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**Rosatom Health Technologies**

Nuclear medicine is a key area in the diagnosis and treatment of oncological, cardiac, rheumatological, neurological and endocrine diseases.

Rosatom Health Technologies is an industry integrator that accumulates the expertise of Rosatom State Corporation in the field of healthcare. The company was established at the facilities of Rosatom enterprises and institutes with the aim of comprehensive development of medical technologies in Russia and abroad. The Health Technologies division is developing in four main areas: production and supply of isotope products (50 countries); equipment for diagnostics and therapy; integrated solutions for medicine; solutions for ionizing processing of products.

The State Corporation’s program to ensure technological sovereignty in the healthcare sector addresses the implementation of such projects as:

* construction of Europe's largest plant for the production of radiopharmaceuticals according to GMP (good manufacturing practice) standards, which will produce unique drugs for the diagnosis and treatment of socially significant diseases - the enterprise will begin operations in 2025 in Obninsk, Kaluga region;
* serial production of high-tech medical equipment;
* creation of medical infrastructure facilities.

Rosatom's high-tech projects in the field of healthcare help preserve the lives and health of thousands of people around the world. Rosatom provides people with access to such vital benefits as the ability to preserve food and sterilize medical products for proactive care of their own health, high-tech medical equipment, radiopharmaceuticals for effective diagnosis and treatment of serious diseases, medical infrastructure to increase the availability of medical care using advanced nuclear medicine techniques.

The division includes 16 specialized organizations and enterprises of the Rosatom State Corporation, which have developments in the field of nuclear medicine, production of radioisotope products, equipment for radiation sterilization and create complex turnkey solutions for medicine.

Rosatom Health Technologies unites leading manufacturers in the domestic industry – JSC NIITFA (equipment production), JSC “V/O Isotope” (circulation and promotion of isotope products), JSC “NIFHI im. L. Ya. Karpov” (production of radiopharmaceuticals), JSC “Rusreactor” (manufacture of small modular reactors for the production of radionuclides), as well as two centers for the production of radiopharmaceuticals based on ultra-short-lived radionuclides – fluorine-18, carbon-11, nitrogen-13 and oxygen-15 for PET-diagnostics.

**Isotope products**

Radiopharmaceuticals allow for effective diagnosis and treatment of oncological, cardiac, rheumatological, neurological, and endocrine diseases. For many people, radiopharmaceuticals are the only way to diagnose the disease and cope with the disease.

Radioisotope medical products of the State Corporation “Rosatom” make it possible to carry out about 2.5 million diagnostic and therapeutic procedures in Russia and abroad. Today Russia is one of the top 5 isotope producers on the world market. Rosatom meets 80% of the needs for reactor and generator isotopes on the domestic market and supplies its products to 50 countries.

Enterprises within the Rosatom circuit carry out the production of most of the most popular isotopes necessary for the needs of nuclear medicine and other industries: Molybdenum-99 (Mo-99), Technetium-99m (Tc-99m), Samarium-153 (Sm-153), Iodine-131, Iodine-125 (I-131, I-125), Lutetium-177 (Lu-177), Actinium-225 (Ac-225), Radium-223 (Ra-223), Tungsten-188 (W-188), Cobalt-60 (Co-60), Iridium-192 (Ir-192) and others.

**Medical equipment**

Rosatom is engaged in the development, production, localization and distribution of therapeutic and diagnostic equipment.

* **The Brachium gamma-therapeutical unit** is the equipment for contact beam therapy. The unit is intended for use in radio-therapeutic departments, specialized oncological treatment, treatment-and prophylactic and research medical institutions.
* **The device for external radiation therapy “Onyx”** belongs to the class of products that create photon radiation using an electron accelerator with an energy of 6 MeV. The complex is characterized by high reliability, lower cost and low operating costs. The device is designed to create collimated beams of ionizing radiation using three-dimensional conformal, stereotactic radiation therapy, both for radical and palliative purposes, both independently and in combination with surgical and chemotherapy treatment methods in radiology departments of oncological institutions at all levels.
* **“Tianox”** is a unique Russian-made nitrogen oxide (NO) therapy unit for adults and children, including newborns, with precapillary pulmonary hypertension. The device itself synthesizes NO, delivers it to the patient’s circuit and controls the concentration.
* **"Sanginox"** –installation of plasma-chemical synthesis of nitric oxide for artificial blood circulation machines. The device synthesizes and supplies nitric oxide from the air indefinitely into the blood circuit when used for artificial blood circulation machines. The use of nitric oxide helps reduce the risk of acute renal failure, restore organs after ischemia and eliminate the negative consequences of the use of artificial circulation during operations. The device is planned to be launched on the market in 2025.
* **Hemodialysis machine / Dialyzers** –the device provides extracorporeal blood purification during hemodialysis procedures. The device implements laser measurement of ultrafiltration rate and provides higher laminarity of blood flow. The start of production of hemodialysis machines is planned in 2025 in a volume of 200 units/year. Dialyzers are intended for extrarenal blood purification using dialysis and ultrafiltration methods in clinics and hospitals when treating patients with renal failure. Production of dialyzers is planned to begin in 2024.
* **Eye-tracker** is a monocular videooculograph for diagnosing saccadic eye movements and visual attention functions. It is used in the rehabilitation of diseases of the central nervous system and post-stroke rehabilitation. The medical device allows the doctor to communicate with patients who have impaired speech function, and promotes primary recovery and further rehabilitation after strokes and other neurological disorders. The videooculograph is planned to be launched on the market in 2024.

**Medical infrastructure facilities**

Today, enterprises of the State Corporation are building medical infrastructure facilities in the regions of Russia and abroad in order to increase the availability of high-tech care for the population using nuclear medicine techniques.

At the moment, radionuclide therapy centers in Lipetsk and Ufa are being prepared for commissioning, capable of providing more than 2,800 services for the diagnosis and treatment of oncological diseases. The radiological building of the East Siberian Oncology Center in Irkutsk is being built. With the participation of Rosatom, a new nuclear medicine building was built for the National Medical Research Center for Pediatric Hematology, Oncology and Immunology named after Dmitry Rogachev with the ability to provide outpatient treatment to more than 3 thousand children per year.

In 2022, Rosatom became a shareholder of Medscan JSC, increasing its share in 2023 to 50%. Medscan JSC is one of the leaders in the non-state healthcare sector in Russia. The holding's medical institutions offer a full range of high-tech medical care according to the world's leading protocols. In 30 regions and 97 cities of Russia there are 58 medical centers, 15 laboratories and 442 laboratory medical offices of the Medscan Group of Companies, including diagnostic centers, laboratories, hospitals with surgical inpatient facilities, multidisciplinary and specialized clinics (including oncology), scientific development centers and research. The flagship of the group is the Russian branch of the Hadassah University Hospital located in the Moscow international medical cluster Skolkovo.

In addition, Rosatom implements projects in the format of Centers for Nuclear Science and Technology (CNST).

Currently, the Center for Nuclear Research and Technology (CNRT) is being built in El Alto (Bolivia), at an altitude of almost 4,000 meters above sea level, which is not only Rosatom’s largest project in Latin America, but also the most high-altitude facility in the world. The project for the construction of the CNRT is being implemented by the State Specialized Design Institute (part of the Rosatom State Corporation). The CNRT includes a research reactor with laboratories, a preclinical cyclotron-radiopharmacological complex (PCRC), a multipurpose processing center (MPC), as well as a laboratory of radiobiology and radioecology. In 2023, a PCRC was commissioned for the production of 11 different medical radioisotopes, as well as a multi-purpose irradiation center, which will allow processing up to 70 tons of agricultural products per day. The PCRC will provide the Bolivian healthcare system with its own production of a whole line of radiopharmaceuticals to conduct clinical trials of more than 5,000 patients per year. The target date for completing the full implementation of the CNRT project is 2025.

**Cyclotron complexes**

The fastest and most accurate way to identify dangerous cardiovascular and oncological diseases is PET/CT studies using radiopharmaceuticals. Cyclotron complexes are an effective tool for producing isotopes. The latest generation cyclotron complexes are focused on the production of isotope products for nuclear medicine, which allow for early functional diagnosis of the most socially dangerous diseases: cardiological, oncological, neurological. Cyclotrons produced by NIIEFA JSC are distinguished by their reliability, efficiency, safety and a wide range of produced isotopes. Isotope products for medical purposes help save the lives and health of thousands of people around the world.

Cyclotrons produced by NIIEFA were supplied to medical institutions in Russia, Hungary, Serbia, China, North Korea, Egypt, Kazakhstan, Uzbekistan and many other countries.

**Multifunctional treatment centers**

The Health Technologies division is implementing projects to create multifunctional centers for processing products by ionizing radiation in Russia and abroad. The safety of this method of processing products has been confirmed by the FAO (Food and Agriculture Organization of the United Nations) and the IAEA (International Atomic Energy Agency).

Rosatom is the leader and the only network player in Russia in the market for processing products with ionizing radiation. The division provides a wide range of product processing services:

* Sterilization of medical devices using ionizing radiation, which provides the highest level of sterility.
* Sterilization to reduce microbiological contamination of pharmaceutical products, medicinal products and cosmetic products based on plant raw materials in packaging.
* Sterilization to reduce microbiological contamination of food products. Another advantage of this method is the absence of the “degassing” process in the technology, which means that the products are ready for use immediately after treatment.
* Electron beam treatment is for the production of heat-shrinkable products, curing of paint coatings, crosslinking of pipes and tubes (PEX), crosslinking of cable insulation, manufacture of automotive components and other products.

Today the network consists of eight centers in Russia. The total productivity of the centers is estimated at approximately 60 thousand tons per year. The method of processing products with ionizing radiation is now actively used in more than 60 countries around the world.