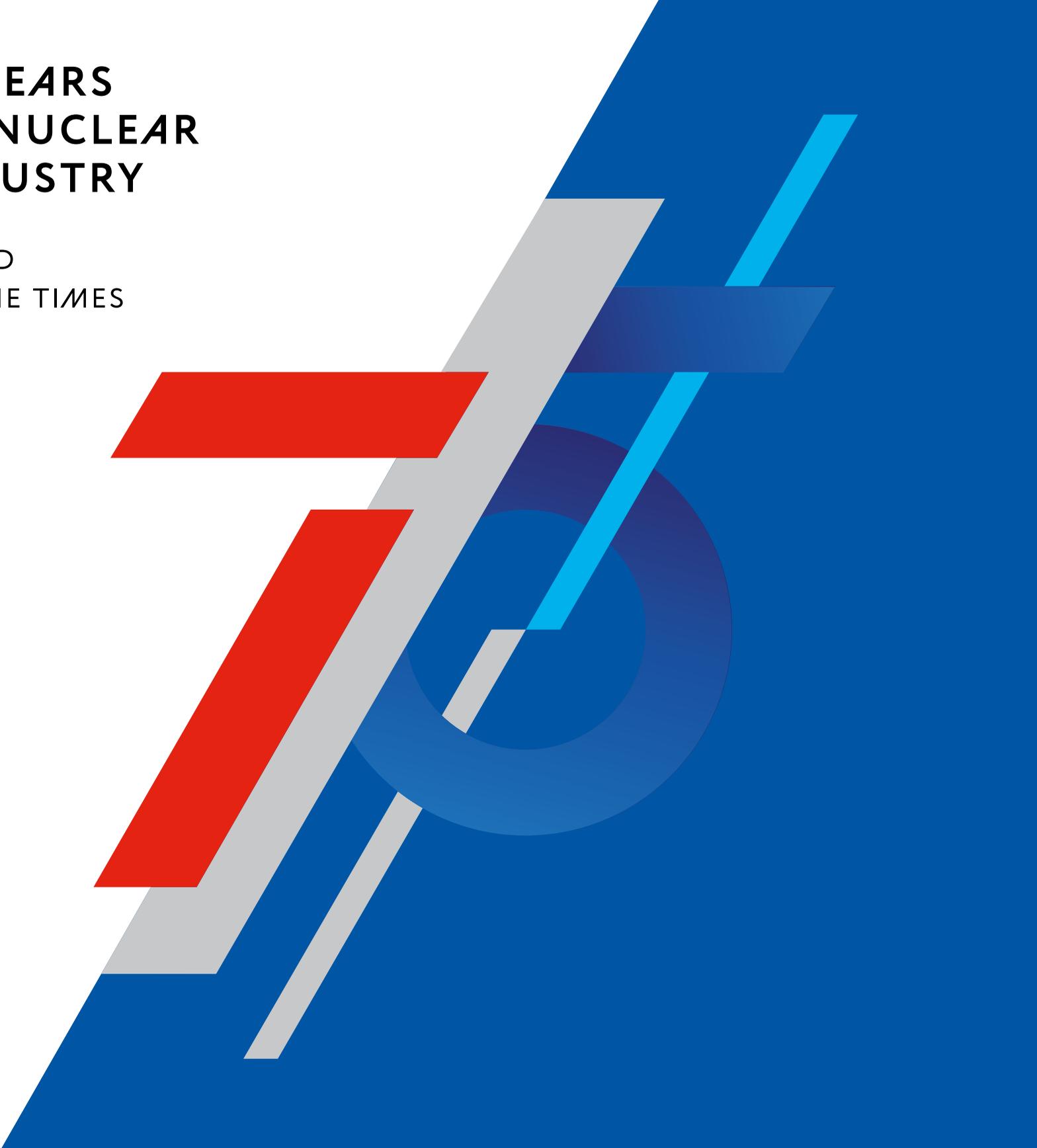


# 75 YEARS OF NUCLEAR INDUSTRY

AHEAD  
OF THE TIMES





**ROSATOM**



## ADDRESS BY THE DIRECTOR GENERAL

**ALEXEY LIKHACHEV**  
Director General  
of ROSATOM

Dear colleagues,

2020 marks the 75th anniversary of the Russian nuclear industry. Historically, our efforts have been focused on promoting peace, stability and progress. As pioneers in the application of nuclear technology, we have been making a major contribution to social and economic development in Russia for decades. Nuclear power plants (NPPs) operated by ROSATOM generate low-carbon power, which meets the needs of people and the economy without affecting the climate.

The nuclear industry has always been a laboratory generating new knowledge and developing new technologies that have been successfully adopted by other industries. It is only natural that ROSATOM has expanded its business far beyond power generation at NPPs. Today, State Atomic Energy Corporation Rosatom comprises more than 300 enterprises, organizations and research institutions, which contribute to the development of healthcare, materials science and mechanical engineering, and manufacture isotope products, supercomputers, software and digital products. The aim of all these activities is to promote systematic improvement in people's lives, while at the same time preserving the environment.

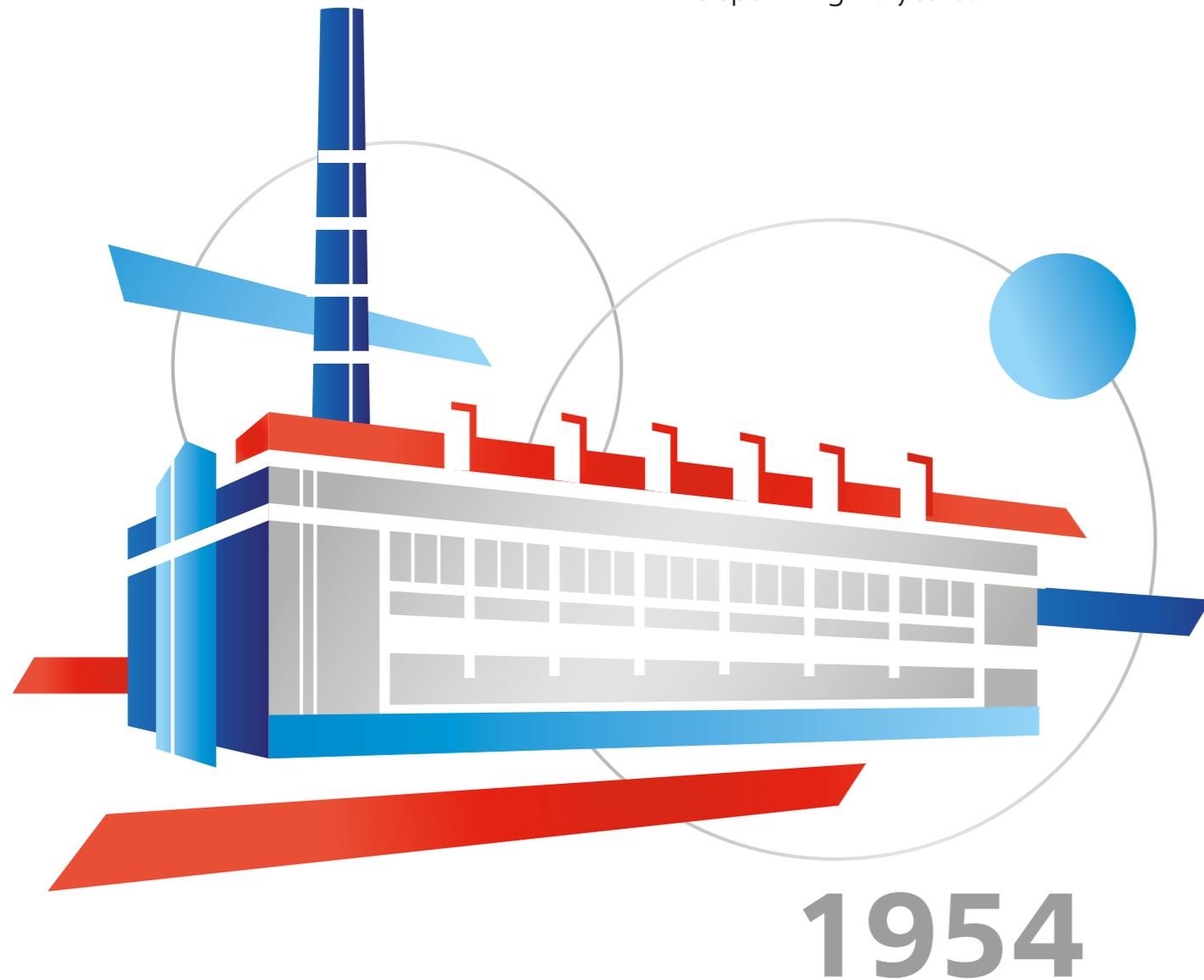
The world is changing rapidly. Life scenarios that only recently seemed unlikely are materializing. I believe that we will be able to rise to all the latest challenges by continuing to do what we do best: finding new technological solutions that had not been available before, accumulating unique knowledge and sharing it with our partners in order to achieve a shared goal.

It is crucial to remember that technologies are created by people. Accordingly, human capital remains of the utmost importance for ROSATOM. We need leaders at all levels, who are capable of working in a rapidly changing environment and acquiring new competences, especially 'digital' ones. In turn, ROSATOM makes every effort to create an environment that will enable its employees to fully unlock their professional and creative potential.

I am convinced that, as ROSATOM is entering a new stage of its development, it will continue to demonstrate strong performance and contribute to sustainable development globally. ●

## CLEAN ENERGY GENERATION

Russia has pioneered the peaceful use of nuclear energy. The first nuclear power plant, which had a capacity of 5 MW, was launched in 1954 in Obninsk (Kaluga Region) and had an accident-free service life spanning 48 years.



## SAFE TECHNOLOGICAL SOLUTIONS, OCCUPATIONAL AND ENVIRONMENTAL SAFETY ARE A TOP PRIORITY FOR ROSATOM



NPPs are a source of low-carbon power. ROSATOM operates 36 NPP power units across Russia with installed capacity totalling 30.3 GW. In 2019, power unit No. 2 of Novovoronezh NPP-2 started commercial operation ahead of schedule. This is the third state-of-the-art generation 3+ power unit in Russia, meeting the highest safety standards.

In 2019, electricity output at Russian NPPs totalled 208.8 billion kWh, accounting for 19% of the country's total electricity output. This helped to prevent greenhouse gas emissions totalling 109.5 million tonnes of CO<sub>2</sub> equivalent.

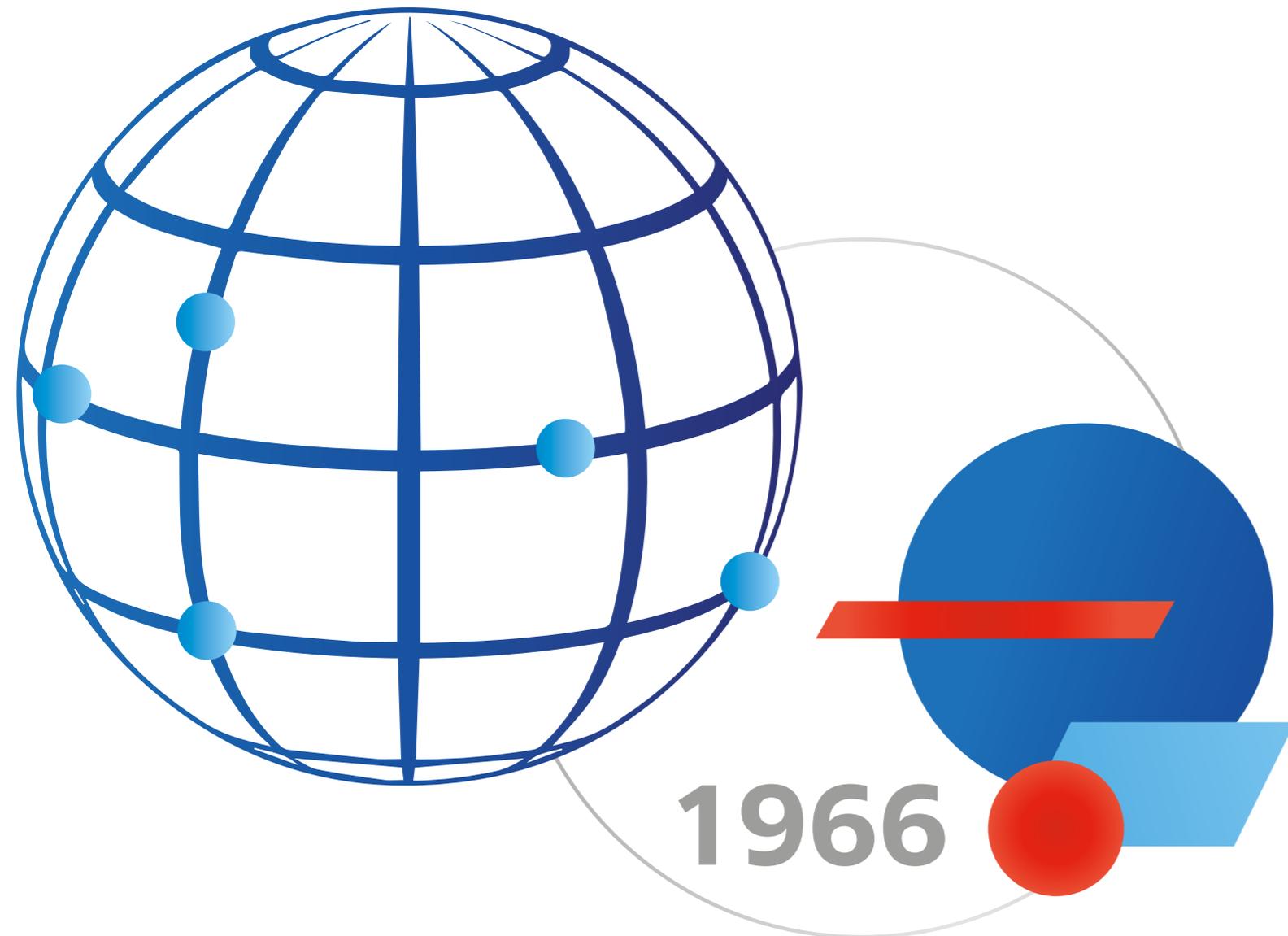
The floating nuclear power plant in Pevek (Chukotka Autonomous District) was connected to the isolated power system of the Chaun-Bilibino energy hub and will now cover 30% of the region's electricity demand. The mobile thermal

nuclear power plant using marine technology will facilitate the development of the Chukotka region, including local manufacturing enterprises and infrastructure.

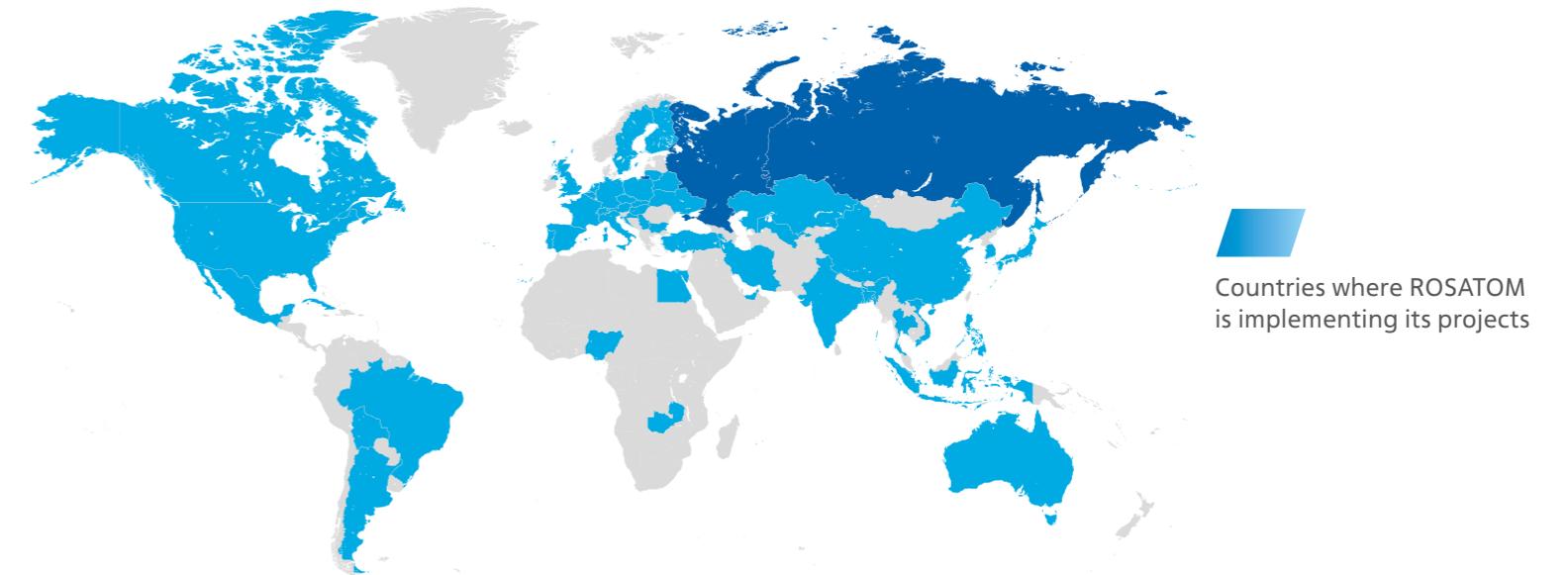
Safe technological solutions, occupational and environmental safety are a top priority for ROSATOM. In NPP construction and operation projects, special focus is given to the management of spent nuclear fuel (SNF), SNF processing products and radioactive waste (RAW) generated in the course of operation, as well as to the decommissioning of facilities posing nuclear and radiation hazards. ●

## PROMOTING GLOBAL DEVELOPMENT

The first nuclear power plant to be commissioned overseas in the Soviet era was Rheinsberg NPP launched in 1966 in the German Democratic Republic. Soviet specialists also built nuclear power plants in Bulgaria, Finland, Czechoslovakia and Hungary.



## NPP CONSTRUCTION AND OPERATION CONTRIBUTES TO ECONOMIC AND INFRASTRUCTURE DEVELOPMENT BOTH IN RUSSIA AND IN FOREIGN CUSTOMER COUNTRIES



NPP construction and operation contributes to economic and infrastructure development both in Russia and in foreign customer countries. As high-technology manufacturing enterprises are guaranteed long-term stable capacity utilization, companies in related industries receive orders, and new jobs are created for local communities, all this contributes to GDP through industry revenue and tax payments. NPP construction and operation provides employment for several thousand people, both at the plant itself and in the sphere of nuclear infrastructure.

ROSATOM is actively promoting Russian nuclear technologies for energy and non-energy applications both in countries that are beginning to develop nuclear power and in countries with a well-developed national nuclear power industry.

ROSATOM is working to strengthen the international legal framework for cooperation. By the end of 2019, intergovernmental agreements had been concluded with 74 countries, including agreements on the construction of nuclear facilities in 20 countries. 2019 saw the signing of 7 intergovernmental agreements and 23 major

interdepartmental arrangements, including an agreement on the construction of a Russian-design Centre for Nuclear Science, Technology and Innovation in Serbia. In addition, ROSATOM is actively cooperating with international organizations, such as the International Atomic Energy Agency, the Nuclear Energy Agency of the Organization for Economic Cooperation and Development and the Commission of the CIS Member States on the Peaceful Use of Nuclear Energy.

ROSATOM's overseas business portfolio includes 36 power units in 12 countries, with 25 power units in 9 countries currently at the active stage of implementation.

As part of its NPP construction projects, ROSATOM concludes long-term contracts for the supply of nuclear fuel throughout the NPP life cycle. As a responsible company committed to sustainable use of resources, ROSATOM is developing recycling technologies, which enable it to reuse valuable materials in the nuclear fuel cycle. ROSATOM has references for the application of these technologies in Russia and offers them to its foreign partners. ●

## DEVELOPING TRANSPORT INFRASTRUCTURE IN THE ARCTIC

On December 3, 1959, the world's first nuclear icebreaker, Lenin, was put into operation. This date marked the emergence of Russia's nuclear-powered icebreaker fleet. The Lenin icebreaker remained in operation for almost three decades and escorted thousands of vessels through ice-bound Arctic seas, covering almost three times the distance between the Earth and the Moon.



1959

## ROSATOM IS DEVELOPING TRANSPORT INFRASTRUCTURE FOR THE IMPLEMENTATION OF STRATEGIC PROJECTS IN THE RUSSIAN ARCTIC



The Northern Sea Route is a maritime transport corridor crossing the Arctic Ocean. This is the shortest route connecting European and Asian Russia. Russia's long-term strategic objectives include developing the Arctic and encouraging navigation along the Northern Sea Route.

ROSATOM has been assigned the functions of the infrastructure operator of the Northern Sea Route. Its responsibilities include escorting vessels, building infrastructure facilities, supporting navigation and ensuring its safety in the challenging Arctic environment.

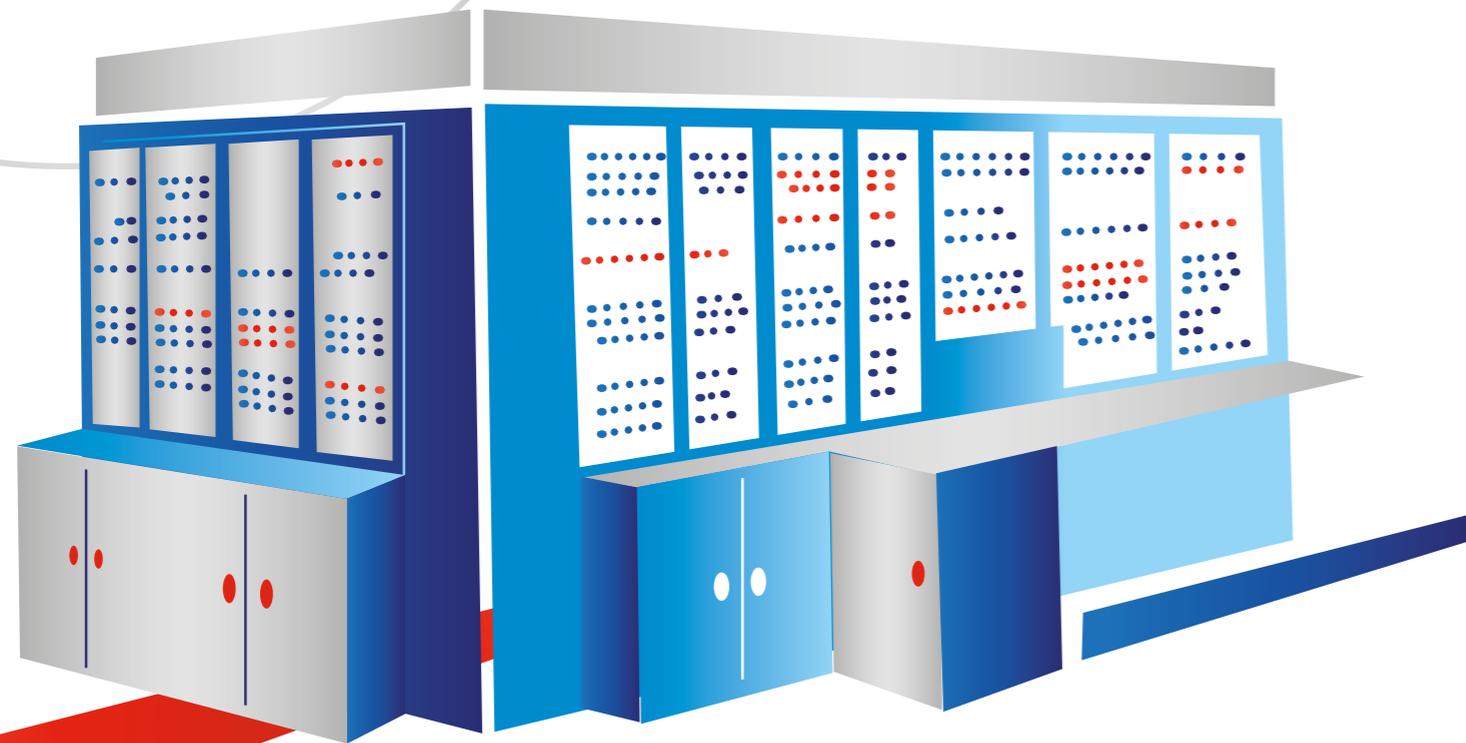
Under the Northern Sea Route Federal Project (which forms part of one of Russia's national projects), by 2024, cargo traffic via the Northern Sea Route is projected to reach 80 million tonnes per year.

To handle the growing cargo traffic along the Northern Sea Route, ROSATOM is upgrading its icebreaker fleet on a large scale. Three new-generation icebreakers are currently under construction; two of them (Sibir and Ural) have been launched, while the third one (Arktika) is under sea trials. In 2019, ROSATOM concluded a contract for the construction of two more follow-on icebreakers of this type. In 2020, ROSATOM plans to sign the contract and to start the construction of a unique icebreaker, Lider, which will enable year-round operation in the High Arctic, mainly in its eastern sector, which is characterized by the most challenging ice conditions.

In 2019, ROSATOM met the targets set for the Northern Sea Route Federal Project ahead of schedule. Cargo traffic totalled 31.5 million tonnes (against a target of 26 million tonnes). ●

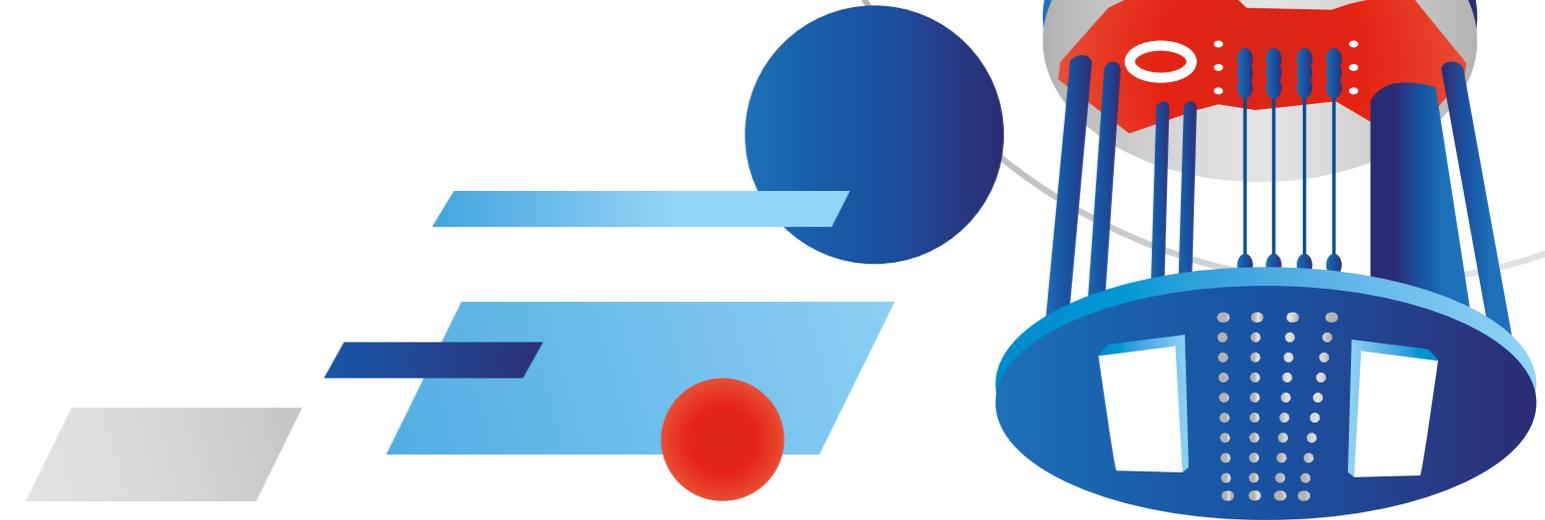
## CONTRIBUTION TO DIGITIZATION

In 1957, Design Bureau No. 11 (KB-11, now the National Research Institute of Experimental Physics in Sarov) put into operation its first computer, Strela ('Arrow'). It helped to solve nuclear physics problems, including those related to NPP design, much faster than before.



# 1957

## ROSATOM IS DEVELOPING EFFICIENT INNOVATIVE SOLUTIONS THAT WILL USHER IN THE DIGITAL WORLD OF THE FUTURE



Digitization of the economy and everyday life is a key modern trend. ROSATOM leverages its extensive experience in responding to major technological challenges to develop efficient innovative solutions that will usher in the digital world of the future.

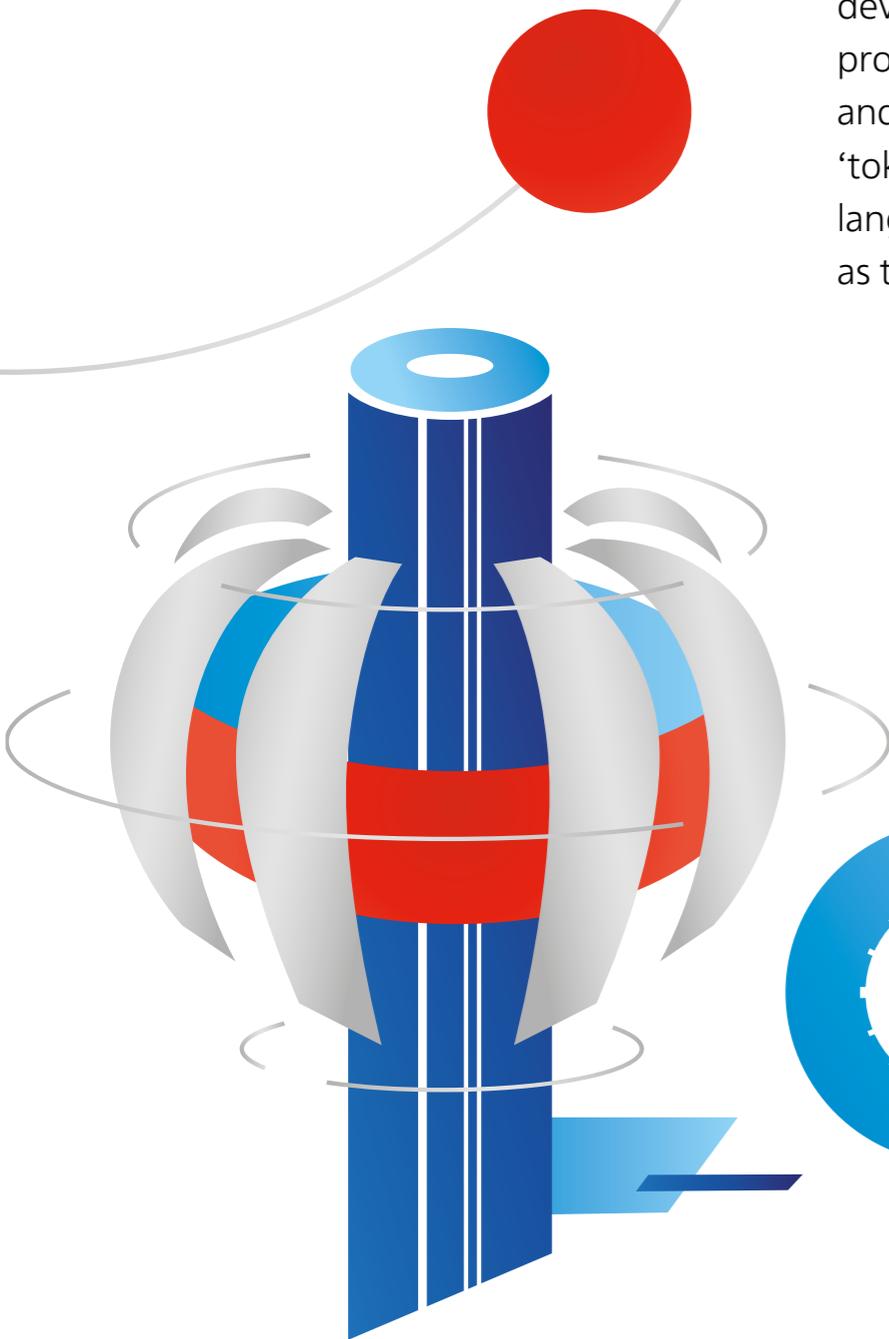
State Atomic Energy Corporation Rosatom is implementing the Uniform Digital Strategy, which is focused on supporting the digitization of the Russian economy, developing ROSATOM's own digital products and putting them on the market, and improving internal business processes.

In 2019, ROSATOM became a competence centre under the Digital Technology Federal Project, which forms part of the Digital Economy National Programme. Seven road maps for developing end-to-end digital technologies in Russia were prepared and approved, with ROSATOM as a responsible contractor.

Under an agreement with the Russian Government, ROSATOM launched a large-scale project to create a Russian-designed 100-qubit quantum computer by 2024. Quantum computers will be able to perform those tasks that are currently impossible, including in the sphere of cybersecurity, artificial intelligence and the modelling of new materials.

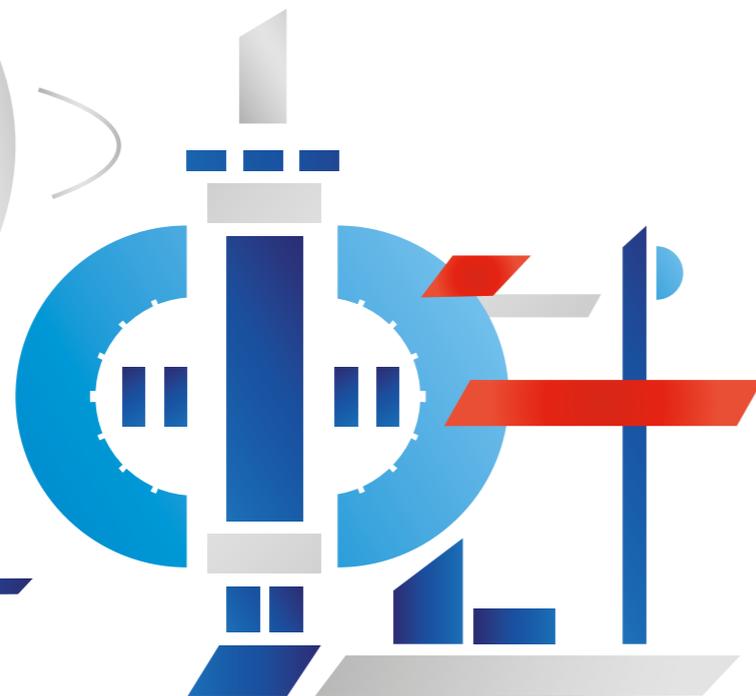
By the end of 2019, ROSATOM put five digital products on the market: modules forming part of the Logos software suite (Logos Aero-Hydro and Logos Thermo), the Volna ('Wave') programming and computing system, the Kalininsky Data Centre and the Technical Documentation E-Shop. Leading Russian industrial, energy, and oil and gas companies became the first customers for these products. ROSATOM's register of digital products includes a total of 149 projects. ●

# INNOVATIONS FOR THE FUTURE



Soviet physicists pioneered the use of nuclear fusion. The first toroidal magnetic confinement devices (tokamaks) were developed in the 1950s. The concept was proposed by academicians Andrey Sakharov and Igor Tamm. The Russian acronym 'tokamak' has been borrowed by other languages around the world, in the same way as the word 'sputnik'.

## 1950s



# ROSATOM CREATES BREAKTHROUGH TECHNOLOGIES TO SUPPORT LONG-TERM DEVELOPMENT AND MEET THE ENERGY NEEDS OF MANKIND

reactors, which are the mainstay of the global nuclear power industry, will be operated alongside power units equipped with fast neutron reactors. As a result, the nuclear industry will shift to a circular economy consistent with sustainable development principles and objectives.

In 2019, ROSATOM started to implement a Single Industry-Wide Plan of R&D Topics, which is designed to promote R&D efforts in development areas prioritized by ROSATOM, including development of the VVER technology, small-scale reactors, new materials, hydrogen energy, nuclear fusion, superconductivity, nuclear medicine, etc.

Innovative solutions developed by ROSATOM are also actively used in other high-technology industries. In 2019, the Astronomical Roentgen Telescope X-Ray Concentrator (ART-XC) developed by researchers from ROSATOM in cooperation with the Space Research Institute of the Russian Academy of Sciences was launched into space as part of the Spektr-RG space observatory. The aim of the observatory is to survey the universe in the X-ray region of the electromagnetic spectrum. Researchers intend to use the unprecedentedly sensitive instruments of the Spektr-RG observatory to study large galaxy clusters and black holes in greater detail.

Overall, more than 50 projects targeted at energy and non-energy markets were underway in 2019 as part of ROSATOM's Innovative Development Programme. The new version of the Programme includes national projects, prioritized projects promoting scientific and technological development in the nuclear industry, and innovative digital transformation projects. ROSATOM engaged the Russian Academy of Sciences, the National Research Centre Kurchatov Institute, 30 universities and 50 third-party research institutions in its R&D initiatives. ●

ROSATOM is actively participating in international 'mega science' projects, including a project to build the world's first experimental fusion reactor, ITER. If it succeeds, the ITER project will provide humanity with an almost inexhaustible source of energy.

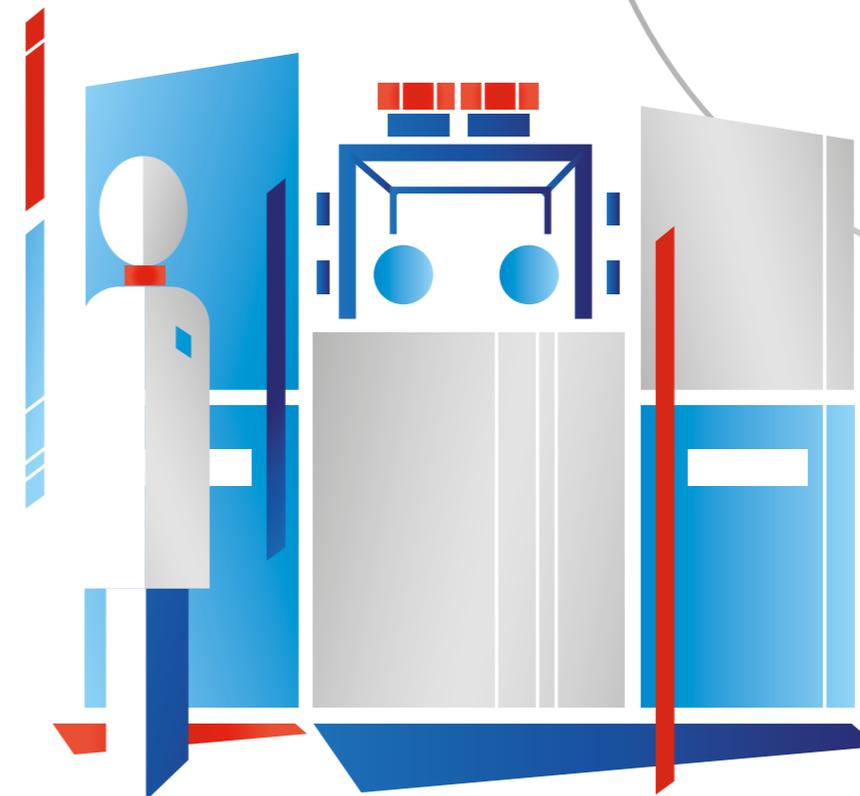
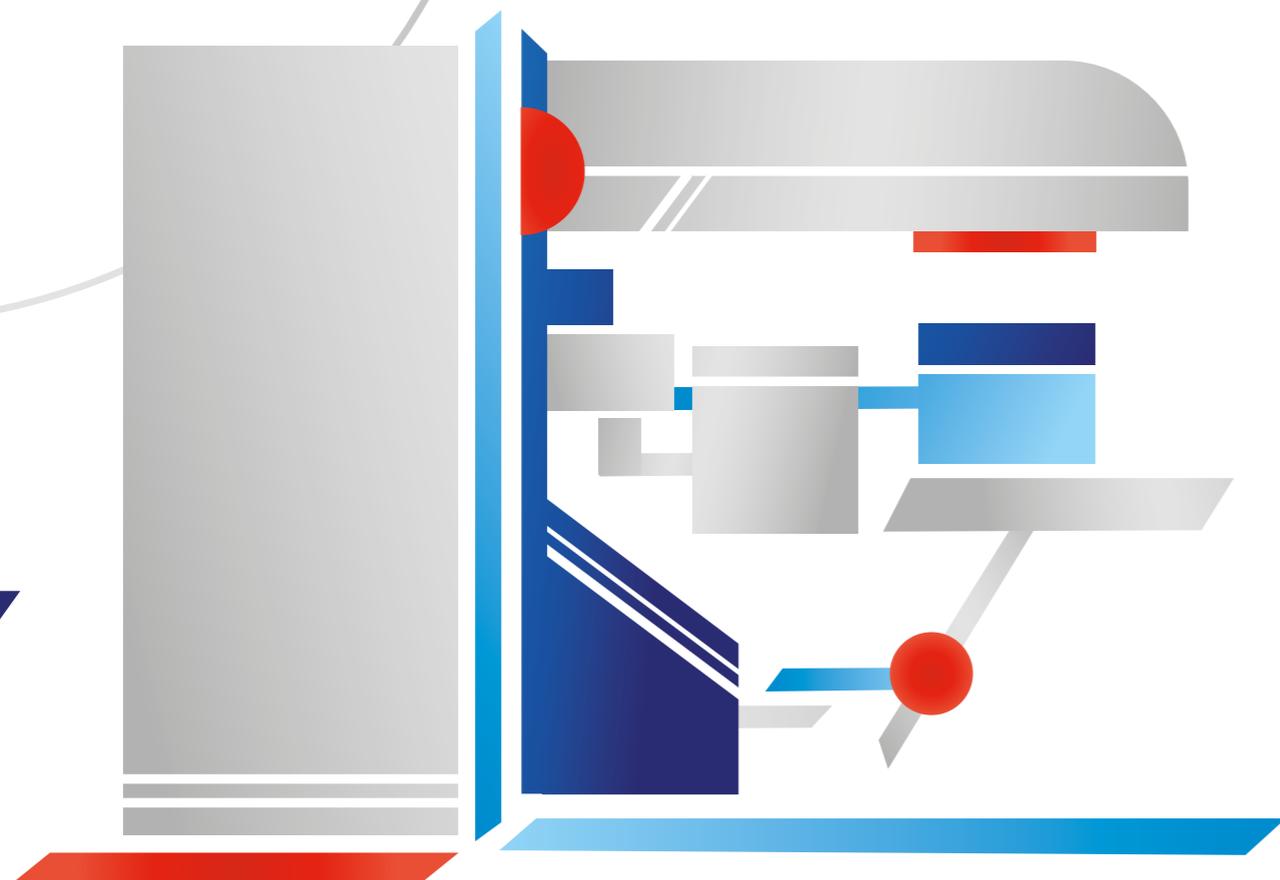
Researchers from ROSATOM will also conduct experiments in inertial confinement fusion. In 2019, a target chamber, where targets will be irradiated by laser beams, was assembled for the world's largest laser facility currently under construction in Sarov. The idea for this facility was proposed in 1961 by Nikolay Basov and Oleg Krokhin.

ROSATOM is implementing a long-term project, Proryv (Breakthrough), 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. The ultimate goal is to create a two-component nuclear power system with a closed fuel cycle, in which power units equipped with thermal-neutron VVER

## NEW OPPORTUNITIES OFFERED BY NEW PRODUCTS

# 1940s

Technologies and capabilities originally developed for the nuclear industry soon started to be applied in other related areas. Isotope production for medical applications started as early as in the 1940s. Initially, isotopes were produced in the first nuclear reactor of the Mayak plant, reactor A-1. Subsequently, the USSR became a leader in nuclear medicine.



**ONE OF ROSATOM'S STRATEGIC GOALS IS TO DEVELOP NEW PRODUCTS. THEY PROVIDE NEW OPPORTUNITIES FOR IMPROVING ENVIRONMENTAL SAFETY, DEVELOPING HEALTHCARE AND MUNICIPAL INFRASTRUCTURE, AND MAKING PROGRESS IN OTHER KEY AREAS RELEVANT TO SUSTAINABLE DEVELOPMENT**

One of ROSATOM's strategic goals is to develop new products. They provide new opportunities for improving environmental safety, developing healthcare and municipal infrastructure, and making progress in other key areas relevant to sustainable development.

ROSATOM's portfolio of new products covers 81 areas, including seven strategic programmes: Wind Power, Composite Materials, Nuclear Medicine, Waste Management, Oil and Gas Services, Digital ROSATOM and the Smart City.

In 2019, ROSATOM completed bench tests of a linear particle accelerator and an upgraded brachytherapy facility. An upgraded facility for the production of molybdenum-99 and other isotopes designed for use in nuclear medicine started full-scale operation.

ROSATOM played an active role in establishing the Composites Without Borders Inter-Regional Industry Cluster, which includes the Republic of Tatarstan and the Saratov and Moscow

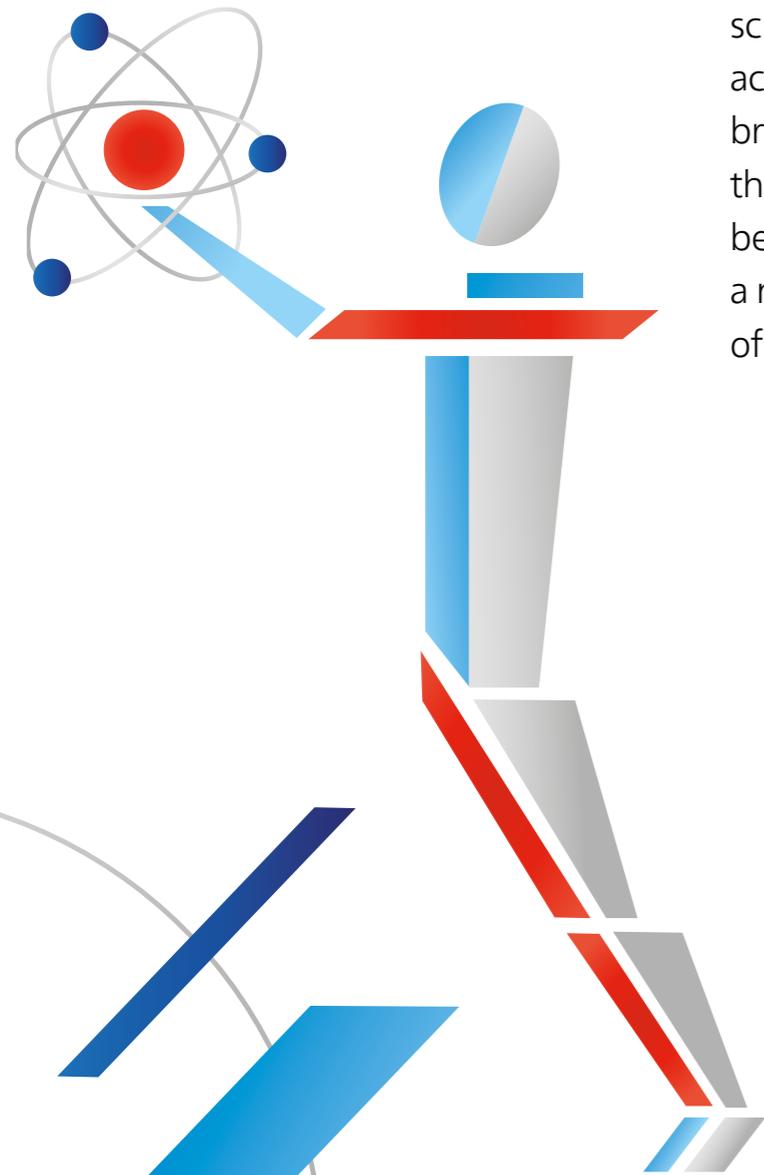
Regions. It is intended that the Tula and Ulyanovsk Regions will be included in the Cluster in 2020. The Cluster will facilitate cooperation between the regions in order to launch full-cycle production of composite materials in Russia and create the relevant process chain.

An agreement was concluded on building and developing a passenger rail system on Sakhalin Island which will use trains powered with hydrogen fuel cells, as well as the relevant support systems.

ROSATOM's Fuel Division started pilot operation of the first Russian-made multi-powder 3D printer with two laser sources.

As part of State Atomic Energy Corporation Rosatom's environmental initiatives on the management of class 1 and 2 industrial waste (with ROSATOM acting as a contractor under the Clean Country Federal Project), in 2019, ROSATOM started to clean up a number of sites in the Chelyabinsk and Leningrad Regions. ●

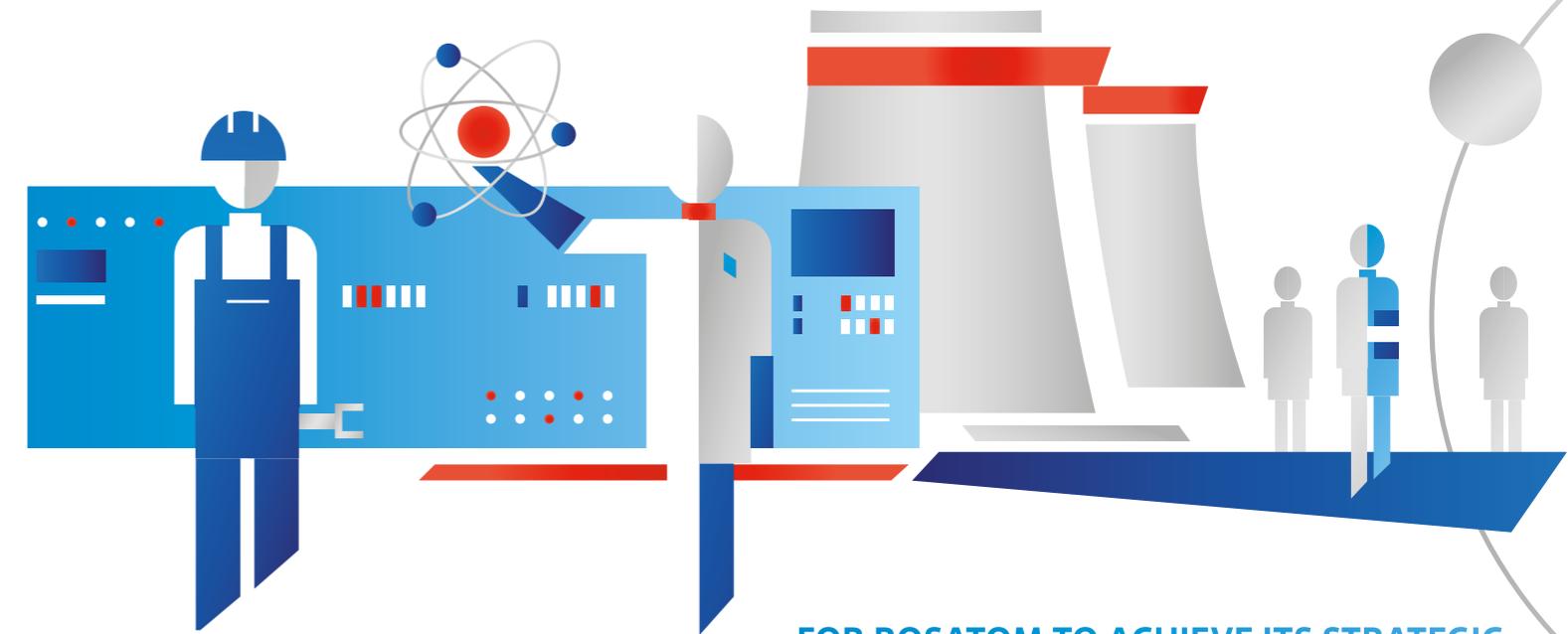
# ROSATOM'S PEOPLE



Prominent people play a fundamental role in the history of the nuclear industry and its development. A group of brilliant scientists led by Igor Kurchatov have achieved an unprecedented technological breakthrough, while talented administrators, the legendary 'nuclear' minister Efim Slavsky being the foremost among them, have created a new industry, which has become a driver of development for the entire economy.



# 1945–2020



**FOR ROSATOM TO ACHIEVE ITS STRATEGIC GOALS, IT IS NECESSARY FOR ITS EMPLOYEES TO BE ABLE TO FULLY UNLOCK THEIR POTENTIAL. THIS IS WHY PEOPLE ARE ROSATOM'S MOST IMPORTANT CAPITAL**

For ROSATOM to achieve its strategic goals, it is necessary for its employees to be able to fully unlock their potential. This is why people are ROSATOM's most important capital. In the 21<sup>st</sup> century, HR policy prioritizes rapid competence development, the ability to work in a new, changing environment and the training of leaders at all levels.

To attract the best talent, ROSATOM works continuously to strengthen its reputation as a global employer and adopter of best HR practices. In 2019, ROSATOM topped the ranking of the best employers compiled by HeadHunter, Russia's largest recruitment website.

State Atomic Energy Corporation Rosatom attracts the best students: in 2019, the grade point average of university graduates hired by ROSATOM totalled 4.7 points. This means that one in every three young employees hired by ROSATOM had graduated with honours. The National Research Nuclear University MEPhI (NRNU

MEPhI) remains the central university for the industry. Its alumni include six Nobel Prize winners.

ROSATOM is actively promoting Russian nuclear education on the export market. In 2019, over 1,600 foreign students were studying in Russian universities with a specialism in nuclear and related disciplines.

In 2019, ROSATOM became a strategic partner of the WorldSkills international professional skills competition in Kazan. After the conclusion of the competition, the WorldSkills Kazan 2019 Skills Declaration was signed by 82 countries on the initiative of Russia, with active support from ROSATOM. The aim of the Declaration is to standardize international approaches to training quality assessment and professional development. It is underpinned by a human-centric approach. This document provides a foundation for the labour market of the future. ●

# ROSATOM'S BUSINESS STRATEGY UNTIL 2030

## STRATEGIC GOALS



Increasing the international market share

New products for the Russian and international markets



Reducing production costs and the lead time



Achieving global leadership in state-of-the-art technology

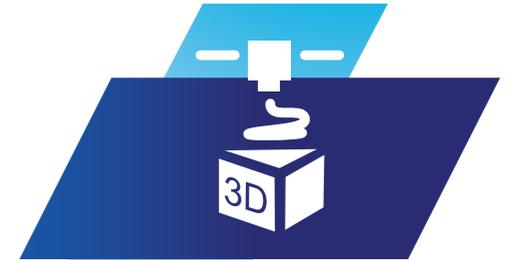
## TECHNOLOGICAL LEADERSHIP



Nuclear power



New materials



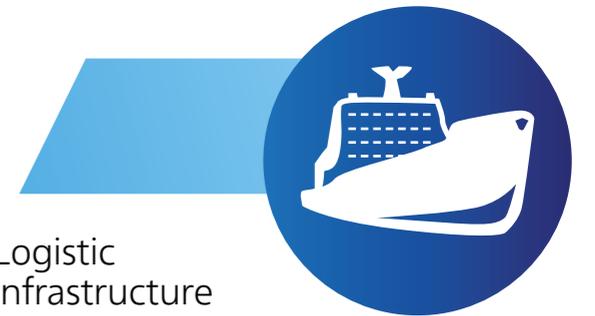
Additive manufacturing



Digitization and artificial intelligence



Environmental projects



Logistic infrastructure based on the Northern Sea Route



Nuclear medicine



Renewable energy

# KEY STRATEGY IMPLEMENTATION TOOLS



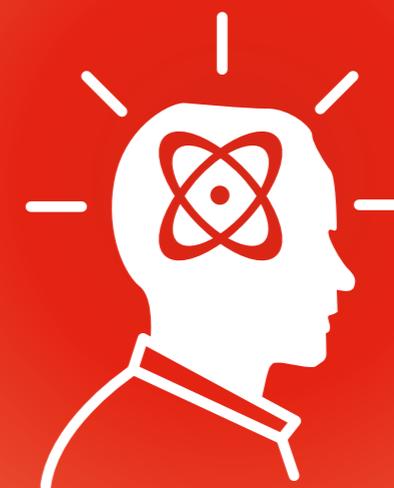
**ROSATOM**

**AS A SINGLE TEAM**



**CUSTOMER-CENTRIC  
APPROACH**

**LEADERSHIP  
IN UNLOCKING TALENT**



# CONTRIBUTION TO SUSTAINABLE DEVELOPMENT

## UN SUSTAINABLE DEVELOPMENT GOALS

-  No Poverty
-  Zero Hunger
-  Good Health and Well-Being
-  Quality Education
-  Gender Equality
-  Clean Water and Sanitation
-  Affordable and Clean Energy

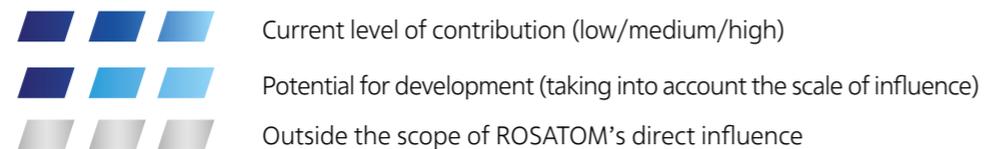
## CONTRIBUTION



## ROSATOM'S ACTIONS ON THE STRATEGIC HORIZON

- Working towards making energy solutions more available and affordable
- Development of irradiation and sterilization systems
- Development of a strategic programme in the sphere of nuclear medicine
- Development of educational platforms, including engagement of third parties
- Providing men and women with equal opportunities for career development at ROSATOM
- Development of water treatment and desalination technologies
- Improvement of technical and commercial performance of NPPs; development of new energy

The level of contribution is shown taking into account the scale of influence and the direct/indirect nature of ROSATOM's impact on the Sustainable Development Goals:



	Decent Work and Economic Growth		Implementation of business initiatives in new business areas
	Industry, Innovation and Infrastructure		Development of industry infrastructure in the countries of operation; development of municipal infrastructure; Northern Sea Route
	Reduced Inequalities		Making electricity more available and affordable and providing more opportunities for highly skilled labour in all regions of operation
	Sustainable Cities and Communities		Development of various aspects of comprehensive municipal management
	Responsible Consumption and Production		Development of solutions for the management of accumulated spent nuclear fuel and radioactive waste; use of recyclable materials in production
	Climate Action		Development of technologies ensuring safe operation of nuclear facilities
	Life Below Water		Development of environmental initiatives and industrial waste management
	Life on Land		Development of environmental initiatives and industrial waste management
	Peace, Justice and Strong Institutions		Development of a regulatory framework governing the use of nuclear technologies on markets served by ROSATOM in accordance with international rules
	Partnerships for Sustainable Development		Development of cooperation with partners in Russia and abroad

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Public annual reports:  
<https://rosatom.ru/en/about-us/public-reporting/>

Official website for placement of orders for the procurement  
of goods, works and services for ROSATOM:  
<http://zakupki.rosatom.ru/>

Official group on VKontakte:  
<http://vk.com/rosatomru>

Official blog on Twitter:  
<https://twitter.com/rosatomglobal>

Official blog on Instagram:  
[https://www.instagram.com/rosatom\\_ru/](https://www.instagram.com/rosatom_ru/)

Official community page on Facebook:  
<https://www.facebook.com/rosatom.global/>

Official channel on YouTube:  
<http://www.youtube.com/user/MirnyAtom>

