPPs;
— Ongoing rehabilitation of radiation-contaminated sites. In the reporting year, the area of rehabilitated radiation-contaminated sites totalled 175,400 m², including 6,700 m² in Medvezhyegorsk, Republic of Karelia (the request from the Head of the Republic of Karelia and the municipal administration was received in 2019, and the work was completed in 2021).

The Sibir nuclear icebreaker was decommissioned for the first time.

5.2.2. Development of the integrated national system for radioactive waste management

Volume of accumulated RAW (total, ‘nuclear legacy’, for the year, including intermediate-, high- and low-level waste)

At year-end 2021, the volume of RAW totalled 5.69×10⁸ m³, of which 5.53×10⁸ m³ were classified as accumulated RAW (‘nuclear legacy’).

RAW generation in 2021, m³

<table>
<thead>
<tr>
<th>RAW type</th>
<th>Very low-level waste</th>
<th>Low-level waste</th>
<th>Intermediate-level waste</th>
<th>High-level waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid RAW</td>
<td>7.69×10⁵</td>
<td>5.2×10³</td>
<td>1.16×10³</td>
<td>3.55×10²</td>
</tr>
<tr>
<td>Liquid RAW</td>
<td>6.51×10⁵</td>
<td>7.08×10⁴</td>
<td>2.36×10⁴</td>
<td></td>
</tr>
</tbody>
</table>

In 2021, work on the third stage of development of the Integrated National System for Radioactive Waste Management (INS RWM).

Commissioning of RAW disposal facilities

No RAW disposal facilities were commissioned in 2021.

As part of the renovation of the near-surface disposal site for solid radioactive waste in Novouralsk (Sverdlovsk Region), the procedure for obtaining a licence to operate the second stage is underway.
Outcomes and progress on plans for the construction and renovation of RAW management infrastructure

In 2021, work continued on the first stage of a permanent disposal facility (deep repository) for class 1 and class 2 RAW (Nizhne-Kansky Rock Massif, Krasnoyarsk Territory): construction of a power supply facility and surface facilities for an underground research laboratory was underway.

For the projects to build a near-surface disposal site for class 3 and 4 solid RAW (Chelyabinsk Region, Ozersk Urban District) and a near-surface disposal site for class 3 and 4 RAW in the Seversk Branch of FSUE National Operator for Radioactive Waste Management (Tomsk Region, Seversk), sets of documents were revised in 2021 in response to comments and recommendations from experts of the Scientific and Engineering Centre for Nuclear and Radiation Safety. An application and a set of documents for amendments to licence requirements for the radioactive waste disposal site in Seversk were submitted to Rostekhnadzor. Construction of complexes of auxiliary buildings and structures and warehouses, transport infrastructure, an access road to the site, internal and external utility networks continued.

Disposal of class 3 and 4 RAW continued; in the reporting year, 6,600 m$^3$ of RAW were accepted for disposal.

Three deep repositories for class 5 liquid RAW were in operation in the CATFs of Dimitrovgrad (Ulyanovsk Region), Seversk (Tomsk Region) and Zheleznogorsk (Krasnoyarsk Territory).

5.2.3. SNF management

As at 31 December 2021, the volume of SNF accumulated in the Russian Federation totalled 25,669 tonnes (tHM$^{104}$), including 16,554 tonnes of SNF in federal ownership. In the reporting year, 409 tonnes of SNF were accumulated.

During the reporting year, 905.12 tonnes of SNF were removed from nuclear facilities in the Russian Federation, and 81.88 tonnes of various types of SNF were reprocessed (including 14.63 tonnes of SNF in federal ownership). Reprocessed SNF accounted for 14.8% of the total volume of SNF generated in the Russian Federation during the year.

In 2021:

— 8,064 spent fuel assemblies (SFAs) from RBMK-1000 reactors were removed and placed in dry storage at FSUE Mining and Chemical Plant;
— 298 SFAs from VVER-1000 reactors were removed and placed in temporary storage for subsequent reprocessing at FSUE Mining and Chemical Plant;
— The following were transported to FSUE Mayak Production Association for reprocessing: 368 SFAs from VVER-1000 reactors, 257 SFAs from the BN-600 reactor and 140 SFAs from the BN-800 reactor. For the first time, SNF from the BN-800 reactor was removed from the Beloyarsk NPP site and sent for reprocessing;
— Removal of SNF from the sites of research institutes and industrial reactor facilities continued.

No new SNF reprocessing capacities were commissioned in 2021.

In the reporting year, the construction of the second start-up facility of the Pilot and Demonstration Centre (PDC) for SNF Reprocessing continued at FSUE Mining and Chemical Plant. The PDC is expected to become a leading-edge SNF reprocessing plant with a high level of environmental and economic performance.

5.2.4. Developing a system for the decommissioning of facilities posing nuclear and radiation hazards and addressing the ‘nuclear legacy’

In 2021, radiation and environmental monitoring of the Yenisei River floodplain was continued; by year-end 2021, no areas requiring rehabilitation had been identified.

As part of a project to develop an industry-wide information system for decommissioning, a pilot project to create a site-level system based on a prototype developed earlier was completed at FSUE RADON.
Work continued on a similar pilot project at JSC SSC RIAR, the largest nuclear organisation operating nuclear research facilities. A project to develop a corporate information system for digital preparation for decommissioning is scheduled to begin in 2022; it will involve developing cutting-edge tools for digital comprehensive engineering and radiation safety audit and digital development of design documentation for decommissioning, which will minimise the impact of human error on these processes.

5.2.5. Decommissioning and dismantling of facilities posing nuclear and radiation hazards

In 2021, five facilities posing nuclear and radiation hazards were decommissioned.

Decommissioning and dismantling of facilities posing nuclear and radiation hazards, units (as a cumulative total since 2016)

<table>
<thead>
<tr>
<th>Year</th>
<th>Target</th>
<th>Actual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>24</td>
<td>26</td>
</tr>
<tr>
<td>2020</td>
<td>31</td>
<td>35</td>
</tr>
<tr>
<td>2021</td>
<td>39</td>
<td>40</td>
</tr>
</tbody>
</table>

5.2.6. Dismantling of nuclear submarines

In 2021, eight reactor compartments of dismantled nuclear submarines were prepared and placed in long-term storage; the dismantling of three nuclear submarines and a Project 1144 heavy nuclear guided-missile cruiser was started; preparation of storage packages from three nuclear maintenance ships, a reactor compartment from a floating 10-compartment reactor unit and storage packages from a floating hull unit of a large Project 1941 nuclear reconnaissance ship and their placement into long-term onshore storage was started.

The disposal of 1,559 SFAs from military nuclear power systems, including damaged and uranium-beryllium fuel assemblies (37 fuel bundles), with a total volume of 2.92 tonnes was completed. 1,932 SFAs were unloaded and transported for further processing. 945 m³ of solid radioactive waste were conditioned.

5.2.7. International technical assistance received in the reporting year

In 2021, using international technical assistance funds (a total of RUB 403.5 million was received), ROSATOM transported the last 19 SFAs from the storage pits of the Lepse floating maintenance base. Thus, the dismantling of yet another facility posing a nuclear hazard has been completed in the North-Western Region.

Special equipment was manufactured to prepare storage facility 3A for the SNF unloading procedure.

Objectives and plans for 2022 and for the medium term

In 2022, ROSATOM will continue to implement the Federal Target Programme on Nuclear and Radiation Safety for the Period from 2016 through 2020 and until 2030, including:

- Continued construction of the Pilot and Demonstration Centre for Spent Nuclear Fuel Reprocessing (the second start-up facility) based on innovative technologies at FSUE Mining and Chemical Plant. In 2022, ROSATOM plans to obtain a certificate of completion for the second start-up facility of the Pilot and Demonstration Centre with a capacity of up to 250 tonnes of SNF per year, with the commissioning scheduled for 2023;
- Transportation of accumulated SNF from NPP sites to long-term storage facilities;
- Rehabilitation of radiation-contaminated sites and decommissioning of facilities posing nuclear and radiation hazards.

In terms of the dismantling of nuclear submarines, surface ships with a nuclear propulsion unit and nuclear maintenance ships and the clean-up of facilities posing radiation hazards, in 2022, ROSATOM plans to:

- Complete the dismantling of two nuclear submarines and two nuclear maintenance ships and put two storage packages from the dismantled surface ship with a nuclear propulsion unit in long-term onshore storage;
- Dispose of 3.1 tonnes of SFAs from military nuclear power systems and an experimental batch of sleeves with control and safety rod absorbers for military nuclear power systems (269 pieces);
- Unload three trainloads of SFAs from military nuclear power systems (accumulated as a result of Navy activities at the former coastal maintenance base in Andreev Bay) and transport them for disposal.

Decommissioning of a reactor unit forming part of the KV-2 test facility at FSUE Alexandrov Research Institute of Technology (to be completed in 2024) and environmental remediation of sites near pier No. 4 and special sewerage systems in Pavlovsky Bay in the Primorsky Territory (a former nuclear submarine base) was started.
5.3. ENVIRONMENTAL SAFETY

Key results in 2021:
— Expenditure on environmental protection totalled RUB 21.1 billion.
— Gross greenhouse gas emissions in the Corporation’s organisations totalled 6,790 tonnes.
— Pollutant emissions into the atmosphere from nuclear organisations totalled 37,000 tonnes.

5.3.1. Environmental safety and environmental protection management

The environmental footprint of the nuclear power industry is smaller than that of carbon-based power generation using fossil fuels. Emissions of hazardous chemicals, including those that destroy the ozone layer or contribute to the greenhouse effect, from nuclear power plants are close to zero.

ROSATOM and its organisations attach great importance to environmental safety and operate responsibly in accordance with the following principles:
— Giving priority to preserving natural ecosystems;
— Making use of the latest scientific achievements and ensuring environmental safety as a mandatory requirement;
— Transparency and making information on environmental aspects of operations of organisations in the industry publicly available.

Ensuring environmental safety in the regions where ROSATOM operates is one of the priorities of its corporate strategy. Operational efficiency, responsible use of natural resources and timely environmental protection measures combined with a willingness to share unique knowledge in order to address the nation’s environmental problems, including those related to handling hazardous waste and repairing historical environmental damage, reflect management focus on the environment and a strong environmental culture among ROSATOM’s employees.

The Corporation’s environmental priorities and values are reflected in the Uniform Industry-Wide Environmental Policy of ROSATOM and Its Organisations; the Policy was updated in 2021, which marked the start of a new stage in its development. A number of tasks facing the industry require a comprehensive approach and cannot be accomplished within a single year. Accordingly, a three-year Comprehensive Plan for the Implementation of the Environmental Policy for the period from 2022 through 2024 is currently being prepared for approval. It includes organisational, operational and technical measures to be implemented by the Corporation and its organisations in order to improve the environment and the standard of living. Successful environmental safety management requires team leadership, openness and speeding up decision-making. Accordingly, a list of environmentally relevant organisations is compiled in the industry on an annual basis (60 organisations as at 31 December 2021). The Corporation’s management gives special focus to their operations. Adhering to the principle of transparency, environmentally relevant organisations publish annual reports on environmental safety on their websites and circulate them to stakeholders at year end.

In order to prevent non-compliance with legislative and regulatory requirements for environmental protection, as part of the internal safety control system functioning in ROSATOM, inspection visits are carried out, including inspections of environmental protection at production facilities in the industry; the findings of these inspections provide a basis for managerial recommendations for improving environmental safety performance.

Organisations in the industry continue to develop and implement environmental, energy and quality management systems, as well as occupational health and safety management systems. In 2021, environmentally relevant organisations had in place the following certified management systems:

<table>
<thead>
<tr>
<th>Management system</th>
<th>Number of environmentally relevant organisations that have the system in place</th>
<th>Number of environmentally relevant organisations that plan to implement the system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental management systems compliant with the ISO 14001 standard</td>
<td>39</td>
<td>3</td>
</tr>
<tr>
<td>Quality management systems compliant with the ISO 9001 standard</td>
<td>47</td>
<td>1</td>
</tr>
<tr>
<td>Occupational health and safety management systems compliant with the OHSAS 18001 standard</td>
<td>31</td>
<td>6</td>
</tr>
<tr>
<td>Energy management systems compliant with the ISO 50001 standard</td>
<td>21</td>
<td>6</td>
</tr>
</tbody>
</table>

Performance assessment

To assess progress in the implementation of the Uniform Industry-Wide Environmental Policy in environmentally relevant organisations, ROSATOM applies the Uniform Industry-Wide Guidelines for the Use of Environmental Performance Indicators. The Guidelines are based on the requirements of environmental legislation of the Russian
An organisation’s environmental performance metrics are grouped into three categories:

- Indicators for the assessment of the negative environmental impact;
- Indicators for the assessment of current cost effectiveness of the organisation’s environmental activities;
- Indicators for the assessment of effectiveness of environmental management in the organisation.

It is mandatory for all manufacturing organisations to carry out industrial environmental control. Environmental monitoring of environmental components is carried out at large facilities. For this purpose, the organisations use fixed and mobile laboratories, stations monitoring pollutant content in various components of the environment, including monitoring wells, and weather stations.

This approach to managerial decision-making enables ROSATOM to align the economic interests of the business with the environmental interests of the government and society.

5.3.2. Financing of environmental measures

In 2021, expenditure on environmental protection in ROSATOM’s organisations totalled RUB 21.10 billion, including expenditure on environmental measures totalling RUB 19.79 billion and fixed asset investment totalling RUB 1.31 billion.

Environmental costs decreased by RUB 5.79 billion year on year. The decrease in expenditure on environmental protection was due to a decrease in investment at Leningrad NPP following the decommissioning of power unit No. 2 with an RBMK-1000 reactor and the commissioning of power unit No. 2 of Leningrad NPP-2 with a VVER-1200 reactor.

Environmental costs at ROSATOM, RUB billion

<table>
<thead>
<tr>
<th></th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenditure on environmental measures</td>
<td>17.10</td>
<td>19.56</td>
<td>19.79</td>
</tr>
<tr>
<td>Fixed asset investment for environmental purposes</td>
<td>6.25</td>
<td>7.33</td>
<td>1.31</td>
</tr>
<tr>
<td>Total</td>
<td>23.55</td>
<td>26.89</td>
<td>21.10</td>
</tr>
</tbody>
</table>

Environmental cost structure at ROSATOM in 2021, RUB billion

- Ensuring radiation safety
- Collecting and treating wastewater
- Managing industrial and consumer waste
- Protecting the atmosphere and preventing climate change
- Other

The largest portion of expenditure on environmental measures was allocated for ensuring radiation safety (46.8%).

A major part of fixed asset investment was allocated for the protection of the atmosphere (66.9%), as well as protection and sustainable use of water resources (30.4%).

Branches of JSC Rosenergoatom account for 74.6% of the total fixed asset investment of ROSATOM’s organisations aimed at environmental protection. ROSATOM’s organisations account for 0.4% of the total amount of environmental investment in the Russian Federation.

5.3.3. Environmental charges and fines

In 2021, charges for the negative environmental impact totalled RUB 116.9 million, including charges for allowable emissions and discharges of pollutants, disposal of industrial and consumer waste totalling RUB 41.6 million (35.6%), and charges for excess emissions and discharges totalling RUB 75.3 million (64.4%).
Charges for the negative environmental impact, RUB million

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Charges for allowable emissions (discharges) of pollutants (disposal of industrial and consumer waste), total, including:</td>
<td>34.0</td>
<td>35.1</td>
<td>41.6</td>
</tr>
<tr>
<td>into water bodies</td>
<td>6.0</td>
<td>3.1</td>
<td>4.1</td>
</tr>
<tr>
<td>into the atmosphere</td>
<td>3.1</td>
<td>3.1</td>
<td>4.2</td>
</tr>
<tr>
<td>for the disposal of industrial and consumer waste</td>
<td>24.9</td>
<td>28.9</td>
<td>33.3</td>
</tr>
<tr>
<td>Charges for excess emissions (discharges) of pollutants (disposal of industrial and consumer waste), total, including:</td>
<td>21.0</td>
<td>40.5</td>
<td>75.3</td>
</tr>
<tr>
<td>into water bodies</td>
<td>5.7</td>
<td>15.2</td>
<td>18.3</td>
</tr>
<tr>
<td>into the atmosphere</td>
<td>8.8</td>
<td>13.9</td>
<td>9.6</td>
</tr>
<tr>
<td>for the disposal of industrial and consumer waste</td>
<td>6.5</td>
<td>11.4</td>
<td>47.4</td>
</tr>
<tr>
<td>Charges for allowable and excess emissions (discharges) of pollutants (disposal of industrial and consumer waste)</td>
<td>55.0</td>
<td>75.6</td>
<td>116.9</td>
</tr>
</tbody>
</table>

Government supervision agencies in the field of natural resource management carry out annual audits of operations of the organisations. Minor violations were detected in certain organisations in the industry in 2021, for which administrative penalties were imposed in the form of fines. The amount of fines imposed on ROSATOM’s organisations for environmental non-compliance totalled RUB 3.7 million.

A total of 35 administrative violations were detected during the reporting period; compared to 2020, the number of violations decreased by 2.8%, while the total amount of fines decreased by RUB 0.2 million.

The violations detected by the government supervision agencies did not necessitate restrictions on production or business operations of the organisations and did not cause any significant harm to the environment.

At the same time, government supervision agencies in the field of natural resource management did not order ROSATOM’s organisations to repair environmental damage; no non-financial sanctions were imposed on the Corporation or its organisations in 2021 for non-compliance with environmental legislation and regulatory requirements in the field of environmental protection; there was no need for the use of dispute resolution mechanisms.

5.3.4. Pollutant emissions into the atmosphere

In 2021, pollutant emissions into the atmosphere totalled 37,000 tonnes; the pollutant capture rate reached 91.4%. In 2021, the Corporation’s organisations accounted for 0.2% of the total emissions in the Russian Federation\(^{108}\).

Pollutant emissions into the atmosphere\(^ {109}\), ‘000 tonnes

<table>
<thead>
<tr>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total (excluding CO(_2)), including:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Particulate emissions</td>
<td>13.4</td>
<td>14.2</td>
</tr>
<tr>
<td>NO(_x) emissions</td>
<td>10.2</td>
<td>6.1</td>
</tr>
<tr>
<td>SO(_2) emissions</td>
<td>9.7</td>
<td>11.6</td>
</tr>
<tr>
<td>CO emissions</td>
<td>3.5</td>
<td>3.3</td>
</tr>
<tr>
<td>Hydrocarbon emissions, including:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methane emissions</td>
<td>0.2</td>
<td>0.8</td>
</tr>
<tr>
<td>Volatile organic compounds</td>
<td>1.1</td>
<td>1.2</td>
</tr>
<tr>
<td>Other gaseous and liquid compounds</td>
<td>0.4</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Pollutant emissions into the atmosphere decreased by 1,000 tonnes compared to 2020 due to the modernisation and upgrades of equipment for pollutant capture and treatment. Significant changes in the volume of sulphur dioxide and nitrogen oxide emissions were caused by changes in the types or quality of fuel used at ROSATOM’s thermal power plants (CHPPs), which produce electricity and heat both for ROSATOM’s organisations and for the towns and cities in which they are located.

\(^{108}\) Calculations are based on data for 2021 provided by the Federal State Statistics Service.

\(^{109}\) Pollutant emissions are reported by ROSATOM’s organisations using chemical analysis procedures or automatic gas analysers.
Pollutant emissions from individual groups of pollution sources, ‘000 tonnes

<table>
<thead>
<tr>
<th>Particulate matter</th>
<th>From fuel combustion for electricity and heat generation</th>
<th>From production and other processes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>12.5</td>
<td>1.0</td>
</tr>
<tr>
<td>NO(_x)</td>
<td>6.5</td>
<td>0.9</td>
</tr>
<tr>
<td>SO(_2)</td>
<td>9.1</td>
<td>0.7</td>
</tr>
<tr>
<td>CO</td>
<td>2.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Hydrocarbons, including volatile organic compounds (excluding methane)</td>
<td>0.01</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Emissions of major ozone-depleting substances, tonnes of chlorofluorocarbon-11 equivalent\(^{16}\)

<table>
<thead>
<tr>
<th>Substance</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dichlorodifluoromethane (Freon 12)</td>
<td>72.24</td>
<td>72.24</td>
<td>72.24</td>
</tr>
<tr>
<td>Chlороdifluoromethane (Freon 22)</td>
<td>0.21</td>
<td>0.09</td>
<td>0.21</td>
</tr>
<tr>
<td>1,1,2-Trichloro-1,2,2-trifluoromethane (Freon 113)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Chlorotrifluoromethane (Freon 13)</td>
<td>164.21</td>
<td>164.21</td>
<td>164.21</td>
</tr>
<tr>
<td>Tetrafluoromethane (Freon 14)</td>
<td>6.24</td>
<td>6.24</td>
<td>6.24</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>242.90</strong></td>
<td><strong>242.78</strong></td>
<td><strong>242.90</strong></td>
</tr>
</tbody>
</table>

Emissions of ozone-depleting substances are associated mainly with zirconium production (JSC Chepetsk Mechanical Plant, 242.692 tonnes of chlorofluorocarbon-11 equivalent) and enriched uranium production (JSC Electrochemical Plant, 0.165 tonnes of chlorofluorocarbon-11 equivalent).

Emissions of ozone-depleting substances increased in 2021 due to refrigeration equipment at JSC Electrochemical Plant operating at full capacity.

Initiatives to reduce harmful emissions into the air

To reduce pollutant emissions into the atmosphere from ROSATOM’s organisations, in 2021, the Corporation developed an industry-wide Action Plan to Minimise the Negative Impact of ROSATOM on the Environment until 2025.

Key measures implemented as part of this plan included the following:

- JSC Chepetsk Mechanical Plant (JSC TVEL) overhauled the VT13/1 and VT13/2 gas scrubbers in building 503 of workshop No. 05, which enabled a 45.6% reduction in calcium dichloride emissions, and the VRD gas scrubber in building 715 of workshop No. 80, which enabled a 39.9% reduction in particulate emissions and helped to increase the average pollutant removal efficiency of the gas scrubber to 94.0% in 2021.
- JSC ZIO-Podolsk (JSC Atomenergomash) equipped a shot blasting chamber with an efficient gas scrubber, which reduced pollutant emissions by 2.5 tonnes per year;
- JSC SSC RIAR (JSC Science and Innovations) put into operation gas scrubbers installed on process equipment at trial facilities, which enabled the removal of 95% of wood dust from air;
- The Krasnokamensk branch of JSC RIR (JSC Rusatom Infrastructure Solutions) upgraded the ash collector, which improved ash collection efficiency by 99.4% and reduced specific ash emissions into the atmosphere from 67 g/s to 8 g/s;
- JSC Experimental and Design Organisation GIDROPRESS (JSC Atomenergomash) optimised the operating mode of boilers in the boiler house to minimise specific fuel consumption during heat generation by boilers, which reduced pollutant emissions into the atmosphere by 4%;
- The Pilot and Demonstration Engineering Centre (PDEC) (JSC Rosenergoatom) upgraded the auxiliary power supply system; this involved replacing diesel generators, which reduced the number of stationary sources of harmful (pollutant) emissions into the atmosphere and annual gross pollutant emissions by 60% and 20% respectively.

5.3.5. Greenhouse gas emissions

Climate change is recognised as one of the most pressing issues facing the international community, businesses and people. The Russian Government has ratified the Paris Agreement on Climate Change, whereby the participating countries take on a commitment to reduce greenhouse gas emissions.
In order to meet the international commitments of the Russian Federation on climate and minimise climate risks, a greenhouse gas emissions accounting system is being developed in the Russian nuclear industry:

— In 2019, a framework high-level document was developed and approved: the Regulations on a System for Accounting for Greenhouse Gas Emissions Generated by the Operations of Organisations in the Russian Nuclear Industry;
— In 2020, the Uniform Industry-Wide Guidelines for Accounting for Greenhouse Gas Emissions from Nuclear Organisations were developed;
— In 2021, an inventory of greenhouse gas emission sources was compiled in nuclear organisations.

In 2021, greenhouse gas emissions totalled 6,790.4 tonnes, up by 11.2% year on year. This was due to an increase in gas combustion in the branches of JSC RIR.

Gross greenhouse gas emissions from ROSATOM’s organisations, tonnes

<table>
<thead>
<tr>
<th>Substance</th>
<th>2019 (tonnes)</th>
<th>2020 (tonnes)</th>
<th>2021 (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon dioxide</td>
<td>5,451.8</td>
<td>5,216.9</td>
<td>5,976.5</td>
</tr>
<tr>
<td>Methane</td>
<td>193.7</td>
<td>766.6</td>
<td>689.1</td>
</tr>
<tr>
<td>Nitrous oxide</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Trifluoromethane</td>
<td>124.8</td>
<td>124.8</td>
<td>124.8</td>
</tr>
<tr>
<td>Perfluoromethane</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Perfluorooctanoate</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Sulphur hexafluoride</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5,770.3</strong></td>
<td><strong>6,108.3</strong></td>
<td><strong>6,790.4</strong></td>
</tr>
</tbody>
</table>

ROSATOM’s organisations accounted for 0.05% of total greenhouse gas emissions in Russia (in CO₂ equivalent), or 0.946 million tonnes of CO₂ equivalent.

Greenhouse gas emissions from CHPPs/TPPs

The holding company JSC RIR and its branches account for greenhouse gas emissions using a calculation method based on instructions and guidelines for quantifying greenhouse gas emissions from organisations carrying out economic and other activities in the Russian Federation, as approved by Order No. 300 of the Ministry of Natural Resources and Environment of Russia dated 30 June 2015.

Under the methodology, CO₂ emissions from stationary fuel combustion are quantified using a calculation method depending on fuel consumption.

Specific CO₂ emissions from CHPPs/TPPs, kg CO₂/MWh

<table>
<thead>
<tr>
<th>Branch name</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novouralsk branch of JSC RIR</td>
<td>2,370</td>
<td>2,095</td>
<td>2,197</td>
</tr>
<tr>
<td>Glazov branch of JSC RIR</td>
<td>1,599</td>
<td>1,509</td>
<td>1,562</td>
</tr>
<tr>
<td>LLC RIAR-GENERATION</td>
<td>1,727</td>
<td>1,611</td>
<td>1,584</td>
</tr>
<tr>
<td>Seversk branch of JSC RIR</td>
<td>1,840</td>
<td>1,840</td>
<td>1,735</td>
</tr>
<tr>
<td>Krasnokamensk branch of JSC RIR</td>
<td>1,390</td>
<td>1,434</td>
<td>1,429</td>
</tr>
<tr>
<td>Ozersk branch of JSC RIR</td>
<td>–</td>
<td>–</td>
<td>1,316</td>
</tr>
</tbody>
</table>

The calculation of specific emissions includes greenhouse gas emissions in full; only electricity has been taken into account as a product.

Specific indicators are not aggregated.
Specific emissions of other pollutants: SO₂, NOₓ, particulate matter, mercury, etc. (excluding CO₂) from CHPPs/TPPs, g/MWh

<table>
<thead>
<tr>
<th>Branch name</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novouralsk branch of JSC RIR</td>
<td>1,821</td>
<td>1,331</td>
<td>2,223</td>
<td>In 2021, an increase compared to 2020 was caused by the wider use of small steam boilers with higher specific emission levels, which was necessitated by a significant drop in outdoor temperatures in winter.</td>
</tr>
<tr>
<td>Glazov branch of JSC RIR</td>
<td>3,520</td>
<td>2,464</td>
<td>2,544</td>
<td>An increase compared to the previous period in 2021 was caused by the wider use of hot water boilers with higher specific emission levels, which was necessitated by a significant drop in outdoor temperatures in winter.</td>
</tr>
<tr>
<td>LLC RIAR-GENERATION</td>
<td>4,022</td>
<td>5,770</td>
<td>5,652</td>
<td>A decrease in specific pollutant emissions was related to improved boiler performance and lower specific consumption of fuel equivalent (SCFE).</td>
</tr>
<tr>
<td>Severk branch of JSC RIR</td>
<td>4,488</td>
<td>5,186</td>
<td>3,821</td>
<td>A decrease in specific pollutant emissions was related to improved boiler performance and lower specific consumption of fuel equivalent (SCFE).</td>
</tr>
<tr>
<td>Krasnokamensk branch of JSC RIR</td>
<td>9,290</td>
<td>10,978</td>
<td>10,742</td>
<td>A year-on-year reduction was related to the improved ash collection efficiency due to the upgrade of electrostatic precipitators, timely and high-quality maintenance and repairs of the ash collection system, and an increase in electricity output.</td>
</tr>
<tr>
<td>Ozersk branch of JSC RIR</td>
<td>–</td>
<td>–</td>
<td>6,869</td>
<td>As JSC RIR acquired the CHPP in 2021, data for 2019 and 2020 and part of the data for 2021 are not available. Specific emissions for 2021 have been calculated for the period from September through December.</td>
</tr>
<tr>
<td>Total across JSC RIR</td>
<td>4,025</td>
<td>4,264</td>
<td>2,438</td>
<td>Total specific indicators have been calculated by dividing total annual pollutant emissions by total electricity output.</td>
</tr>
</tbody>
</table>

Planned commissioning of CHPP/TPP capacities, MW

<table>
<thead>
<tr>
<th>Branch name</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>Comments</th>
<th>Total investment, RUB million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novouralsk branch of JSC RIR</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>No capacity commissioning planned.</td>
<td>–</td>
</tr>
<tr>
<td>Glazov branch of JSC RIR</td>
<td>–</td>
<td>–</td>
<td>+ 4.9</td>
<td>Restart of mothballed capacities.</td>
<td>21.67</td>
</tr>
<tr>
<td>LLC RIAR-GENERATION</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>No capacity commissioning planned.</td>
<td>–</td>
</tr>
<tr>
<td>Severk branch of JSC RIR</td>
<td>+ 100</td>
<td>–</td>
<td>–</td>
<td>Simultaneous decommissioning of two turbine units is scheduled for 2022: 50 MW (TA-4) and 100 MW (TA-12). The commissioning of turbine unit No. 13 in 2022 is hindered by Decree No. 86 of the Government of the Russian Federation dated 30 January 2021, whereby turbine units No. 6 and No. 21 may be decommissioned no earlier than 21 months from the date of filing an application for equipment decommissioning. A proposal has been initiated to amend Decree No. 86 of the Russian Government to enable the decommissioning of turbine units No. 6 and No. 12 earlier than 21 months from the date of the application. Applications for the decommissioning of turbine units No. 6 and No. 12 have been submitted.</td>
<td>109.35</td>
</tr>
<tr>
<td>Krasnokamensk branch of JSC RIR</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>No capacity commissioning planned.</td>
<td>–</td>
</tr>
<tr>
<td>Ozersk branch of JSC RIR</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>No capacity commissioning planned.</td>
<td>–</td>
</tr>
<tr>
<td>PJSC Quadra – Power Generation</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>As PJSC Quadra – Power Generation was acquired by JSC RIR in Q1 2022, the exact power generation capacity is still to be determined.</td>
<td>–</td>
</tr>
<tr>
<td>Total across JSC RIR</td>
<td>+ 100</td>
<td>–</td>
<td>+ 4.9</td>
<td>–</td>
<td>131.02</td>
</tr>
</tbody>
</table>

Installed capacity of CHPPs/TPPs, MW

<table>
<thead>
<tr>
<th>Branch name</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novouralsk branch of JSC RIR</td>
<td>24.9</td>
</tr>
<tr>
<td>Glazov branch of JSC RIR</td>
<td>24.9</td>
</tr>
<tr>
<td>LLC RIAR-GENERATION</td>
<td>20.5</td>
</tr>
<tr>
<td>Severk branch of JSC RIR</td>
<td>449</td>
</tr>
<tr>
<td>Krasnokamensk branch of JSC RIR</td>
<td>410</td>
</tr>
<tr>
<td>Ozersk branch of JSC RIR</td>
<td>256</td>
</tr>
<tr>
<td>Total across JSC RIR</td>
<td>1,185.3</td>
</tr>
</tbody>
</table>
5.3.6. Water use

The nuclear industry is a major water user. The systematic approach to water use management is underpinned by water accounting data covering all water resources used in the industry (surface water, groundwater, reused and recycled water). Furthermore, industrial facilities are designed and their locations are selected with due regard for uneven geographical distribution of natural water resources. Wastewater quality assurance approaches and methods used by the Corporation are based on scientific research and are aimed at preserving the natural water quality and minimising pollutant discharges into water bodies, thus ensuring the sustainability of water resources in the regions of operation.

Water withdrawal and discharge for the needs of ROSATOM’s organisations is regulated by water use agreements and fully complies with prescribed limits. Sustainable use of water resources is achieved through:

— The use of water recycling and reuse systems;
— Wastewater treatment using mechanical, biological, and physical and chemical methods;
— Minimising freshwater consumption in regions with access to seawater;
— Continuous monitoring of wastewater quality and compliance with statutory limits;
— The implementation of investment projects focused on the construction and renovation of wastewater treatment facilities and water supply networks.

In 2021, water withdrawal from natural sources by ROSATOM’s organisations made up 8.1% of the total water withdrawal in the Russian Federation and totalled 4,979.2 million m³, which is 1,080 million m³ less than in 2020. The main consumers of water among ROSATOM’s organisations are Leningrad NPP and Kola NPP (75.6% of the total water withdrawal); all water withdrawn from water bodies by NPPs (more than 99%) is used for operational needs (cooling of the processing medium in turbine condensers and heat exchangers) and returned to water bodies without any contamination.

<table>
<thead>
<tr>
<th>Source</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seawater</td>
<td>4,215.1</td>
<td>3,772.7</td>
<td>2,672.3</td>
</tr>
<tr>
<td>Fresh surface water, including rivers, marshes and lakes</td>
<td>2,203.5</td>
<td>2,191.2</td>
<td>2,204.5</td>
</tr>
</tbody>
</table>

The volume of water used by ROSATOM’s organisations in water recycling and reuse systems totalled 37,974.6 million m³ in 2021, which is 7.6 times more than the annual volume of water withdrawn from natural water sources for the industry in 2021.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total volume of recycled and reused water, million m³</td>
<td>35,096.7</td>
<td>36,308.2</td>
<td>37,974.6</td>
</tr>
<tr>
<td>Water withdrawal, million m³ (% of recycled and reused water)</td>
<td>6,531.3 (18.6%)</td>
<td>6,059.2 (16.7%)</td>
<td>4,979.2 (13.1%)</td>
</tr>
<tr>
<td>Total, million m³</td>
<td>41,628.0</td>
<td>42,367.4</td>
<td>42,953.8</td>
</tr>
<tr>
<td>Share of recycled and reused water in water withdrawal, %</td>
<td>537.4</td>
<td>599.2</td>
<td>762.7</td>
</tr>
</tbody>
</table>

The volume of water used by ROSATOM’s organisations for their own needs in 2021 totalled 4,881.2 million m³, which is 1,104.3 million m³ less than in 2020. This was mainly due to a reduction in water consumption at Leningrad NPP.

<table>
<thead>
<tr>
<th>Type of consumption</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking and sanitary purposes</td>
<td>41.5</td>
<td>37.6</td>
<td>37.0</td>
</tr>
<tr>
<td>Operational needs</td>
<td>6,395.7</td>
<td>5,928.5</td>
<td>4,810.5</td>
</tr>
<tr>
<td>Other types</td>
<td>13.2</td>
<td>19.4</td>
<td>13.7</td>
</tr>
<tr>
<td>Total</td>
<td>6,450.4</td>
<td>5,985.5</td>
<td>4,881.2</td>
</tr>
</tbody>
</table>
Water reserves in water recycling and reuse systems increased by 1,666.4 million m³ compared to 2020. A one-time increase in water reserves helps to drastically reduce water withdrawal from natural water sources. In 2021, this reduction totalled 1,080 million m³; this, in turn, helped to reduce wastewater discharges by 1,124.9 million m³ compared to 2020, which invariably makes a positive impact on the state of water bodies.

**Water discharge**

ROSATOM manages all its negative impacts in compliance with the standards set in laws and regulations of the Russian Federation, which stipulate the necessary tools for identifying and controlling pollutant discharges. Prioritised substances are stipulated in a decree of the Government of the Russian Federation; discharges are recorded by all organisations and reported in Form 2-TP annual statistical reports. Statutory limits and permitted volumes of discharges are calculated and approved for each organisation in accordance with a methodology approved by the Ministry of Natural Resources. All organisations discharge wastewater within the established limits and have the relevant permits. Pollutant content in wastewater is monitored by in-house laboratories as part of industrial environmental control; compliance with statutory limits is confirmed as part of monitoring and supervision by the Federal Service for Supervision of Natural Resources. In some cases, water from natural water sources does not meet quality standards, and an organisation withdraws water that has already been contaminated for its own needs. In these cases, water is also treated before discharge to ensure compliance with statutory limits, where possible.

In 2021, wastewater discharge by ROSATOM’s organisations totalled 4,264.5 million m³, with clean water compliant with regulatory requirements accounting for 95.6% of the total volume, while the share of treated wastewater compliant with regulatory requirements and contaminated wastewater stood at 0.9% and 3.5% respectively.

Clean water compliant with regulatory requirements accounts for more than 95% of the total wastewater discharge; therefore, wastewater discharge by ROSATOM’s organisations does not have any significant impact on water bodies and related habitats of local flora and fauna.

In the structure of wastewater discharge, the main destinations are seas (2,611.5 million m³, or 61.2%), lakes (1,171.1 million m³, or 27.5%) and rivers (401.5 million m³, or 9.4%).

Wastewater discharge decreased by 1,124.9 million m³ year on year due to a decrease in discharges from Leningrad NPP into the Gulf of Finland in the Baltic Sea.

In the reporting year, discharge of treated wastewater compliant with regulatory requirements totalled 40.1 million m³, of which 4.2% was treated using the biological method, 3.8% was treated using the physical and chemical method, and 92.0% was treated using the mechanical method.

Contaminated wastewater discharge by ROSATOM’s organisations accounted for 1.3% of the total volume of discharges in Russia in 2021.

**Total wastewater discharge**:

<table>
<thead>
<tr>
<th>Water category</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean water compliant with regulatory requirements</td>
<td>5,635.3</td>
<td>5,209.8</td>
<td>4,075.1</td>
</tr>
<tr>
<td>Treated wastewater compliant with regulatory requirements</td>
<td>44.9</td>
<td>35.4</td>
<td>40.1</td>
</tr>
<tr>
<td>Contaminated wastewater</td>
<td>184.3</td>
<td>144.2</td>
<td>149.3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>5,864.5</td>
<td>5,389.4</td>
<td>4,264.5</td>
</tr>
</tbody>
</table>

**Pollutant content in wastewater in 2021**, kg:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical oxygen demand</td>
<td>13,833,926.355</td>
</tr>
<tr>
<td>Suspended matter</td>
<td>1,803,633.000</td>
</tr>
<tr>
<td>Phosphates (phosphorus contained)</td>
<td>32,902.000</td>
</tr>
<tr>
<td>Hexavalent chromium</td>
<td>64,595</td>
</tr>
<tr>
<td>Trivalent chromium</td>
<td>62,828</td>
</tr>
<tr>
<td>Manganese</td>
<td>633,565</td>
</tr>
<tr>
<td>Iron</td>
<td>23,198,916</td>
</tr>
<tr>
<td>Nickel</td>
<td>72,753</td>
</tr>
<tr>
<td>Copper</td>
<td>408,081</td>
</tr>
<tr>
<td>Zinc</td>
<td>577,472</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>457,754</td>
</tr>
<tr>
<td>Cadmium</td>
<td>1,521</td>
</tr>
</tbody>
</table>

119 Calculations are based on data for 2021 provided by the Federal State Statistics Service.
120 The data presented herein have been consolidated based on government statistical reports (2-TP).
121 The data presented herein have been consolidated based on government statistical reports (2-TP).
Initiatives to reduce discharges of harmful substances into water bodies

In order to reduce the discharge of pollutants into water bodies by ROSATOM’s organisations, a five-year industry-wide Action Plan to Reduce the Negative Impact of ROSATOM on the Environment until 2025 has been developed.

Key measures implemented in 2021 as part of this plan included the following:

- JSC SSC RIAI (JSC Science and Innovations) built local facilities for the treatment of storm water runoff, meltwater and industrial wastewater, which helped to reduce wastewater contamination with petroleum products and prevent the discharge of untreated wastewater from electroplating operations;
- JSC Hotpe (Ekaterinburg) (JSC Rusatom Healthcare) replaced biological treatment facilities for domestic and industrial wastewater with more modern facilities, which resulted in a 13% increase in wastewater treatment efficiency (from 85% to 98%);
- An automated system for the disinfection of sewage from underground facilities of the organisation was put into operation at FSUE Mining and Chemical Plant, which enabled 100% disinfection of sewage;
- The Far Eastern Centre for Radioactive Waste Management (DalRAO, a branch of FSUE Federal Environmental Operator) implemented a set of measures to improve the performance of storm water runoff treatment facilities at the long-term radioactive waste storage facility in Razboynik Bay in its Fokino Division, which helped to reduce the volume of pollutants discharged into water bodies;
- At Balakovo NPP (JSC Rosenergoatom), firefighting water supply, utility and drinking water supply, sewerage and industrial and storm water runoff drainage networks were upgraded at the industrial site and construction facilities; this involved replacing the existing steel pipeline with a polyethylene one, which reduced water losses during consumption and reduced waste generation by increasing the service life of the pipeline;
- At Novovoronezh NPP (JSC Rosenergoatom), the circulation pump (TSN-5) of the onshore pumping station was upgraded, which enabled a reduction in annual water consumption and a reduction in the consumption of water withdrawn from the Don River from 32,000 m³/hour to 19,000 m³/hour;
- At Kalinin NPP (JSC Rosenergoatom), a project was implemented to introduce automatic monitoring of petroleum product content in wastewater, which helped to prevent the risk of petroleum product content in wastewater exceeding the statutory limit (0.05 mg/l).

5.3.7. Industrial and consumer waste management

In 2021, nuclear organisations produced 33.8 million tonnes of industrial and consumer waste, which is 2.9 million tonnes (9.4%) more than in 2020. 99.98% of the generated waste is hazard class 4 and 5 waste (low-hazard and virtually non-hazardous waste). An increase in the volume of waste generated in 2021 was due to an increase in the amount of rock and loose overburden produced at JSC Lunnoye and PJSC PIMCU respectively. Most of the waste is class 5, which is the least hazardous waste.

Industrial and consumer waste generated in ROSATOM’s organisations accounted for 0.4% of the total volume of waste generation in Russia in 2021. 81.8% of the total amount of waste generated and received by ROSATOM’s organisations was recycled; 0.003% was treated. The weight of transferred waste totalled 223,800 tonnes, including 43,800 tonnes of solid household waste transferred to a regional operator.

Industrial and consumer waste management, ‘000 tonnes

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount at the beginning of the reporting year</th>
<th>Waste generated and received during the year</th>
<th>Recycling and treatment of generated and received waste</th>
<th>Transferred to third-party organisations</th>
<th>Storage in organisations</th>
<th>Amount at the end of the reporting year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>408,868.7</td>
<td>24,782.2</td>
<td>77.2</td>
<td>2,138.7</td>
<td>2,332.7</td>
<td>412,391.5</td>
</tr>
<tr>
<td>2020</td>
<td>412,117.5</td>
<td>30,926.3</td>
<td>79.9</td>
<td>198.3</td>
<td>6,033.7</td>
<td>415,886.3</td>
</tr>
<tr>
<td>2021</td>
<td>444,381.8</td>
<td>33,614.3</td>
<td>81.8</td>
<td>223.8</td>
<td>5,529.1</td>
<td>445,081.5</td>
</tr>
</tbody>
</table>

**Calculations are based on data for 2021 provided by the Federal State Statistics Service.**

**The data presented herein have been consolidated based on government statistical reports (2-TP).**
In 2021, ROSATOM did not carry out any operations involving transboundary movements or disposal of waste classified as ‘hazardous’ according to Annexes I, II, III and VIII of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.

Industrial and consumer waste management by hazard class in 2021, ‘000 tonnes

<table>
<thead>
<tr>
<th>Hazard class</th>
<th>Waste amount as at 1 January 2021</th>
<th>Waste generated and received during the year</th>
<th>Recycling</th>
<th>Treatment</th>
<th>Waste transfer to third-party organisations</th>
<th>Waste stored at the sites operated by ROSATOM during the year, ‘000 tonnes</th>
<th>Total</th>
<th>Including burial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% ‘000 tonnes</td>
<td>% ‘000 tonnes</td>
<td></td>
<td></td>
<td>% ‘000 tonnes</td>
<td>% ‘000 tonnes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.020</td>
<td>0.333</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000088</td>
<td>0.03</td>
<td>0.337</td>
<td>0.00004</td>
</tr>
<tr>
<td>2</td>
<td>0.063</td>
<td>1.221</td>
<td>0.005</td>
<td>0.04</td>
<td>0.0087</td>
<td>0.01</td>
<td>0.342</td>
<td>0.002</td>
</tr>
<tr>
<td>3</td>
<td>1.744</td>
<td>6.492</td>
<td>0.142</td>
<td>0.12</td>
<td>0.0008</td>
<td>0.01</td>
<td>6.539</td>
<td>0.003</td>
</tr>
<tr>
<td>4</td>
<td>4.442</td>
<td>93.202</td>
<td>0.15</td>
<td>0.11</td>
<td>0.17</td>
<td>0.12</td>
<td>88.383</td>
<td>19.789</td>
</tr>
<tr>
<td>5</td>
<td>439,937.092</td>
<td>37,133,093</td>
<td>82.1</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>128,218</td>
<td>5,959.330</td>
</tr>
<tr>
<td>TOTAL</td>
<td>444,381.8</td>
<td>33,814.3</td>
<td>81.8</td>
<td>1.05</td>
<td>0.003</td>
<td>223.8</td>
<td>5,529.1</td>
<td>5,223.2</td>
</tr>
</tbody>
</table>

For details on ROSATOM’s waste treatment projects, see the section ‘Implementation of the Ecology National Project’ in the chapter ‘Strategic Report’.

5.3.8. Impact on local flora and fauna

The high quality of the natural environment is a vital prerequisite for the existence of mankind on Earth. Global environmental problems, such as the greenhouse effect and associated irreversible climate change, the depletion of the ozone layer and a rising level of toxic substances in the environment, ultimately lead to a reduction of biodiversity on the planet.

In terms of environmental performance, nuclear power is much more advantageous than thermal power, since nuclear power plants consume no oxygen and do not emit a significant amount of harmful chemicals into the atmosphere.

Environmental protection measures are beneficial to living organisms, including human beings. At the same time, the nuclear industry, primarily nuclear power plants, is subjected to close scrutiny by various environmental organisations, the general public and the media due to the potential radiation impact of nuclear power plants on the environment.

In the Russian Federation, there are no criteria for quantitative assessment of the radiation impact on flora and fauna, and in the vast majority of cases the assessment of such impacts is viewed as supplementary to the setting of hygienic standards.

Nuclear organisations operating nuclear facilities regularly monitor radionuclide content in local agricultural products, wild-growing foods (berries, mushrooms, etc.) and fodder growing in radiation control areas, as well as in fish and other aquatic organisms living in cooling ponds at NPPs. The specific activity of dose-forming radionuclides is monitored in food products. Regional offices of the Russian Federal Biomedical Agency (RFMDA) conduct independent radiation monitoring of the environment and locally produced food; radiation monitoring of abiotic components of the environment is carried out by the Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet).

The results of long-term radiation monitoring show that the content of radioactive substances in various types of crops corresponds to the background radiation level, that the species composition of flora and fauna is practically unchanged, with no hazards that can affect their existence, and that the growth rate of the amount of dead wood is within permissible limits.

In addition, the close proximity of NPPs to nature reserves also provides evidence of biodiversity conservation at their locations. The Lapland State Nature Reserve is located within a 30-kilometre radius of Kola NPP, and 16 nature monuments and 33 wildlife sanctuaries are located within a 30-kilometre radius of Kalinin NPP. This shows that the radiation impact of nuclear technologies and production facilities on the natural environment poses no danger to living organisms or their habitat and, accordingly, cannot be assessed as negative.

All organisations in the nuclear industry take measures to prevent the degradation of natural ecosystems as a result of their operation. Measures aimed at preserving the diversity of flora and fauna include the following:

— Equipping tailings ponds with bird deterrents to prevent birds from landing on the water surface;
— Equipping water intake facilities with fish screens in order to prevent young fish from swimming or getting drawn into them;
— Equipping transformer substations, their components and operating mechanisms with special devices (fences, casings, etc.) to prevent animals from entering the premises of the substation and getting into these units and mechanisms;
— Installing bird diverters on power lines;
— Maintaining fences along the perimeter of industrial sites in good condition, including in order to prevent animals from entering the premises of an organisation;
Ensuring that motor vehicles and special machinery travel on paved roads and providing special parking lots for them; 
Using machines and mechanisms that are in good condition, with adjusted fuel fittings preventing losses of fuel and lubricants and their spills onto the ground and vegetation; 
Measures to protect the atmosphere, which help to minimise the amount of pollutants inhaled by animals and humans, as well as the deposition of pollutants on vegetative parts of plants, further spread of harmful substances along the food chains and their accumulation in living organisms; 
Arranging waste accumulation sites compliant with technical and sanitary standards; removing waste and transporting it to designated locations in a timely manner; 
Fire prevention measures in order to ensure that industrial sites comply with fire safety requirements and to prevent the death of living organisms in fires; 
Measures to provide protection against noise exposure (using equipment that is less noisy; more effective soundproofing, etc.); 
Lighting of industrial sites at night.

5.3.9. Rehabilitation of disturbed areas

At year-end 2021, the area of land disturbed by ROSATOM’s organisations totalled 7,200 hectares.

Breakdown by type of operations that caused land disturbance in 2021, ‘000 ha

<table>
<thead>
<tr>
<th>Operation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining</td>
<td>0.1</td>
</tr>
<tr>
<td>Construction</td>
<td>0.013</td>
</tr>
<tr>
<td>Other operations</td>
<td>0.0001</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>0.1131</strong></td>
</tr>
</tbody>
</table>

In 2021, ROSATOM’s organisations implemented a set of measures to restore the productivity and economic value of disturbed lands and improve the environment. In 2021, the area of rehabilitated (restored) land totalled 2.13 hectares. No land was reclaimed for forest plantations; reforestation activities in the Corporation’s organisations were carried out by JSC Dalur on an area of 59.7 hectares.

In 2021, ROSATOM’s organisations took steps to replenish aquatic wildlife:

- JSC Siberian Chemical Plant stocked the Tom River with pelle (0.37 tonnes of fry);
- At Beloyarsk NPP, the Beloyarsk Reservoir was stocked with bighead carp, grass carp and black carp (428,000 fry);
- At Kalinin NPP, the Udomlya Reservoir was stocked with black carp (82,700 fry);
- At Smolensk NPP, the cooling pond was stocked with silver carp, black carp and grass carp (91,300 fry);
- At Rostov NPP, the cooling pond was stocked with silver carp, black carp and European carp (3 tonnes of fry);
- At Kursk NPP, the cooling pond was stocked with silver carp (4.5 tonnes of fry).

In 2021, ROSATOM’s organisations took steps to replenish aquatic wildlife:

- JSC Siberian Chemical Plant stocked the Tom River with pelle (0.37 tonnes of fry);
- At Beloyarsk NPP, the Beloyarsk Reservoir was stocked with bighead carp, grass carp and black carp (428,000 fry);
- At Kalinin NPP, the Udomlya Reservoir was stocked with black carp (82,700 fry);
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- At Kalinin NPP, the Udomlya Reservoir was stocked with black carp (82,700 fry);
- At Smolensk NPP, the cooling pond was stocked with silver carp, black carp and grass carp (91,300 fry);
- At Rostov NPP, the cooling pond was stocked with silver carp, black carp and European carp (3 tonnes of fry);
- At Kursk NPP, the cooling pond was stocked with silver carp (4.5 tonnes of fry).

Land rehabilitation in ROSATOM’s organisations, ha

<table>
<thead>
<tr>
<th>Organisation</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>JSC Lunnoye</td>
<td>10.76</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>PJSC ZIO-Podolsk</td>
<td>0.07</td>
<td>0.04</td>
<td>0.1</td>
</tr>
<tr>
<td>JSC Siberian Chemical Plant</td>
<td>11.30</td>
<td>32.9</td>
<td>0.00</td>
</tr>
<tr>
<td>FSUE Integrated Plant Elektroimprimor</td>
<td>1.63</td>
<td>2.69</td>
<td>0.84</td>
</tr>
<tr>
<td>FSUE Russian Federal Nuclear Centre – Zababakhin All-Russia Research Institute of Technical Physics (RFNC VNITF)</td>
<td>0.00</td>
<td>0.00</td>
<td>0.22</td>
</tr>
<tr>
<td>FSUE RFNC VNIIEF</td>
<td>5.00</td>
<td>1.30</td>
<td>0.5</td>
</tr>
<tr>
<td>FSUE PA Saver</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Vylyuchinsk Division of FEC DalRAO (branch of FSUE FED)</td>
<td>0.76</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>FSUE Mayak Production Association</td>
<td>0.00</td>
<td>0.12</td>
<td>0.47</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>29.52</strong></td>
<td><strong>37.05</strong></td>
<td><strong>2.13</strong></td>
</tr>
</tbody>
</table>
5.3.10. Emissions and discharges of radionuclides

**Emissions of radionuclides**

In 2021, radiation burden on the environment decreased significantly compared to the previous year due to a lower radioactivity of emissions from FSUE Mayak Production Association. The total activity of radionuclides released into the atmosphere by ROSATOM’s organisations amounted to 6.60·10^{15} Bq.

Beta-emitting radionuclides accounted for 91.48% of the total activity (6.04·10^{15} Bq).

**Total activity of radionuclides released into the atmosphere by ROSATOM’s organisations, Bq**

<table>
<thead>
<tr>
<th>Year</th>
<th>Permitted Discharge</th>
<th>Actual Discharge</th>
<th>Percentage of the permitted level</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>4.85·10^{14}</td>
<td>4.91·10^{14}</td>
<td>&lt; 0.01%</td>
</tr>
<tr>
<td>2020</td>
<td>4.91·10^{14}</td>
<td>4.37·10^{13}</td>
<td>0.82%</td>
</tr>
<tr>
<td>2021</td>
<td>6.6·10^{14}</td>
<td>4.37·10^{13}</td>
<td>66.95</td>
</tr>
</tbody>
</table>

**Actual and permitted discharge of radionuclides by nuclear organisations in 2021**

<table>
<thead>
<tr>
<th>Type of radionuclides</th>
<th>Permitted Emission, Bq</th>
<th>Actual Emission, Bq</th>
<th>Percentage of the permitted level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha-emitting</td>
<td>5.40·10^{15}</td>
<td>5.53·10^{13}</td>
<td>10.41%</td>
</tr>
<tr>
<td>Beta-emitting</td>
<td>2.92·10^{15}</td>
<td>6.40·10^{13}</td>
<td>&lt; 0.01%</td>
</tr>
</tbody>
</table>

In 2021, actual emissions of uranium nuclides from some emission sources in PJSC NCCP slightly increased. This was due to longer running hours of ventilation equipment. Radionuclide emissions into the atmosphere did exceed the total maximum permitted level in 2021.

**Discharges of radionuclides**

ROSATOM’s organisations discharged 53.14 million m^3 of wastewater with a total activity of 5.53·10^{13} Bq into the open drainage system.

Compared to 2020, wastewater discharges decreased by 2.99%, while the total activity increased by 26.71%.

**Volume of wastewater contaminated with radionuclides, million m^3**

<table>
<thead>
<tr>
<th>Year</th>
<th>Contaminated Wastewater</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>46.65</td>
</tr>
<tr>
<td>2020</td>
<td>54.76</td>
</tr>
<tr>
<td>2021</td>
<td>53.14</td>
</tr>
</tbody>
</table>

**Total activity of radionuclides discharged into the open drainage system, Bq**

<table>
<thead>
<tr>
<th>Year</th>
<th>Permitted Discharge</th>
<th>Actual Discharge</th>
<th>Percentage of the permitted level</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>4.17·10^{15}</td>
<td>4.37·10^{15}</td>
<td>11.63%</td>
</tr>
<tr>
<td>2020</td>
<td>4.37·10^{15}</td>
<td>5.53·10^{15}</td>
<td>8.42%</td>
</tr>
<tr>
<td>2021</td>
<td>5.53·10^{15}</td>
<td>5.53·10^{15}</td>
<td>100%</td>
</tr>
</tbody>
</table>

In 2021, radionuclide discharges did not exceed permitted levels.

**Contaminated sites and their remediation**

At year-end 2021, there were radionuclide-contaminated sites in 18 organisations in the industry. The area of contaminated sites totalled 108.87 km^2, including:

- 24.70 km^2 at industrial sites;
- 83.66 km^2 in buffer areas;
- 0.51 km^2 in radiation control areas.

The area of contaminated sites (water bodies) decreased compared to 2020 as a result of a decrease in the level of water bodies at FSUE Mayak Production Association due to low water availability in the reporting year.

Radioactive contamination is caused mainly by caesium-137 and strontium-90 radionuclides, as well as natural uranium and its decay products. About 76% (82.92 km^2) of radionuclide-contaminated sites are located around FSUE Mayak Production Association (they were contaminated as a result of an accident in 1997).
The area of contaminated sites remediated over the past five years totals 1.33*10^-2 km²; in 2021, no site remediation was carried out in the industry.

5.3.11. Radiation impact on the population and the environment

According to the findings of radiation and hygienic certification in the Russian Federation of 2020\(^2\), additional radiation exposure of the population at the locations of nuclear organisations associated with their day-to-day operation on average did not exceed 1.3% per person of the basic dose limits for the population set in the NRB-99/2009 Standard (1 mSv on average for any consecutive five years). The highest level of radiation exposure among local residents was recorded in Ozersk in the Chelyabinsk Region (8.3% of the basic dose limits for the population; FSUE Mayak Production Association). This is more than four times lower than the medical radiation exposure of the population in the Chelyabinsk Region, the situation is similar to the previous years.

According to the Federal Service for Surveillance on Consumer Rights Protection and Human Wellbeing (Rospotrebnadzor)\(^3\), the key factors behind radiation exposure of the population are natural and medical sources of ionising radiation. The average contribution of natural sources of ionising radiation to the total radiation exposure of local residents across Russia stands at 84.3%, while medical sources account for 15.4%. The contribution of organisations using nuclear technology is estimated at a fraction of a percent (0.05%). Over many years, this has been the case in all regions where large facilities posing radiation hazards are situated.

Breakdown of radiation exposure of the population, %

<table>
<thead>
<tr>
<th>Source</th>
<th>Contribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural sources</td>
<td>84.87%</td>
</tr>
<tr>
<td>Medical sources</td>
<td>14.90%</td>
</tr>
<tr>
<td>Operation of ionising radiation sources</td>
<td>0.18%</td>
</tr>
<tr>
<td>Man-made background radiation</td>
<td>0.05%</td>
</tr>
</tbody>
</table>

Between 2001 and 2019, average total radiation exposure of local residents from all natural radiation sources across the Russian Federation stood at 3.36 mSv/year per resident.

Gas and aerosol emissions from NPPs

The factors behind radiation exposure of local residents and the environment from nuclear power plants include emissions of radioactive substances from NPPs into the atmosphere. The radiation impact of emissions of radio-active substances on the population and the environment is regulated by statutory limits for NPPs established by the Federal Environmental, Industrial and Nuclear Supervision Service (Rostechnadzor). Emissions of all radionuclides subject to the limits are continuously monitored at all nuclear power plants to make sure that they are within the limits.

In 2021, as in previous years, gas and aerosol emissions from NPPs were significantly lower than the allowable limits set by Rostechnadzor for emissions of radioactive substances into the atmosphere. Actual emissions of radioactive substances calculated under a conservative accounting procedure did not exceed:

- 28% of the permitted amount for inert radioactive gases;
- 8% of the permitted amount for carbon-14;
- 10% of the permitted amount for tritium.

Emissions of inert radioactive gases from NPPs by type of reactors, % of the permitted amount

<table>
<thead>
<tr>
<th>Reactor Type</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
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<tbody>
<tr>
<td>VVER</td>
<td>32.72</td>
<td>32.80</td>
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<tr>
<td>RBMK</td>
<td></td>
<td>27.80</td>
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<tr>
<td>BN</td>
<td></td>
<td></td>
<td>32.72</td>
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<tr>
<td>EGP</td>
<td></td>
<td></td>
<td>32.80</td>
</tr>
</tbody>
</table>

\(^2\) The findings of radiation and hygienic certification of organisations and areas were presented by the State Research Centre Burnasyan Federal Medical Biophysical Centre of the FMBA of Russia.

Contribution of NPPs to background radiation measured by ROSATOM

The gamma radiation dose rate is continuously monitored in buffer and radiation control areas around nuclear power plants.

The analysis of field data on the gamma radiation dose rate shows that gamma radiation doses in buffer and radiation control areas of all NPPs are within the limits of natural background radiation which was formed before the start-up of the nuclear power plants. This indicates that nuclear power plants produce no radioactive contamination in the monitored areas.

The findings of regular measurement of the content of radioactive substances in the natural environment in the locations of NPPs show that NPPs have no detectable impact on local residents or the environment.

The contribution of NPP operation to radiation exposure of the population living in the areas where NPPs are located does not exceed the minimum significant dose of 10 μSv/year; the level of radiation risk for local residents is entirely acceptable.

5.3.12. Forecast for the environmental impact of ROSATOM and its organisations; plans to reduce the impact and ensure environmental safety in 2022 and in the medium term

ROSATOM’s organisations will continue to systematically reduce their negative environmental impact and take steps to prevent climate change as part of the Action Plan to Minimise the Negative Impact of ROSATOM on the Environment until 2025. In addition, the following steps will be taken:

— Maintaining fixed asset investment related to environmental protection at the current level;
— Continuing to pursue the policy of sustainable use of natural resources and implementing a number of measures to reduce the discharge of contaminated wastewater;
— Further reducing hazardous waste generation;
— Expanding and improving radiation and chemical monitoring systems in the areas where the Corporation’s organisations are located;
— Developing plans in ROSATOM’s organisations for the decommissioning of PCB-containing equipment and the transfer of such equipment (including waste) for decontamination/disposal.

With regard to greenhouse gas emissions, in 2022 and 2023, ROSATOM plans to revise the quantitative assessment of emissions from its organisations in accordance with the new requirements of Russian environmental legislation.

With regard to the use of ozone-depleting substances, the Corporation plans to gradually replace industrial and household refrigeration appliances and air conditioners in its organisations with modern ozone-friendly equipment.

5.4. KEY PROJECTS IN THE FIELD OF NUCLEAR AND RADIATION SAFETY AND ENVIRONMENTAL PROTECTION

As part of its efforts to implement the Basic Principles of Government Policy on Nuclear and Radiation Safety in the Russian Federation until 2025 and beyond, ROSATOM has achieved the following results:

— A rationale has been provided for the optimisation of radiation protection of group A personnel in ROSATOM’s organisations; this involved calculating and analysing the planned exposure safety index. Numerical approaches have been developed and functional specifications have been drafted for a software package that will provide data support for the optimisation;
— The first key result of the project to implement the Practical Arrangements between the IAEA and ROSATOM on cooperation in radiation safety has been achieved: the IAEA Technical Document on Assessment of Prospective Cancer Risks from Occupational Exposure to Ionising Radiation has been developed and published; ROSATOM’s fundamental standards for radiation monitoring instruments aligned with the IEC and ISO international standards have been approved: ‘Instruments and Devices for Measuring or Detecting Ionising Radiation. General Provisions’, ‘Instruments and Devices for Measuring or Detecting Ionising Radiation. Terms and Definitions’, ‘Instruments and Devices for Measuring or Detecting Ionising Radiation. Processing of Measurements’.

In the sphere of environmental protection, one of the key priorities is to adapt the Corporation’s business as a whole and specific operations to climate change. The Russian Federation is currently developing the legal and regulatory framework for greenhouse gas emissions accounting and regulation and is creating a favourable environment for climate projects.
Since 2020, ROSATOM has been developing and adjusting an industry-wide system for greenhouse gas emissions accounting: methodological approaches to greenhouse gas emissions accounting in the industry have been defined, and an inventory of greenhouse gas emission sources in the Corporation’s organisations has been compiled, which will provide a basis for categorising emission sources based on their significance and revising the quantitative assessment of emissions. Work has begun to establish a body responsible for the validation and verification of carbon dioxide emissions and removals in JSC RIR, and an assessment of capabilities of nuclear organisations for the implementation of potential climate projects is underway.

As part of Russia’s commitment to comply with the requirements of the Stockholm Convention on Persistent Organic Pollutants, an inventory of equipment and waste containing polychlorinated biphenyls has been compiled in ROSATOM’s organisations, and plans are being developed for the decommissioning of such equipment and the transfer of waste for decontamination/disposal.
### Appendix 1. GRI Index

<table>
<thead>
<tr>
<th>Standard</th>
<th>Indicator</th>
<th>Section, page</th>
<th>Comments</th>
</tr>
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<tr>
<td>GRI 101: Foundation (2016)</td>
<td></td>
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<td>102-1 Name of the organisation</td>
<td>About ROSATOM, p. 18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>102-2 Activities, brands, products, and services</td>
<td>1.4. Markets Served by ROSATOM, p. 44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>102-3 Location of headquarters</td>
<td>Contact Details and Useful Links, p. 469</td>
<td></td>
<td></td>
</tr>
<tr>
<td>102-4 Location of operations</td>
<td>2.2. International Business Development, p. 235</td>
<td></td>
<td></td>
</tr>
<tr>
<td>102-5 Ownership and legal form</td>
<td>About ROSATOM, p. 18, Appendix 1. GRI Index, p. 430</td>
<td>The Corporation is a legal entity established by the Russian Federation in the form of a state-owned corporation (in accordance with Federal Law No. 317-FZ of 1 December 2007).</td>
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<td>1.4. Markets Served by ROSATOM, p. 44</td>
<td>2.2. International Business Development, 2.2.1. Promoting ROSATOM's technologies on foreign markets, p. 235</td>
<td></td>
</tr>
<tr>
<td>102-7 Scale of the organisation</td>
<td>About ROSATOM, p. 18, Key Results in 2021, p. 26</td>
<td>1.3. Value Creation and Business Model, p. 42</td>
<td></td>
</tr>
</tbody>
</table>

### Additional Information

**102-11 Precautionary Principle or approach**

3.1. Environmental safety and environmental protection management, p. 400

Appendix 1. GRI Index, p. 431

Additional information on the use of the precautionary principle is provided in the Unified Industry Policy on Sustainable Development at: https://rosatom.ru/upload/iblock/a42/a42fc60d74177ed-f55f9e4ec64618da3.pdf

**102-13 Membership of associations**

1.5.1. Strengthening the international legal framework for cooperation, p. 62

### Strategy

**102-14 Statement from senior decision-maker**

Statement of the Chairman of the Supervisory Board, p. 20

Chapter 1. Strategic Report, Statement of the Director General, p. 24


Chapter 3. Social Report, Statement of the Deputy Director General for HR, p. 262


**102-15 Key impacts, risks, and opportunities**

1.1.2. Long-term strategic goals, p. 29

1.2.2 Risk management, p. 154
<table>
<thead>
<tr>
<th>Standard</th>
<th>Indicator</th>
<th>Section, page</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethics and integrity</td>
<td>102-16 Values, principles, standards, and norms of behaviour</td>
<td>1.1.2. Long-term strategic goals, p. 31; 3.2.1. HR policy approaches and principles, p. 271; 3.3.2. Human rights, p. 306</td>
<td></td>
</tr>
<tr>
<td></td>
<td>102-17 Mechanisms for advice and concerns about ethics</td>
<td>3.3.2. Human rights, p. 306; Contact Details and Useful Links, p. 469</td>
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<td>Corporate Governance</td>
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<td>1.12.1. Corporate governance, Governing bodies, p. 145</td>
<td>There are no committees under the Supervisory Board.</td>
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<td></td>
<td>102-23 Chair of the highest governance body</td>
<td>1.12.1. Corporate governance, Governing bodies, p. 145</td>
<td></td>
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<tr>
<td></td>
<td>102-34 Nature and total number of critical concerns</td>
<td>1.12.1. Corporate governance, Governing bodies, p. 146</td>
<td></td>
</tr>
<tr>
<td></td>
<td>102-35 Remuneration policies</td>
<td>1.12.1. Corporate governance, Governing bodies, p. 145, 147; 3.2.3 Personnel costs and remuneration system, pp. 275</td>
<td></td>
</tr>
<tr>
<td>Stakeholder engagement</td>
<td>102-40 List of stakeholder groups</td>
<td>1.12.8. Strategic communications, p. 203</td>
<td></td>
</tr>
<tr>
<td></td>
<td>102-41 Collective bargaining agreements</td>
<td>3.4.4. Social partnership in the nuclear industry, p. 312</td>
<td></td>
</tr>
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<td></td>
<td>102-44 Key topics and concerns raised</td>
<td>1.12.8. Strategic communications, p. 203</td>
<td></td>
</tr>
<tr>
<td>Report profile</td>
<td>102-45 Entities included in the consolidated financial statements</td>
<td>Report Profile, p. 9; Appendix 1. GRI Index, p. 433</td>
<td>Material subsidiaries of JSC Atomenergopro included in its financial statements under IFRS are listed in note 38 thereto (see: <a href="http://atomenergoprom.ru/ru/invest/report/swot/">http://atomenergoprom.ru/ru/invest/report/swot/</a>). In addition, the Corporation’s financial statements under IFRS include organisations outside the scope of JSC Atomenergoprom, which are listed on the website at: <a href="http://www.report.rosatom.ru">www.report.rosatom.ru</a></td>
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<td>102-46 Defining report content and topic Boundaries</td>
<td>Report Profile, pp. 9-10; Appendix 1. GRI Content Index, p. 430</td>
<td>The Reporting Principles set out in the GRI Standards are reflected in ROSATOM’s Uniform Industry-Wide Policy on Public Reporting.</td>
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<td></td>
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<td>Report Profile, p. 12; Appendix 1. GRI Content Index, p. 430</td>
<td></td>
</tr>
<tr>
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<td>102-48 Restatements of information</td>
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<td>There were no restatements of information in the reporting period.</td>
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<td>102-49 Changes in reporting</td>
<td>Report Profile, pp. 14-16; Appendix 1. GRI Content Index, p. 433</td>
<td>The list and number of material topics covered in the Report for 2021 were revised in response to stakeholder requests. ROSATOM held an online foresight dialogue on materiality in order to identify material topics to be disclosed in the 2021 Report; as part of the dialogue, 32 material topics were selected (the 2020 Report covered 39 material topics).</td>
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<td></td>
<td>102-50 Reporting period</td>
<td>Report Profile, p. 9</td>
<td></td>
</tr>
</tbody>
</table>

**APPENDICES**
<table>
<thead>
<tr>
<th>Standard</th>
<th>Indicator</th>
<th>Section, page</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>102-51</td>
<td>Date of most recent report</td>
<td>Appendix 1. GRI Content Index, p. 434</td>
<td>ROSATOM’s Report for 2020 was published in October 2021.</td>
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<tr>
<td>102-52</td>
<td>Reporting cycle</td>
<td>Report Profile, p. 9</td>
<td></td>
</tr>
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<td>102-53</td>
<td>Contact point for questions regarding the report</td>
<td>Contact Details, p. 469</td>
<td></td>
</tr>
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<td>Claims of reporting in accordance with the GRI Standards</td>
<td>Report Profile, p. 9</td>
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<td>102-56</td>
<td>External assurance</td>
<td>Appendix 1. GRI Content Index, p. 434</td>
<td>The Corporation’s policy with regard to seeking external assurance is set out in the Uniform Industry-Wide Methodological Guidelines on Public Reporting of ROSATOM and its Organisations. The Corporation’s public reports are approved by its Director General.</td>
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**Material topics**

1. **Implementation of ROSATOM’s strategy**

   **GRI 103: Management Approach (2016)**
   - 103-1 Explanation of the material topic and its Boundary
     - 1.1. Development Strategy, 1.1.1. Business context, p. 29
   - 103-2 The management approach and its components
     - 1.1. Development Strategy, 1.1.2. Long-term strategic goals, p. 31
   - 103-3 Evaluation of the management approach
     - Financial and Economic Performance, p. 21
     - 1.3. Value Creation and Business Model, p. 42

2. **Nuclear and radiation safety**

   **GRI 103: Management Approach (2016)**
   - 103-1 Explanation of the material topic and its Boundary
     - 5.1. Nuclear and Radiation Safety, p. 370
   - 103-2 The management approach and its components
     - 5.1. Nuclear and Radiation Safety, p. 370
   - 103-3 Evaluation of the management approach
     - 5.1.2. Nuclear and radiation safety at nuclear facilities, p. 370

3. **Prospects for the development of the nuclear power industry**

   **GRI 103: Management Approach (2016)**
   - 103-1 Explanation of the material topic and its Boundary
     - 1.1. Development Strategy, 1.1.1. Business context, p. 29
   - 103-2 The management approach and its components
     - 1.1. Development Strategy, 1.1.2. Long-term strategic goals, p. 29
   - 1.6.3. Government programme ‘Development of the Nuclear Power and Industry Complex’, p. 78
   - 103-3 Evaluation of the management approach
     - 1.6.3. Government programme ‘Development of the Nuclear Power and Industry Complex’, p. 79

4. **RAW and SNF management and addressing ‘nuclear legacy’ issues**

   **GRI 103: Management Approach (2016)**
   - 103-1 Explanation of the material topic and its Boundary
     - 1.4. Markets Served by ROSATOM, p. 44
     - 1.7.3. Construction of new icebreakers, Nuclear and radiation safety, p. 86
     - 1.6.1. Performance of the Nuclear Weapons Division, Fulfilment of the state defence order, p. 73
<table>
<thead>
<tr>
<th>Standard</th>
<th>Indicator</th>
<th>Section, page</th>
<th>Comments</th>
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<tbody>
<tr>
<td>103-1</td>
<td>Explanation of the material topic and its Boundary</td>
<td>103-1</td>
<td>5.1.4: Emergency preparedness, p. 376</td>
</tr>
<tr>
<td>103-2</td>
<td>The management approach and its components</td>
<td>103-2</td>
<td>5.1.4: Emergency preparedness, p. 376</td>
</tr>
<tr>
<td></td>
<td>GRI 103: Management Approach (2016)</td>
<td>103-2</td>
<td>5.1.6: Industrial safety, p. 378</td>
</tr>
<tr>
<td></td>
<td>103-3 Evaluation of the management approach</td>
<td>103-3</td>
<td>5.1.5: Industry-Wide Radiation Monitoring System, p. 377</td>
</tr>
<tr>
<td>103-1</td>
<td>Explanation of the material topic and its Boundary</td>
<td>103-1</td>
<td>2.1. Business Diversification, p. 225</td>
</tr>
<tr>
<td>103-2</td>
<td>The management approach and its components</td>
<td>103-2</td>
<td>2.1.1: Management system, p. 225</td>
</tr>
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<td>103-2</td>
<td>2.1.2: Results in 2021, p. 226</td>
</tr>
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<td>103-1</td>
<td>Explanation of the material topic and its Boundary</td>
<td>103-1</td>
<td>1.5: International Cooperation, p. 61</td>
</tr>
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<td>103-2 The management approach and its components</td>
<td>103-2</td>
<td>2.2.1: Promoting ROSATOM's technologies on foreign markets, p. 235</td>
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<td>103-2</td>
<td>2.2.1: Promoting ROSATOM's technologies on foreign markets, p. 235</td>
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<td>103-3 Evaluation of the management approach</td>
<td>103-3</td>
<td>2.2.2: Changes in foreign revenue and the portfolio of overseas orders, p. 238</td>
</tr>
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<td>Explanation of the material topic and its Boundary</td>
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<td>1.4: Markets Served by ROSATOM, p. 44</td>
</tr>
<tr>
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<td>103-2</td>
<td>1.5.1: Strengthening the international legal framework for cooperation, p. 62</td>
</tr>
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<td>103-3</td>
<td>2.2.1: Promoting ROSATOM's technologies on foreign markets, p. 235</td>
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<td>103-3</td>
<td>2.2.1: Promoting ROSATOM's technologies on foreign markets, p. 235</td>
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<td>Explanation of the material topic and its Boundary</td>
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<td>1.4: Markets Served by ROSATOM, p. 44</td>
</tr>
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<td>The management approach and its components</td>
<td>103-2</td>
<td>1.4: Markets Served by ROSATOM, p. 44</td>
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<td>103-2</td>
<td>1.5: International Cooperation, p. 61</td>
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<td>103-3 Evaluation of the management approach</td>
<td>103-3</td>
<td>2.2.1: Promoting ROSATOM's technologies on foreign markets, p. 235</td>
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5. Development of the Arctic

<table>
<thead>
<tr>
<th>GRI 103: Management Approach (2016)</th>
<th>103-1 Explanation of the material topic and its Boundary</th>
<th>1.4: Markets Served by ROSATOM, Market for cargo transportation along the Northern Sea Route, p. 60</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.7.1: ROSATOM's powers related to development and operation in the Arctic, p. 84</td>
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<td>1.4: Markets Served by ROSATOM, Market for cargo transportation along the Northern Sea Route, p. 60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.7.1: ROSATOM's powers related to development and operation in the Arctic, p. 84</td>
<td></td>
</tr>
<tr>
<td>103-3 Evaluation of the management approach</td>
<td>1.7.2: Escorting vessels and handling cargo traffic along the Northern Sea Route, p. 85</td>
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6. Emergency preparedness

<table>
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<tr>
<th>GRI 103: Management Approach (2016)</th>
<th>103-1 Explanation of the material topic and its Boundary</th>
<th>5.1.4: Emergency preparedness, p. 376</th>
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<td>103-2 The management approach and its components</td>
<td>5.1.4: Emergency preparedness, p. 376</td>
</tr>
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<td></td>
<td>103-3 Evaluation of the management approach</td>
<td>5.1.5: Industry-Wide Radiation Monitoring System, p. 377</td>
</tr>
</tbody>
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10. Business development and diversification, including diversification of the MIC

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<tr>
<td></td>
<td>103-2 The management approach and its components</td>
<td>2.1.1: Management system, p. 225</td>
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<tr>
<td></td>
<td>103-3 Evaluation of the management approach</td>
<td>2.1.2: Results in 2021, p. 226</td>
</tr>
</tbody>
</table>

11. Development of international business and international cooperation

<table>
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<tr>
<th>GRI 103: Management Approach (2016)</th>
<th>103-1 Explanation of the material topic and its Boundary</th>
<th>1.5: International Cooperation, p. 61</th>
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</tr>
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<td>103-3 Evaluation of the management approach</td>
<td>2.2.2: Changes in foreign revenue and the portfolio of overseas orders, p. 238</td>
</tr>
</tbody>
</table>

13. Traditional and new markets

<table>
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<tr>
<th>GRI 103: Management Approach (2016)</th>
<th>103-1 Explanation of the material topic and its Boundary</th>
<th>1.4: Markets Served by ROSATOM, p. 44</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>103-2 The management approach and its components</td>
<td>1.4: Markets Served by ROSATOM, p. 44</td>
</tr>
<tr>
<td></td>
<td>103-3 Evaluation of the management approach</td>
<td>1.4: Markets Served by ROSATOM, p. 44</td>
</tr>
<tr>
<td>Standard</td>
<td>Indicator</td>
<td>Section, page</td>
</tr>
<tr>
<td>----------</td>
<td>-----------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>14. Financial and economic performance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.12.6. Investment management, p. 186</td>
</tr>
<tr>
<td></td>
<td>103-2 The management approach and its components</td>
<td>1.12.5. Financial management, Implementation of ROSATOM’s financial strategy in 2021, p. 179</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.12.6. Investment management, ROSATOM’s approaches to investment management, p. 186</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.12.5. Financial management, Receiving and maintaining credit ratings, p. 181</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.12.5. Investment management, Results in 2021, p. 186</td>
</tr>
<tr>
<td>GRI 201: Economic Performance (2016)</td>
<td>201-4 Financial assistance received from government</td>
<td>Appendix 1. GRI Index, p. 438</td>
</tr>
<tr>
<td><strong>15. Scientific and technological advancement and innovation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GRI 103: Management Approach (2016)</td>
<td>103-1 Explanation of the material topic and its Boundary</td>
<td>1.9.2. Participation in digitisation in Russia, p. 101</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.9. Digital Transformation, p. 29</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.7.3. Construction of new icebreakers, p. 86</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.7.5. New business areas, p. 91</td>
</tr>
<tr>
<td></td>
<td>103-2 The management approach and its components</td>
<td>1.1.1. Mining Division, p. 130</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.1.2. Fuel Division, p. 133</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.1.3. Mechanical Engineering Division, p. 136</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.1.4. Engineering Division, p. 139</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.1.5. Power Engineering Division, p. 142</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.1. Development Strategy, 1.1.2. Long-term strategic goals, p. 29</td>
</tr>
<tr>
<td></td>
<td>103-3 Evaluation of the management approach</td>
<td>1.1.1. Mining Division, p. 150</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.1.2. Fuel Division, p. 133</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.1.3. Mechanical Engineering Division, p. 136</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.1.4. Engineering Division, p. 139</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.1.5. Power Engineering Division, p. 142</td>
</tr>
</tbody>
</table>
19. Combating corruption

GRI 103: Management Approach (2016)

103-1 Explanation of the material topic and its Boundary

1.12.3. Internal control system, p. 169
1.12.4. Prevention of corruption and other offences, p. 174

103-2 The management approach and its components

1.12.3. Internal control system, p. 169
1.12.4. Prevention of corruption and other offences, p. 174
1.6.2. Law drafting, p. 75

103-3 Evaluation of the management approach

1.12.3. Internal control system, Results in 2021, p. 169

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GRI 205: Anti-Corruption (2016)

205-2 Communication and training about anti-corruption policies and procedures

1.12.4. Prevention of corruption and other offences, p. 176

No detailed records with a breakdown by category or region are kept. All employees and partners of ROSATOM can obtain information on anti-corruption measures (including the relevant regulations) on the official website (http://rosatom.ru/about/protivodeystvie-korruptsii).

21. Developing the regions where nuclear facilities are located. Social and economic impacts

GRI 103: Management Approach (2016)

103-1 Explanation of the material topic and its Boundary

Chapter 4. Report on the Development of Nuclear Towns and Cities, Statement of the Head of Department for Liaison with Regions, Key Results in 2021, p. 326
4.1 Development Priorities, p. 333

103-2 The management approach and its components

4.1 Development Priorities, p. 333
4.3.2 PSEDA development in CATFs in the nuclear industry. PSEDA status in 2021. Development prospects, p. 343

103-3 Evaluation of the management approach

4.1 Development Priorities, p. 333

22. Provision of access to energy

GRI 103: Management Approach (2016)

103-1 Explanation of the material topic and its Boundary

Chapter 4. Report on the Development of Nuclear Towns and Cities, Statement of the Head of Department for Liaison with Regions, Key Results in 2021, p. 328
4.11.5. Power Engineering Division, p. 142

103-2 The management approach and its components

Chapter 4. Report on the Development of Nuclear Towns and Cities, Statement of the Head of Department for Liaison with Regions, Key Results in 2021, p. 328
4.11.5. Power Engineering Division, p. 142

103-3 Evaluation of the management approach

Chapter 4. Report on the Development of Nuclear Towns and Cities, Statement of the Head of Department for Liaison with Regions, Key Results in 2021, p. 330
4.11.5. Power Engineering Division, p. 142

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### Standard Indicator Section, page Comments

#### 23. Occupational health and safety

<table>
<thead>
<tr>
<th>Standard Indicator</th>
<th>Section, page</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>403-2 Hazard identification, risk assessment, and incident investigation</td>
<td>3.3.1. Occupational health and safety, p. 293 Appendix 1. GRI Index, p. 442 In accordance with the Labour Code of the Russian Federation (Articles 216 and 379), the Corporation’s employees have the right to refuse to perform work if there is a hazard to their life and health due to non-compliance with occupational safety requirements until the hazard has been eliminated, except as otherwise provided in federal laws.</td>
</tr>
<tr>
<td></td>
<td>403-3 Occupational health services</td>
<td>3.3.1. Occupational health and safety, p. 217</td>
</tr>
</tbody>
</table>

#### Standard Indicator Section, page Comments

<table>
<thead>
<tr>
<th>Standard Indicator</th>
<th>Section, page</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>403-4 Worker participation, consultation, and communication on occupational health and safety</td>
<td>3.3.1. Occupational health and safety, p. 295 Appendix 1. GRI Index, p. 442 The operation of occupational health and safety committees (commissions) is governed by section 6.3. ‘Occupational Safety and Health Committee (Commission)’ of the Uniform Industry-Wide Guidelines for Developing and Improving an Occupational Health and Safety Management System in ROSATOM’s Organisations.</td>
</tr>
<tr>
<td></td>
<td>403-5 Worker training on occupational health and safety</td>
<td>3.3.1. Occupational health and safety, p. 297</td>
</tr>
<tr>
<td></td>
<td>403-6 Promotion of worker health</td>
<td>3.4.2. Social programmes, p. 309</td>
</tr>
<tr>
<td></td>
<td>403-7 Prevention and mitigation of occupational health and safety impacts directly linked by business relationships</td>
<td>3.3.1. Occupational health and safety, p. 297</td>
</tr>
<tr>
<td></td>
<td>403-9 Work-related injuries</td>
<td>3.3.1. Occupational health and safety, pp. 298, 299 The indicator has been disclosed in part. Injury rates are not disclosed for contractor organisations, as no records of hours worked by contractors are kept. The number of persons injured in accidents includes employees at ROSATOM’s sites, including abroad, provided that the employee works for an organisation within the scope of consolidation of ROSATOM, is employed under Russian law, and the accident has been investigated under Russian law.</td>
</tr>
</tbody>
</table>
The LTIFR calculation does not include employees injured in road accidents caused by third parties, those whose health suddenly deteriorated due to an illness, those who suffered a sports-related injury and those who were injured in accidents investigation into which was not completed in 2021.

403-10 Work-related ill health 3.3.1. Occupational health and safety, p. 301

The indicator has been disclosed in part. No data are collected and no records are kept on occupational diseases of employees in contractor organisations. No records are kept on the number of fatalities as a result of work-related ill health.

24. Personnel management, social policy, corporate culture and volunteering

GRI 103: Management Approach (2016)

103-1 Explanation of the material topic and its Boundary Chapter 3. Social Report, Statement of the Deputy Director General for HR, p. 262 3.9.1. ROSATOM’s approaches and principles of volunteering, p. 315

103-2 The management approach and its components 3.2.1. HR policy approaches and principles, p. 271 3.2.3. Personnel costs and remuneration system, p. 275 3.9.1. ROSATOM’s approaches and principles of volunteering, p. 315 3.5.2. Prioritised areas of volunteer activity, p. 316

103-3 Evaluation of the management approach 3.2.3. Personnel costs and remuneration system, p. 275 3.2.10. Employee engagement, p. 290

GRI 401: Employment (2016)

401-2 Benefits provided to full-time employees that are not provided to temporary or part-time employees 3.4.2. Social programmes, p. 309 Appendix 1. GRI Index, p. 445

Equal benefits are provided to full-time employees of the organisations. There are restrictions on benefits provided to:
- Employees who have a second job (they are only entitled to voluntary health insurance and accident insurance if these are not provided at their main place of employment);
- Seasonal and temporary workers;
- Those employed under independent contractor agreements.

GRI 402: Labour/Management Relations (2016)

402-1 Minimum notice periods regarding operational changes Appendix 1. GRI Content Index, p. 445

The Corporation notifies its employees of operational changes within the time frame stipulated in the Labour Code of the Russian Federation; accordingly, these time frames are not stipulated/the relevant information is not duplicated in collective bargaining agreements.

25. Work of ROSATOM’s Public Council

GRI 103: Management Approach (2016)

103-1 Explanation of the material topic and its Boundary 4.5 Work of ROSATOM’s Public Council and Community Relations, p. 361

103-2 The management approach and its components 4.5 Work of ROSATOM’s Public Council and Community Relations, p. 361

103-3 Evaluation of the management approach 4.5 Work of ROSATOM’s Public Council and Community Relations, p. 361
### 27. Radiation impact on the environment

<table>
<thead>
<tr>
<th>Standard</th>
<th>Indicator</th>
<th>Section, page</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRI 103: Management Approach (2016)</td>
<td>103-1 Explanation of the material topic and its Boundary</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400</td>
<td>5.3.11. Radiation impact on the population and the environment, p. 424</td>
</tr>
<tr>
<td></td>
<td>103-2 The management approach and its components</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400</td>
<td>1.12.2 Risk management, Risk management outcomes in 2021, p. 152</td>
</tr>
<tr>
<td></td>
<td>103-3 Evaluation of the management approach</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400</td>
<td>5.3.11. Radiation impact on the population and the environment, p. 424</td>
</tr>
</tbody>
</table>

### 28. Development of technologies improving the quality of people’s lives and/or reducing the environmental footprint

<table>
<thead>
<tr>
<th>Standard</th>
<th>Indicator</th>
<th>Section, page</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRI 103: Management Approach (2016)</td>
<td>103-1 Explanation of the material topic and its Boundary</td>
<td>1.2. Sustainable Development Management, p. 34</td>
<td>4.1 Development Priorities, p. 333</td>
</tr>
<tr>
<td></td>
<td>103-2 The management approach and its components</td>
<td>1.2. Sustainable Development Management, p. 34</td>
<td>2.4 Business Efficiency, p. 250</td>
</tr>
<tr>
<td></td>
<td>103-3 Evaluation of the management approach</td>
<td>4.1 Development Priorities, p. 333</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400</td>
</tr>
</tbody>
</table>

### 29. Emissions into the atmosphere

<table>
<thead>
<tr>
<th>Standard</th>
<th>Indicator</th>
<th>Section, page</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRI 103: Management Approach (2016)</td>
<td>103-1 Explanation of the material topic and its Boundary</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400</td>
<td>5.3.11. Radiation impact on the population and the environment, p. 424</td>
</tr>
<tr>
<td></td>
<td>103-2 The management approach and its components</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400</td>
<td>1.12.2 Risk management, Risk management outcomes in 2021, p. 152</td>
</tr>
<tr>
<td></td>
<td>103-3 Evaluation of the management approach</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400</td>
<td>5.3.11. Radiation impact on the population and the environment, p. 424</td>
</tr>
</tbody>
</table>

### 30. Management of effluents and waste

<table>
<thead>
<tr>
<th>Standard</th>
<th>Indicator</th>
<th>Section, page</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRI 103: Management Approach (2016)</td>
<td>103-1 Explanation of the material topic and its Boundary</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400</td>
<td>5.3.11. Radiation impact on the population and the environment, p. 424</td>
</tr>
<tr>
<td></td>
<td>103-2 The management approach and its components</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400</td>
<td>1.4. Markets Served by ROSATOM, p. 364</td>
</tr>
<tr>
<td></td>
<td>103-3 Evaluation of the management approach</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400</td>
<td>5.3.11. Radiation impact on the population and the environment, p. 424</td>
</tr>
<tr>
<td>Standard</td>
<td>Indicator</td>
<td>Section, page</td>
<td>Comments</td>
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<tr>
<td>GRI 303: Water and Effluents (2018)</td>
<td>303-1 A description of how the organisation interacts with water, including how and where water is withdrawn, consumed, and discharged</td>
<td>5.3.6. Water use, p. 412</td>
<td></td>
</tr>
<tr>
<td></td>
<td>303-2 Management of water discharge-related impacts</td>
<td>5.3.6. Water use, pp. 412-416</td>
<td></td>
</tr>
<tr>
<td></td>
<td>303-3 Water withdrawal</td>
<td>5.3.6. Water use, p. 412 Appendix 1. GRI Index, p. 448</td>
<td>The Corporation does not draw formation water or other types of water produced as a result of extraction, processing or use of any raw materials. Seawater is included in the ‘Other’ category. ROSATOM’s regions of operation do not suffer from water shortage.</td>
</tr>
<tr>
<td></td>
<td>303-4 Water discharge</td>
<td>5.3.6. Water use, p. 414 Appendix 1. GRI Index, p. 448</td>
<td>ROSATOM’s regions of operation do not suffer from water shortage. No break down into freshwater and other water is provided (due to a lack of a centralised accounting system).</td>
</tr>
<tr>
<td></td>
<td>303-5 Water consumption</td>
<td>5.3.6. Water use, p. 413 Appendix 1. GRI Index, p. 448</td>
<td>ROSATOM’s regions of operation do not suffer from water shortage.</td>
</tr>
<tr>
<td></td>
<td>306-2 Management of significant waste-related impacts</td>
<td>5.3.7. Industrial and consumer waste management, p. 416</td>
<td></td>
</tr>
<tr>
<td></td>
<td>306-3 Waste generated</td>
<td>5.3.7. Industrial and consumer waste management, p. 418</td>
<td></td>
</tr>
<tr>
<td>GRI 306: Waste (2020)</td>
<td>306-4 Waste diverted from disposal</td>
<td>5.3.7. Industrial and consumer waste management, p. 418</td>
<td>Disclosures 306-4 and 306-5 are provided in part, with no breakdown by waste management method as stipulated in the GRI Standards. Data on waste management are disclosed with a breakdown by waste management method as listed in the statistical reporting form 2-TP (Waste), due to a lack of waste management accounting practices aligned with the GRI 306 Standard (2020) in Russia.</td>
</tr>
<tr>
<td></td>
<td>306-5 Waste directed to disposal</td>
<td>5.3.7. Industrial and consumer waste management, p. 418</td>
<td></td>
</tr>
</tbody>
</table>

31. Compliance with environmental and technical standards

<table>
<thead>
<tr>
<th>Standard</th>
<th>Indicator</th>
<th>Section, page</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRI 103: Management Approach (2016)</td>
<td>103-1 Explanation of the material topic and its Boundary</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400</td>
<td></td>
</tr>
<tr>
<td></td>
<td>103-2 The management approach and its components</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400 1.12.2 Risk management, Risk management outcomes in 2021, p. 152 5.3.2. Financing of environmental measures, p. 402</td>
<td></td>
</tr>
<tr>
<td></td>
<td>103-3 Evaluation of the management approach</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400 5.3.3. Environmental charges and fines, p. 403</td>
<td></td>
</tr>
<tr>
<td>GRI 307: Environmental Compliance (2016)</td>
<td>307-1 Non-compliance with environmental laws and regulations</td>
<td>5.3.3. Environmental charges and fines, p. 404</td>
<td></td>
</tr>
</tbody>
</table>

32. Energy efficiency

<table>
<thead>
<tr>
<th>Standard</th>
<th>Indicator</th>
<th>Section, page</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRI 103: Management Approach (2016)</td>
<td>103-1 Explanation of the material topic and its Boundary</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400 2.3. Energy Efficiency, 2.3.1. Energy efficiency management system, p. 254</td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>Indicator</td>
<td>Section, page</td>
<td>Comments</td>
</tr>
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</tr>
<tr>
<td>103-2</td>
<td>The management approach and its components</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400</td>
<td>1.12.2 Risk management, Risk management outcomes in 2021, p. 152</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.3. Energy Efficiency</td>
<td>5.3.1. Energy efficiency management system, p. 245</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.3.2. Financing of environmental measures, p. 402</td>
<td></td>
</tr>
<tr>
<td>103-3</td>
<td>Evaluation of the management approach</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400</td>
<td>2.3. Energy Efficiency, 2.3.1. Energy efficiency management system, p. 245</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.3.2. Results in 2021, p. 246</td>
<td></td>
</tr>
<tr>
<td>33. Management of disturbed and contaminated areas</td>
<td>GRI 103: Management Approach (2016)</td>
<td>103-1 Explanation of the material topic and its Boundary</td>
<td>5.3.9. Rehabilitation of disturbed areas, p. 420</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.7. Development of the Northern Sea Route, p. 84</td>
<td>1.7.4. Activities of FSUE Hydrographic Enterprise, p. 90</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.7.4. Activities of FSUE Hydrographic Enterprise, p. 90</td>
<td></td>
</tr>
<tr>
<td>103-2</td>
<td>The management approach and its components</td>
<td>5.3.9. Rehabilitation of disturbed areas, p. 420</td>
<td>1.7. Development of the Northern Sea Route, p. 84</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.7.4. Activities of FSUE Hydrographic Enterprise, p. 90</td>
<td></td>
</tr>
<tr>
<td>103-3</td>
<td>Evaluation of the management approach</td>
<td>5.3.9. Rehabilitation of disturbed areas, p. 420</td>
<td>1.7. Development of the Northern Sea Route, p. 84</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.7.4. Activities of FSUE Hydrographic Enterprise, p. 90</td>
<td>Appendix 1. GRI Index, p. 450</td>
</tr>
</tbody>
</table>

### 34. Climate action and climate risks

<table>
<thead>
<tr>
<th>Standard</th>
<th>Indicator</th>
<th>Section, page</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRI 304: Biodiversity (2016)</td>
<td>304-3 Habitats protected or restored</td>
<td>5.3.9. Rehabilitation of disturbed areas, p. 421</td>
<td>Habitat restoration through the rehabilitation of disturbed land is not subject to verification by external independent experts. There are no partnerships with third parties to protect or restore habitat areas.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.7.4. Activities of FSUE Hydrographic Enterprise, p. 90</td>
<td>Appendix 1. GRI Index, p. 450</td>
</tr>
<tr>
<td>GRI 305: Emissions (2016)</td>
<td>305-6 Emissions of ozone-depleting substances (ODS)</td>
<td>5.3.4. Pollutant emissions into the atmosphere, p. 406</td>
<td>The Corporation did not export or import ODS.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.3.5. Greenhouse gas emissions, p. 407</td>
<td>Appendix 1. GRI Index, p. 451</td>
</tr>
</tbody>
</table>

### 35. Respect for human rights

<table>
<thead>
<tr>
<th>Standard</th>
<th>Indicator</th>
<th>Section, page</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRI 103: Management Approach (2016)</td>
<td>103-1 Explanation of the material topic and its Boundary</td>
<td>1.2. Sustainable Development Management, p. 34</td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.3.5. Greenhouse gas emissions, p. 407</td>
<td>5.3.2. Financing of environmental measures, p. 402</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.12.2 Risk management, Risk management outcomes in 2021, p. 152</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.3.1. Environmental safety and environmental protection management, p. 400</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.3.2. Financing of environmental measures, p. 402</td>
<td></td>
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<td></td>
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<td>5.3.5. Greenhouse gas emissions, p. 407</td>
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<table>
<thead>
<tr>
<th>Standard</th>
<th>Indicator</th>
<th>Section, page</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>3.3.2. Human rights, p. 305</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.3.2. Human rights, p. 305</td>
<td></td>
</tr>
</tbody>
</table>
GRI 406: Non-discrimination (2016)

406-1 Incidents of discrimination and corrective actions taken

3.3.2. Human rights, p. 307, Appendix 1. GRI Index, p. 451

No incidents of discrimination were recorded in 2021.


412-3 Employee training on human rights policies or procedures

3.3.2. Human rights, p. 307

The indicator has been disclosed in part. The percentage of employees who have undergone training has not been disclosed due to the lack of the relevant accounting system, which ROSATOM plans to implement in the medium term.

GRI 404: Training and Education (2016)

404-1 Average hours of training per year per employee by gender and employee category

3.2.7. Employee training, p. 280

The indicator has been disclosed in part. No records are kept on average hours of training per employee by gender.

404-2 Programmes for upgrading employee skills and transition assistance programmes

3.2.4. Executive succession pool, p. 277
3.2.6. Career counselling, p. 278
3.2.7. Employee training, p. 282

GRI 103: Management Approach (2016)

103-1 Explanation of the material topic and its Boundary

1.2. Sustainable Development Management, p. 54

103-2 The management approach and its components

1.2. Sustainable Development Management, p. 54
2.4. Business Efficiency, p. 250

103-3 Evaluation of the management approach

1.2. Sustainable Development Management, p. 54

GRI 103: Management Approach (2016)

103-1 Explanation of the material topic and its Boundary

Chapter 3. Social Report, Statement of the Deputy Director General for HR, p. 262
3.2.7. Employee training, p. 279

103-2 The management approach and its components

3.2.4. Executive succession pool, p. 276
3.2.7. Employee training, p. 279
3.4.5. Cooperation with universities and recruitment of young professionals, p. 313

103-3 Evaluation of the management approach

3.4.5. Cooperation with universities and recruitment of young professionals, p. 313

38. Youth and education policy; cooperation with universities

GRI 103: Management Approach (2016)

103-1 Explanation of the material topic and its Boundary

Chapter 3. Social Report, Statement of the Deputy Director General for HR, p. 262
3.2.7. Employee training, p. 279

103-2 The management approach and its components

3.2.4. Executive succession pool, p. 276
3.2.7. Employee training, p. 279
3.4.5. Cooperation with universities and recruitment of young professionals, p. 313

103-3 Evaluation of the management approach

3.4.5. Cooperation with universities and recruitment of young professionals, p. 313

36. Quality management

GRI 103: Management Approach (2016)

103-1 Explanation of the material topic and its Boundary

Chapter 3. Social Report, Statement of the Deputy Director General for HR, p. 262
3.2.7. Employee training, p. 279
## APPENDIX 2. TOTAL NUMBER OF ROSATOM’S EMPLOYEES AS AT 31 DECEMBER 2021

<table>
<thead>
<tr>
<th>Region where the organisation is located</th>
<th>Region where the organisation is located</th>
<th>TOTAL, including</th>
<th>Employees on the payroll</th>
<th>External part-time employees</th>
<th>Permanent employees (on a permanent employment contract)</th>
<th>Temporary employees (on a fixed-term employment contract)</th>
<th>Men</th>
<th>Women</th>
<th>Permanent employees (on a fixed-term employment contract)</th>
<th>Temporary employees (on a fixed-term employment contract)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moscow</td>
<td></td>
<td>43,173</td>
<td>41,465</td>
<td>1,708</td>
<td>26,328</td>
<td>16,845</td>
<td>40,151</td>
<td>3,022</td>
<td>16,845</td>
<td>26,328</td>
</tr>
<tr>
<td>Saint Petersburg</td>
<td></td>
<td>9,310</td>
<td>8,870</td>
<td>440</td>
<td>5,215</td>
<td>4,095</td>
<td>8,834</td>
<td>476</td>
<td>5,215</td>
<td>8,870</td>
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<tr>
<td>Arkhangelsk Region</td>
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<td>76</td>
<td>76</td>
<td>2</td>
<td>68</td>
<td>10</td>
<td>78</td>
<td>0</td>
<td>68</td>
<td>76</td>
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<tr>
<td>Astrakhan Region</td>
<td></td>
<td>113</td>
<td>113</td>
<td>0</td>
<td>93</td>
<td>20</td>
<td>74</td>
<td>39</td>
<td>93</td>
<td>113</td>
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<tr>
<td>Belgorod Region</td>
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<td>2</td>
<td>8</td>
<td>0</td>
<td>6</td>
<td>8</td>
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<tr>
<td>Vladimir Region</td>
<td></td>
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<td>2,660</td>
<td>368</td>
<td>1,286</td>
<td>1,742</td>
<td>2,990</td>
<td>48</td>
<td>1,742</td>
<td>2,660</td>
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<tr>
<td>Volgograd Region</td>
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<td>175</td>
<td>174</td>
<td>1</td>
<td>102</td>
<td>73</td>
<td>161</td>
<td>14</td>
<td>102</td>
<td>174</td>
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<tr>
<td>Volgoda Region</td>
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<td>61</td>
<td>24</td>
<td>85</td>
<td>0</td>
<td>61</td>
<td>84</td>
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<td>Voronezh Region</td>
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<td>7,143</td>
<td>43</td>
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<td>1,858</td>
<td>6,820</td>
<td>366</td>
<td>5,328</td>
<td>7,143</td>
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<td>Zabaykalsky Territory</td>
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<td>6,880</td>
<td>6,512</td>
<td>368</td>
<td>4,560</td>
<td>3,200</td>
<td>6,687</td>
<td>193</td>
<td>4,560</td>
<td>6,512</td>
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<tr>
<td>Ivanovo Region</td>
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<td>13</td>
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<td>13</td>
<td>8</td>
<td>16</td>
<td>5</td>
<td>13</td>
<td>13</td>
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<tr>
<td>Irkutsk Region</td>
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<td>1,353</td>
<td>12</td>
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<td>390</td>
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<td>73</td>
<td>975</td>
<td>1,353</td>
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<td>612</td>
<td>1</td>
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<td>111</td>
<td>301</td>
<td>312</td>
<td>502</td>
<td>612</td>
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<tr>
<td>Kaluga Region</td>
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<td>2,872</td>
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<td>44</td>
<td>1,741</td>
<td>1,131</td>
<td>2,495</td>
<td>377</td>
<td>1,741</td>
<td>2,828</td>
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<td>23</td>
<td>0</td>
<td>23</td>
<td>0</td>
<td>23</td>
<td>23</td>
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<tr>
<td>Kirov Region</td>
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<td>15</td>
<td>1</td>
<td>14</td>
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<td>5</td>
<td>1</td>
<td>14</td>
<td>10</td>
<td>14</td>
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<tr>
<td>Kransnodar Region</td>
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<td>3</td>
<td>10</td>
<td>5</td>
<td>14</td>
<td>1</td>
<td>10</td>
<td>12</td>
</tr>
</tbody>
</table>

GRI 102-8
<table>
<thead>
<tr>
<th>Region where the organisation is located</th>
<th>Employees on the payroll</th>
<th>External part-time employees</th>
<th>Men</th>
<th>Women</th>
<th>Permanent employees (on a permanent employment contract)</th>
<th>Temporary employees (on a fixed-term employment contract)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Republic of Mordovia</td>
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<td>0</td>
<td>166</td>
<td>79</td>
<td>224</td>
<td>21</td>
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<td>0</td>
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<td>72</td>
<td>8</td>
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<td>Republic of Tatarstan</td>
<td>508</td>
<td>8</td>
<td>71</td>
<td>9</td>
<td>323</td>
<td>185</td>
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<td>Rostov Region</td>
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<td>6,918</td>
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<td>0</td>
<td>9</td>
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<td>Saratov Region</td>
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<td>4,795</td>
<td>1,800</td>
<td>6,402</td>
<td>193</td>
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<td>Sverdlovsk Region</td>
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<td>132</td>
<td>13,049</td>
<td>8,376</td>
<td>21,037</td>
<td>388</td>
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<td>Smolensk Region</td>
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<td>29</td>
<td>3,823</td>
<td>1,908</td>
<td>5,635</td>
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<td>Stavropol Territory</td>
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<td>151</td>
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<td>Tver Region</td>
<td>5,459</td>
<td>17</td>
<td>3,495</td>
<td>1,964</td>
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<td>153</td>
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<td>Tomsk Region</td>
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<td>1</td>
<td>1</td>
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<td>Udmurt Republic</td>
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<td>3,440</td>
<td>1,452</td>
<td>4,786</td>
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<td>Ulyanovsk Region</td>
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<td>2,902</td>
<td>1,184</td>
<td>3,923</td>
<td>163</td>
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<td>Khabarovsk Territory</td>
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<td>0</td>
<td>19</td>
<td>3</td>
<td>22</td>
<td>0</td>
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<tr>
<td>Chelyabinsk Region</td>
<td>29,925</td>
<td>38</td>
<td>17,700</td>
<td>12,225</td>
<td>29,536</td>
<td>389</td>
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<tr>
<td>Chukotka Autonomous District</td>
<td>798</td>
<td>3</td>
<td>556</td>
<td>242</td>
<td>787</td>
<td>11</td>
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<td>Yaroslavl Region</td>
<td>5</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>0</td>
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<tr>
<td>Other</td>
<td>29</td>
<td>28</td>
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<td>27</td>
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</tbody>
</table>

**APPENDICES**

**Total headcount in ROSATOM’s overseas branches and organisations as at 31 December 2021, persons**

<table>
<thead>
<tr>
<th>Country</th>
<th>Average headcount</th>
<th>Average number of external part-time employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>16,197.294</td>
<td>1,801</td>
</tr>
<tr>
<td>Belarus</td>
<td>2,693.530</td>
<td>18,040</td>
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<tr>
<td>Turkey</td>
<td>1,933.476</td>
<td>10,930</td>
</tr>
<tr>
<td>Kazakhstan</td>
<td>1,106.773</td>
<td>0.300</td>
</tr>
<tr>
<td>Hungary</td>
<td>329.472</td>
<td>1,899</td>
</tr>
<tr>
<td>Finland</td>
<td>254.570</td>
<td>0.000</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>203.080</td>
<td>0.000</td>
</tr>
<tr>
<td>Egypt</td>
<td>129.083</td>
<td>0.000</td>
</tr>
<tr>
<td>Germany</td>
<td>119.496</td>
<td>0.000</td>
</tr>
<tr>
<td>China</td>
<td>100.189</td>
<td>0.027</td>
</tr>
<tr>
<td>Other</td>
<td>1,662.917</td>
<td>3,456</td>
</tr>
<tr>
<td>Total</td>
<td>24,728.820</td>
<td>32,710</td>
</tr>
</tbody>
</table>

**Total headcount (core employees + external part-time employees) as at 31 December 2021 by type of employment and gender, persons**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Russian Federation</td>
<td>163,946</td>
<td>93,512</td>
</tr>
<tr>
<td>Temporary employees (on a fixed-term contract)</td>
<td>12,904</td>
<td>4,769</td>
</tr>
<tr>
<td>Full-time employees</td>
<td>172,827</td>
<td>93,297</td>
</tr>
<tr>
<td>Part-time employees</td>
<td>4,223</td>
<td>5,184</td>
</tr>
<tr>
<td>Republic of Bangladesh</td>
<td>96</td>
<td>33</td>
</tr>
<tr>
<td>Temporary employees (on a fixed-term contract)</td>
<td>16,821</td>
<td>601</td>
</tr>
<tr>
<td>Full-time employees</td>
<td>16,914</td>
<td>632</td>
</tr>
<tr>
<td>Part-time employees</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**Data on the personnel structure have been provided for ROSATOM’s host countries with the largest number of employees.**
APPENDICES

APPENDIX 3. REPORT OF THE INTERNAL AUDIT DEPARTMENT OF STATE ATOMIC ENERGY CORPORATION ROSATOM

REPORT
of the Internal Audit Department of State Atomic Energy Corporation Rosatom
on the findings of internal audit of the business process
‘Public Reporting Procedure in ROSATOM’

Internal audit of the business process ‘Public Reporting Procedure in ROSATOM’ has been performed pursuant to the Consolidated Monitoring Plan of Specialized Internal Control Bodies of ROSATOM for the Second Half of 2022 signal off by the Director General of ROSATOM and approved by the Chairman of the Supervisory Board of ROSATOM.

The audit has involved:
- An assessment of efficiency of internal controls in the public reporting process;
- An assessment of compliance of the public reporting procedure with applicable legislation, international standards and internal regulatory requirements for public reporting;
- Producing recommendations for improving internal controls in public reporting and enhancing the efficiency of this process.

The findings of the audit suggest that the business process ‘Public Reporting Procedure in ROSATOM’ complies with applicable legislation, international standards and internal regulatory requirements governing the public reporting process. At the same time, the auditors would like to highlight the need for more detailed disclosure of information as required by individual provisions of international standards and internal regulations. The shortcomings revealed during the audit did not have a significant impact on the reliability and quality of the public annual report.

Head of the audit team
A.P. Ivanova

Member of the audit team
A.V. Romanova

APPENDIX 4. INDEPENDENT AUDITOR’S REPORT ON THE NON-FINANCIAL STATEMENTS OF STATE ATOMIC ENERGY CORPORATION ROSATOM

INDEPENDENT PRACTITIONER’S LIMITED ASSURANCE REPORT [TRANSLATION FROM RUSSIAN ORIGINAL]

To the management of State Atomic Energy Corporation Rosatom
We have undertaken an limited assurance engagement of State Atomic Energy Corporation Rosatom (hereafter referred to as “ROSATOM”) stakeholder engagement in the course of sustainability activities implementation as well as the accompanying ROSATOM Policy Annual Report for 2022 (hereafter referred to as “The Report”)

Responsibility of ROSATOM
ROSATOM is responsible for its compliance with the principles of the AA1000 Accountability Principles 2010 (hereafter referred to as “AA1000 AP 2010”) in stakeholder engagement in the course of sustainability activities implementation as well as for presentation of the support in accordance with the requirements of the International Integrated Reporting Framework. This responsibility includes the design, implementation and maintenance of internal controls relevant to the preparation of the Report that is free from material misstatement, whether due to fraud or error.

Our Independence and Qualification
We report to you that we have carried out our engagement in accordance with the AA1000 AP 2010, and areindependent of the management of ROSATOM with respect to the matters to which our report relates.

The firm applies International Standards on Quality Control 1, Quality Control for the Performance of Audits and Reviews of Financial Statements, and Other Assurance and Related Services Engagements, and is accordingly entitled to use the quality control assurance programme of Rosatom, which is in accordance with the external quality assurance standards issued by the International Auditing and Assurance Standards Board for Auditors and the International Federation of Accountants. The firm is also in compliance with the requirements of the AA1000 AP 2010 with respect to independence, standards, policies, procedures and quality assurance requirements.

Our Responsibility
Our responsibility is to express limited assurance conclusions:

- on ROSATOM stakeholder engagement in the course of sustainability activities implementation as well as for presentation of the support in accordance with the requirements of the International Integrated Reporting Framework.

Based on the procedures we have performed and the evidence we have obtained, we have concluded:

- that ROSATOM stakeholder engagement in the course of sustainability activities implementation as well as for presentation of the support in accordance with the requirements of the International Integrated Reporting Framework is free from material misstatement.

A limited assurance engagement undertaken in accordance with these standards includes assessing the following criteria (hereafter referred to as “Criteria”):

- ROSATOM stakeholder engagement in the course of sustainability activities implementation as well as for presentation of the support in accordance with the requirements of the International Integrated Reporting Framework.
- The Report is free from material misstatement.

Translated by Mr. Ivanov

FBK

GRI 102-56

458–459
### Glossary, Abbreviations and Acronyms

#### Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Becquerel (Bq)</td>
<td>A unit of nuclide activity in a radiation source equal to nuclide activity where one nucleus decays per second</td>
</tr>
<tr>
<td>BOO (Build – Own – Operate) contract</td>
<td>A contract imposing obligations related to the construction, ownership and operation of a facility</td>
</tr>
<tr>
<td>Capacity factor</td>
<td>The ratio of actual electricity output of a reactor unit during its operation to electricity output that would have been produced during its operation at full nameplate capacity without shutdowns</td>
</tr>
<tr>
<td>Closed nuclear fuel cycle</td>
<td>A nuclear fuel cycle in which spent nuclear fuel is processed in order to extract uranium and plutonium for nuclear fuel fabrication</td>
</tr>
<tr>
<td>Corporate business model</td>
<td>A model comprising key business processes used by an organisation to create and maintain its value in the short, medium and long term</td>
</tr>
<tr>
<td>Corporate social responsibility</td>
<td>A concept whereby an organisation takes into account stakeholder needs. It is a set of obligations voluntarily assumed by the organisation’s executives to take into account the interests of employees, shareholders, local communities in the organisation’s regions of operation, government bodies and municipal governments and other stakeholders. These obligations are funded mainly from the organisation’s own funds and are aimed at implementing significant internal and external social (in a broad sense) programmes whose outcomes help develop the organisation, improve its reputation and image, and enable constructive stakeholder engagement</td>
</tr>
<tr>
<td>Depleted uranium</td>
<td>Uranium with a lower content of the U-235 isotope than natural uranium (e.g. uranium in spent fuel from reactors fuelled with natural uranium)</td>
</tr>
<tr>
<td>Dialogue with stakeholders (as part of reporting processes)</td>
<td>An event held in accordance with the international AA1000 Series of Standards to facilitate communication between the organisation and representatives of key stakeholders when preparing and promoting its public reports</td>
</tr>
<tr>
<td>Digitisation</td>
<td>A systematic approach to the use of digital resources in order to improve labour productivity, gain a competitive advantage and promote overall economic development</td>
</tr>
<tr>
<td>Enrichment (isotopic)</td>
<td>a) The amount of atoms of a specific isotope in a mixture of isotopes of the same element if it exceeds the share of this isotope in a naturally occurring mixture (expressed as a percentage); b) a process resulting in an increase in the content of a specific isotope in a mixture of isotopes</td>
</tr>
</tbody>
</table>

#### Glossary, Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
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<tr>
<td>Corporate social responsibility</td>
<td>A concept whereby an organisation takes into account stakeholder needs. It is a set of obligations voluntarily assumed by the organisation’s executives to take into account the interests of employees, shareholders, local communities in the organisation’s regions of operation, government bodies and municipal governments and other stakeholders. These obligations are funded mainly from the organisation’s own funds and are aimed at implementing significant internal and external social (in a broad sense) programmes whose outcomes help develop the organisation, improve its reputation and image, and enable constructive stakeholder engagement</td>
</tr>
<tr>
<td>Depleted uranium</td>
<td>Uranium with a lower content of the U-235 isotope than natural uranium (e.g. uranium in spent fuel from reactors fuelled with natural uranium)</td>
</tr>
<tr>
<td>Dialogue with stakeholders (as part of reporting processes)</td>
<td>An event held in accordance with the international AA1000 Series of Standards to facilitate communication between the organisation and representatives of key stakeholders when preparing and promoting its public reports</td>
</tr>
<tr>
<td>Digitisation</td>
<td>A systematic approach to the use of digital resources in order to improve labour productivity, gain a competitive advantage and promote overall economic development</td>
</tr>
<tr>
<td>Enrichment (isotopic)</td>
<td>a) The amount of atoms of a specific isotope in a mixture of isotopes of the same element if it exceeds the share of this isotope in a naturally occurring mixture (expressed as a percentage); b) a process resulting in an increase in the content of a specific isotope in a mixture of isotopes</td>
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</table>

#### EPC (Engineering – Procurement – Construction) contract
A contract imposing obligations related to the turnkey construction of a facility, i.e. obligations related to engineering, procurement and construction of the facility. Unlike a BOO contract, it does not provide for ownership of the facility to be built.

#### EPCM (Engineering – Procurement – Construction + Management) contract
A contract imposing obligations related to the turnkey construction (engineering, procurement and construction) and management of a facility. Unlike a BOO contract, it does not provide for ownership of the facility to be built.

#### ESG
A term defining the full range of sustainability aspects of an organisation, namely environmental, social and governance aspects (E – the environment, S – the social aspect, G – governance).

#### Fast neutrons
Neutrons whose kinetic energy exceeds a certain limit. This limit varies within a broad range and depends on the application (reactor physics, protection or radiation monitoring). In reactor physics, this limit is usually set at 0.1 MeV.

#### First criticality
A stage in the commissioning of an NPP which involves loading nuclear fuel into the reactor, achieving first criticality and performing required physical experiments at a power level at which heat is removed from the reactor through natural heat losses.

#### Fuel assembly
A set of fuel elements (rods, bars, plates, etc.) held together with spacer grids and other structural elements that are transported and irradiated in the reactor in one piece. Fuel assemblies are loaded into the reactor core.

#### Global Reporting Initiative (GRI)
An international system for reporting on economic, environmental and social performance based on the Sustainability Reporting Standards.

#### Global Reporting Initiative (GRI) Sustainability Reporting Standards
Standards that outline the principles for defining report content and ensuring the appropriate quality of reporting information; disclosures comprising performance indicators related to an organisation’s economic, environmental and social impacts, approaches to managing these impacts and other characteristics.

#### Industry-wide emergency prevention and response system (IEPRS)
A functional subsystem for emergency prevention and response in organisations under the jurisdiction and within the scope of operations of ROSATOM.

#### Integrated report
A report consolidating all material data on the organisation’s strategy, corporate governance, performance indicators and prospects to present a comprehensive picture of its economic, social and environmental status. The report gives a clear idea of value creation in the organisation at present and in the future.

#### International Integrated Reporting Council (IIRC)
An international organisation responsible for promoting and updating the International Integrated Reporting Framework. The objective of the IIRC is to develop universal approaches to corporate reporting in order to promote sustainable development of the global economy.
Natural background radiation

Non-financial reporting

NPP safety

Nuclear fuel

Nuclear fuel cycle (NFC)

Nuclear power

Nuclear safety

Operator

Pilot operation

Power start-up

Radiation burden

Radiation monitoring

Radiation safety

Radioactive discharge

Radioactive release

Radioactive waste

Radioactive waste disposal

Radioactive waste processing and conditioning

Recommendations of the Russian Union of Industrialists and Entrepreneurs (RSPP) for Use in Governance Practice and Corporate Non-Financial Reporting (basic performance indicators)

Research reactor

Separative work unit (SWU)

Spent nuclear fuel reprocessing

Stakeholder assurance of the report

Radiation monitoring

Measures for obtaining information on radiation levels in the organisation and in the environment through work performed by dosimetric and radiometric monitoring.

Operator

An organisation that has obtained a permit from a regulator for the operation of an NPP or another nuclear facility.

Pilot operation

A stage in the commissioning of an NPP at which the NPP starts to generate energy, and the operation of the NPP is tested at various power levels, up to the level specified for commercial operation.

Power start-up

A stage in the commissioning of an NPP at which the NPP starts to generate energy, and the operation of the NPP is tested at various power levels, up to the level specified for commercial operation.

Radiation burden

A sum of individual doses of radiation received or planned in the course of operation, maintenance, repairs, replacement or dismantling of equipment at a nuclear facility.

Radiation safety

Protection of the current and future generations of people and the environment against the harmful impact of ionising radiation.

Radioactive discharge

Controlled release of radionuclides into industrial reservoirs as a result of the operation of a nuclear facility.

Radioactive release

Controlled atmospheric emission of radionuclides by a nuclear facility.

Radioactive waste

Materials and substances unsuitable for further use, as well as equipment and products with radionuclide content above prescribed levels.

Radioactive waste disposal

Safe placement of radioactive waste in repositories or any places that rules out waste withdrawal or a possibility of radioactive leaks into the environment.

Radioactive waste processing and conditioning

Process operations aimed at ensuring that the physical form and condition of radioactive waste are appropriate for its disposal.

Recommendations of the Russian Union of Industrialists and Entrepreneurs (RSPP) for Use in Governance Practice and Corporate Non-Financial Reporting (basic performance indicators)

A system of economic, social and environmental performance indicators for non-financial reports developed by the RSPP in order to facilitate the adoption of responsible business principles. It is based on a number of framework documents developed by UN organisations (including the UN Global Compact) and the Global Reporting Initiative, as well as methodological and procedural guidelines of the Federal State Statistics Service of the Russian Federation and guidelines developed by the RSPP (the Social Charter of Russian Business, Recommendations on the Preparation of Non-Financial Reports 'Five Steps Towards Social Sustainability of Companies', etc.)

Research reactor

A nuclear reactor designed for use as an object of research to obtain data on reactor physics and technology required in order to design and develop similar reactors or components thereof.

Separative work unit (SWU)

A measure of efforts expended on the separation of a given amount of material with a specific isotopic composition into two fractions with different isotopic compositions; separative work is measured in kilograms, and enrichment and energy costs are calculated per kilogram of separative work performed.

Spent nuclear fuel reprocessing

A set of chemical engineering processes for removing fission products from spent nuclear fuel and for regeneration of fissionable material for reuse.

Stakeholder assurance of the report

A procedure organised in accordance with the AA1000SES (2015) international standard whereby representatives of principal stakeholders provide assurance for the report by confirming the materiality and completeness of information disclosed in the report, and whereby the organisation responds to requests and proposals from stakeholders. The outcome of stakeholder assurance is a Statement of Public Assurance signed by representatives of principal stakeholders and included in the report.
Stakeholders
Individuals and/or legal entities and groups of individuals or entities that make an impact on
the organisation's operations through their actions and/or are affected by the organisation. An
organisation may have different stakeholders (national and international regulatory (supervisory)
authorities, shareholders, consumers of goods and services, business partners, suppliers and
contractors, civil society organisations, local communities, trade unions, etc.) with differing and
conflicting interests.

Sustainable development
Development of society that meets the needs of the present without compromising the ability of
future generations to meet their own needs.

UN Sustainable Development Goals
17 goals adopted as part of the 2030 Agenda for Sustainable Development by the UN General
Assembly in 2015. The Goals were adopted under Resolution 70/1 of the UN General Assembly
dated 25 September 2015.

Uranium conversion
A chemical engineering process involving the transformation of uranium-containing materials into
uranium hexafluoride.

Uranium hexafluoride
A chemical compound of uranium and fluorine (UF₆), which is the only highly volatile uranium
compound (when heated to 53°C, uranium hexafluoride changes directly from the solid state into
the gaseous state); it is used as feedstock for the separation of uranium-238 and uranium-235
isotopes using gaseous diffusion or the gas centrifuge method and for production of enriched
uranium.

Uranium ore enrichment
A combination of processes for primary treatment of uranium-containing mineral resources in
order to separate uranium from other minerals contained in the ore.

Water-cooled water-moderated power reactor (VVER)
A power reactor in which water is used as both a coolant and a moderator. Russian NPPs typically
use two versions of VVER reactors: VVER-440 and VVER-1000.

List of Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>APCS</td>
<td>Automated process control system</td>
</tr>
<tr>
<td>ARMS</td>
<td>Automated radiation monitoring system</td>
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<tr>
<td>CATF</td>
<td>Closed administrative and territorial formation</td>
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<tr>
<td>CHPP</td>
<td>Combined heat and power plant</td>
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<tr>
<td>DUHF</td>
<td>Depleted uranium hexafluoride</td>
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<td>ESP</td>
<td>Executive succession pool</td>
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<tr>
<td>FAIR</td>
<td>Facility for Antiproton and Ion Research</td>
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<td>FMBA of Russia</td>
<td>Federal Biomedical Agency</td>
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<tr>
<td>FS</td>
<td>Feasibility study</td>
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<td>FTP</td>
<td>Federal target programme</td>
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<tr>
<td>GRI</td>
<td>Global Reporting Initiative (sustainability reporting guidelines)</td>
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<td>HLW</td>
<td>High-level waste</td>
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<tr>
<td>IAEA</td>
<td>International Atomic Energy Agency</td>
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<tr>
<td>IARMS</td>
<td>Industry-Wide Automated Radiation Monitoring System</td>
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<tr>
<td>IGA</td>
<td>Intergovernmental agreement</td>
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<tr>
<td>IP</td>
<td>Intellectual property</td>
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<tr>
<td>IRAW</td>
<td>Individual risk assessment workstation</td>
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<tr>
<td>ITER</td>
<td>International Thermonuclear Experimental Reactor</td>
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<tr>
<td>KPI</td>
<td>Key performance indicator</td>
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<tr>
<td>LNG</td>
<td>Liquefied natural gas</td>
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<tr>
<td>LTIFR</td>
<td>Lost Time Injury Frequency Rate</td>
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<tr>
<td>MIC</td>
<td>Military-industrial complex</td>
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<tr>
<td>NELC</td>
<td>Nuclear Energy Information Centre</td>
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<tr>
<td>NFA</td>
<td>Nuclear fuel assembly</td>
</tr>
<tr>
<td>NFC</td>
<td>Nuclear fuel cycle</td>
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</tbody>
</table>

APPENDICES

466–467
Contact Details and Useful Links

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ROSATOM’s anti-corruption hotline
Tel.: +7 (800) 100-07-07
Email: 0707@rosatom.ru

Official corporate website
http://www.rosatom.ru/

Official reporting portal
https://www.report.rosatom.ru

Official website for placement of orders for the procurement of goods, work and services for ROSATOM
http://zakupki.rosatom.ru/

Official group on VKontakte
http://vk.com/rosatomru

Official blog on Twitter
https://twitter.com/rosatom

Official channel on YouTube
http://www.youtube.com/user/MirnyAtom

GRI 102-17
Feedback Form

Dear readers,

You have read the annual report of State Atomic Energy Corporation Rosatom, which is intended for a wide range of stakeholders. We attach great importance to the opinion of the readers of our Report. We would appreciate it if you helped improve the quality of the Company’s reports by completing the questionnaire below.

Please return the completed form by mail to the Communications Department at 24 Bolshaya Ordynka Street, Moscow, 119017 or by email (EAMamy@rosatom.ru).

1. Please assess the Report using the following criteria:

Accuracy and objectivity
- Excellent □
- Good □
- Satisfactory □
- Poor □

Completeness and relevance of information
- Excellent □
- Good □
- Satisfactory □
- Poor □

Report structure, ease of reference, wording
- Excellent □
- Good □
- Satisfactory □
- Poor □

2. Please specify which sections of the Report you have found to be relevant and useful:

3. What topics do you think should be covered in the next Report?

4. Your recommendations and additional comments:

5. Please specify which stakeholder group you represent:
- Employee of JSC Atomenergoprom or ROSATOM □
- Employee of an organisation forming part of JSC Atomenergoprom or ROSATOM □
- Representative of the Federal government □
- Representative of a regional government □
- Representative of a local government □
- Representative of a contractor/supplier □
- Representative of a customer/consumer of goods and services □
- Representative of a business partner □
- Representative of a non-governmental organisation □
- Representative of the media □
- Representative of the expert community □
- Representative of a regional government □
- Other (please specify) □