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Images for Artificial Intelligence

Rosatom encourages new technologies that improve health and quality of life and help saving electricity. In order to pursue this goal, the Russian nuclear corporation has established a venture capital fund. Some of the projects in its portfolio are already operational and generate revenue. One of the most impressive projects is Botkin.AI, an AI-based medical system.

Digital Evolution Ventures was set up in mid-2018. A year before, Russian President Vladimir Putin had tasked five state-owned corporations, including Rosatom, to set up investment funds to finance small innovative companies.

The strategy of Digital Ventures Evolution provides for investments in hi-tech projects that are interesting for Rosatom's non-nuclear businesses, such as smart cities, new materials, new medicine, etc. The projects are selected and investment terms defined by Orbita Capital Partners, a management company of the venture capital fund. Upon the first closing, Rosatom contributed RUB 3 billion to the fund. The second fund closing will soon be completed with another investor to bring in the same amount of money.

The contract between Rosatom and the management company is made for 10 years, and a half of the intended investment period (2.5 years) has already passed. In the second five-year period, the fund will manage and exit from its businesses.

Botkin.AI is one of the fund's most promising projects. It is an AI-powered platform for

Sergey Sorokin, Intellogic founder

automatic analysis of medical images. Its first and most developed product is designed to check CT scans for lung cancer signs. While testing the platform in one of the Russian regions, the company received 1,500 chest scans. Fifty of them were known to be taken from cancer patients. Botkin.AI found cancer signs in 66 scans. Sixteen patients were re-examined and found to have cancer — the disease had been overlooked. **"The test was a precondition for receiving finance. The technology proved to be viable, so we invested in it,"** Evgeny Kuznetsov, CEO of Orbita Capital Partners said.

The Botkin.AI platform can process images in the DICOM (Digital Imaging and Communications in Medicine) format, a standard most commonly used for storing and transmitting medical (CT, MRI, and X-ray) images. **"Images are uploaded from the diagnostic equipment to our platform. AI analyzes them and, within a few minutes, sends a report on the pathologies identified and their locations to the doctor. This is how the clinical decision support system works,"** explained Sergey Sorokin, a founder of Intellogic, a company that has developed the platform. It can be used to perform a retrospective analysis of medical examinations to improve the quality of diagnostics.

In order to train its AI-powered platform, Intellogic uses anonymized images from the database containing information about more than 200,000 medical examinations taken from open datasets of Russian and foreign clinics and data obtained during the pilot runs of the system. **"In a recent trial run in Moscow, we were processing nearly 3,000 CT scans a day,"** Sergey Sorokin said.

Rosatom has invested tens of millions of rubles in the platform. The money helped Intellogic improve its platform and achieve consistent results on different scanning devices and in different hospitals — consistency is essential for scaling up the platform. The technology makes almost no mistakes in interpretation. Botkin.AI was certified by the Russian Federal Service for Surveillance in Healthcare and allowed to be used in clinical practices. **"This year, the product has made a full-scale entry into the market,"** Evgeny Kuznetsov said.

In early 2020, the technology developed by Intellogic was selected, together with some other technologies, to be tested by the Moscow Healthcare Department. In addition, the company managed very quickly, in just two weeks, to improve a coronavirus diagnostics system and started helping health professionals in the Yamalo-Nenets

Sergey Botkin

Botkin.AI platform is named after Sergey Botkin, a famous Russian doctor (1832–1889). Sergey Petrovich Botkin was a talented clinician, therapist, teacher to many doctors, and social activist. He is one of the founders of modern Russian medical science and education.

Autonomous Okrug fight coronavirus as soon as June 2020.

Intellogic also works with private clinics with 12 projects currently underway. The fund assesses its companies by revenue — Intellogic has increased it 10 times over a year. The company plans to enter international markets in the future.

Digital Evolution Ventures will continue to invest in the platform and other technology start-ups. Titan Power Solution is one of them. The company develops and manufactures systems based on supercapacitors (ultracapacitors). The company is interesting for Rosatom as a supplier for wind turbines. It has received RUB 60 million in investments from Digital Evolution Ventures, 12BF Global Ventures and the Far East High Technology Fund. In 2020, Titan Power Solution doubled its revenue and won new contracts.

Another promising start-up is AlphaOpen, a developer of AlphaLogic platform designed to manage and monitor building engineering systems. The platform can be integrated with Rosatom's Smart City services. VEB Ventures and Digital Evolution Ventures have jointly invested RUB 130 million in the company. Altogether, Rosatom's venture capital fund has invested in 13 projects.

For reference

Venture capital funds specialize in financing technology companies in their early stages when the possibility of financial success (the company will be selling its products and produce a strong cash flow) is low.

Since investment risks are high, venture capital funds invest simultaneously in 10 to 20 startups. Some of them fail to generate return, and investments are written off. But some become successful and pay back enough to cover all of the fund's investment costs.

There can be several investment rounds: as business of the company is growing, the amount of investment is growing, too. The fund profits from selling the company either by making it public through IPO or selling it to a larger market player. Another option is to integrate the company into the core business of the investor. This may be cheaper than acquiring an operational company in the market if a large corporation needs to develop any of its business lines.

Venture capital financing was first put into practice in the United Stated, where it secured rapid development of technologies. The practice was later implemented all over the world and was particularly successful in China. Over the last few years, venture capital funds have invested around USD 65 billion a year in the USA and around USD 35–40 billion in China.

Russia Labels Nuclear Sustainable

Russia is witnessing a growing demand for sustainable electricity. By buying clean energy, companies reaffirm their commitment to the principles of sustainable development. Russia is the first European country to have referred nuclear power, together with renewables, to clean energy sources.

Trend towards sustainability

In November, VetroOGK (Rosatom's subsidiary specializing in wind power generation) and SiburEnergoManagement (SIBUR Group) signed a contract for the supply of electricity from the Rosatom Adygea wind farm to the Novokuibyshevsk-based production facility of Biaxplen (SIBUR Group) in the Samara Region. The company manufactures biaxial films used in the production of food packaging, consumer goods, labels and adhesive tapes. For the time being, electricity supply will not be large — SiburEnergoManagement will be testing the new supplier and only then will make a decision whether to extend the contract and increase the supply.

The Adygea wind farm supplies electricity and Biaxplen Novokuibyshevsk receives it through Russia's Unified Power Grid.

"Increasing the share of renewables through our in-house generation and direct contracts with green energy suppliers is an integral part of SIBUR's 2025 Sustainable Development Strategy aiming to reduce our impact on the environment," Vladimir Tupikin, Head of Energy and Resources at SIBUR said.

Renewables are considered worldwide to be the cleanest sources of energy leaving minimal carbon footprint. Accordingly, products made with energy from renewable sources are also considered cleaner. The entire supply chain helps achieve two goals of sustainable development, responsible production and consumption and clean and affordable energy.

"At present, an established policy of minimal carbon consumption makes a company more competitive, provided that vendors and suppliers along the entire supply chain stick to the same principles. NovaWind contributes to the reduction of carbon footprint and transition of as many companies as possible to sustainable development," said Alexander Korchagin, CEO of NovaWind (Rosatom's wind energy division).

In Europe, sustainable supply chains and, specifically, renewable energy supplies are

approached very seriously, both in terms of environment and in terms of domestic market protection. Ursula von der Leyen, President of the European Commission, has proposed to introduce a carbon border tax on the goods imported in the European Union.

Taking into account those plans, Russian companies are interested in making their products 'greener' by using renewable energy. Clean energy, including energy from renewable sources, will help Biaxplen prove that its products are clean and avoid payment of the carbon border tax. Biaxplen, according to the company's website, "works to increase exports of films to the EU markets."

According to AtomEnergoPromSbyt (AEPS, a Rosatom Group electricity distribution company), local divisions of international companies are more often interested in purchasing clean energy. **"In general, interest (voluntary demand) for clean energy comes from global brands included in RE100 as part of their commitment to reducing impact of their production on the environment,"** said Evgeny Erokhin, AEPS Deputy CEO for Energy Sales.

One of such companies, Nestle Purina PetCare (a subsidiary of Nestle Russia) located in Vorsino, Kaluga Region, has been purchasing electric power from the Adygea wind farm since May 2020. The contract provides for the supply of 50 million kWh of electricity.

To be confirmed

The use of clean energy needs to be confirmed. A contract between a consumer and a supplier of clean energy from renewable source can serve as a confirmation. In Russia, NP Market Council Association publishes a list of clean energy purchase and sale contracts on a monthly basis.

An independent auditor may also review contracts. For example, if a company belongs to RE100, a global renewable energy initiative, (RE100 stands for '100% renewable'), its contracts are audited for compliance with the principles of RE100.

A special certificate of origin will confirm that energy comes from renewable sources in Russia. It will be an electronic document certifying that electricity has been generated with a 'combination of environmental, social and other positive effects'.

Having received the certificate, its holder has the right to distribute information that its activities and products are 'associated with positive effects arising out of production of electricity at qualified generation facilities, such as reduction of man-caused impact on health and environment and improvement of the quality of life.'

According to the law, 'qualified generation facilities' include renewable sources of energy and nuclear stations. It means that Russia

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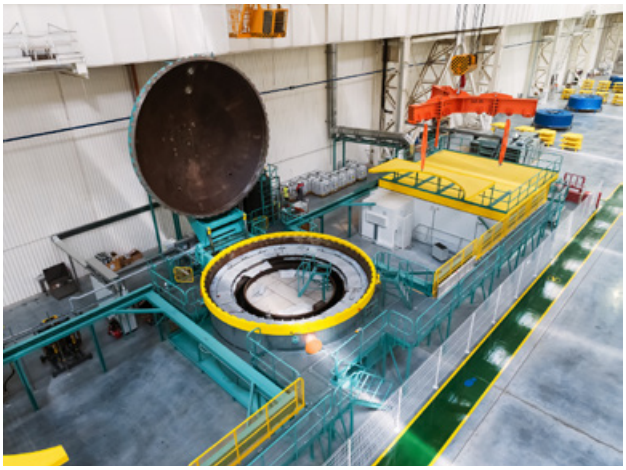

might become the first European country to legally recognize that nuclear generation has positive social and environmental effects.

Russia will begin issuing certificates of origin in 2022. In Europe, such certificates have been issued for a long time now, so the main task is to integrate the Russian and European systems.

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NovaWind (part of Rosatom) builds wind farms and generates electricity using wind energy. By 2024, NovaWind will build 1.2 GW of wind generation capacity.

In 2020, NovaWind commissioned two wind farms in Southern Russia. Adygea, having an installed capacity of 150 MW, will generate over 350 million kWh, or 20% of electricity consumed in the Republic of Adygea. Kochubeevskaya (210 MW) was commissioned in late 2020 and has already started supplying electricity to the Russian wholesale market.

At present, NovaWind is building Marchenkovskaya (120 MW), Karmalinovskaya (60 MW) and Bondarevskaya (120 MW) wind farms. Over 80 prospective construction sites are surveyed; wind measurements are taken in three regions.

With Attention to Detail

Last year, an anniversary year for Rosatom, Newsletter published stories about key Russian nuclear companies. This year, Newsletter will write about countries in which Rosatom operates, either building or preparing to build nuclear stations or supplying nuclear fuel or equipment for reactor-based complex nuclear facilities. We will start with Finland.

Finland is a member of the European Union and has been using nuclear technology for a long time. The country operates two nuclear power plants, Loviisa and Olkiluoto. The Loviisa NPP has two units with a capacity of 507 MW each, commissioned in 1977 and 1980. They are Soviet-designed VVER-440 reactors. Olkiluoto has two units with a capacity of 890 MW each. They were commissioned almost in the same years, 1978 and 1980. In 2019, all the four units generated around 23 TWh of electricity, or 34.7% of total electric power produced in the country.

Loviisa

The Loviisa nuclear power plant was the first — and successful — joint nuclear project between Russia (then the USSR) and Finland. Finnish engineers and nuclear industry officials were studying the nuclear industry so carefully, meticulously and scrupulously that the entire world has known their strictest national safety standards since then.

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As remembered by eyewitnesses, the Finnish party required every system to be backed up, and checked every welding joint. They insisted on carrying additional feasibility tests and even asked to reduce the welding speed saying the workers could become tired and make a mistake. The speed was, of course, reduced but there were no mistakes. **"I am proud to say that the Loviisa NPP was, and has been since then, one of the best projects in the world. Many technical solutions we used at Loviisa for the first time were later embraced and improved in other nuclear construction projects,"** Mikhail Rogov, then Vice President and Director for Promising Projects at the Moscow branch of NIAEP-ASE and now Director for Promising Projects at Rosatom's engineering division, shared his memories at the plant's anniversary in 2017. It is not a praise or advertisement — the Loviisa reactors were planned to operate for 35 years, but now their service life is extended to 50 years with a further 20-year lifetime extension under discussion.

Finland continues to support and develop its nuclear industry. The third reactor is now under construction at Olkiluoto. In addition, Finland plans to build a new nuclear plant, Hanhikivi-1.

Hanhikivi

Hanhikivi will be a single-unit 1,200 MW nuclear power plant with a Generation III+ VVER-1200 reactor. In December 2013, Rosatom and Fennovoima signed and EPC contract providing for Rosatom to build a licensed and fully functional nuclear power plant and transfer it to the customer.

On December 21, 2020, RAOS Project OY, a Rosatom subsidiary and a general supplier

for Hanhikivi, submitted Basic Design Stage 1 documents describing technical solution for Hanhikivi 1 to Fennovoima, a private Finnish company and a project owner. The company accepted documents for review and consideration. The documents include conceptual and functional designs of the plant, a 3D model, designs of systems and buildings.

Basic Design Stage 1 is a basis for a preliminary safety analysis report (PSAR). Finland's Radiation and Nuclear Safety Authority (STUK) will first consider it and then the government of Finland will make a decision on whether to issue a construction license for the nuclear power plant.

PSAR contains 15 sections, and some of them have been already submitted to STUK. Other sections will be ready in the spring of 2021. Prior to the submission to STUK, all the received documents are reviewed by Fennovoima.

"Our common task for the next few months of 2021 is to settle all technical issues of the project at the 'paper stage' to minimize or, much better, eliminate the need for corrections and adjustments during the construction stage," explained Ivan Doschuk, Director for Hanhikivi-1 Engineering at RAOS Project.

"As usual at all constructions sites I have been to, and also at the FH1 project, all the delays must be recovered at the end of the year, and they have almost been recovered by a special effort of all companies and workers. After the holidays, the work will be resumed with the same move to stay on the project schedule," said Rainer Goehring, Site Director for Hanhikivi-1 at RAOS Project OY.

On December 16, school students from Pyhäjoki (a host town for the Hanhikivi nuclear power plant) took part in the NEXT 75 international youth conference in Sochi (Russia). They discussed global challenges and tasks that the humanity will have to solve in the very near future.

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Social life

Nuclear construction is not the only activity of Rosatom in the countries it operates — the Russian nuclear corporation raises public awareness of nuclear technology. In September 2019, more than 3,500 local residents visited the Hanhikivi construction site during the Open Doors Day. In 2020, the plans were disrupted by the coronavirus, but the tradition will be resumed.

Another regular event is a seminar for suppliers organized by Rosatom in Finland in association with FinNuclear Association. In 2020, the seminar was held online — over 160 participants registered for the seminar, and more than a half of them took part in business to business (B2B) meetings.

Choosing social projects, Rosatom prefers educational and intellectual events. In August 2019, Helsinki hosted a two-week chess festival organized by the Finnish Chess History Society in association with the World Chess Federation (FIDE) and with support from Rosatom. Amateur chess players from Scandinavia, Baltic countries and Russia took part in the festival. The culmination of the festival was a 15-board simultaneous chess exhibition by famous Russian grandmaster Anatoly Karpov against young Finnish talents.

Finland: a look from outside

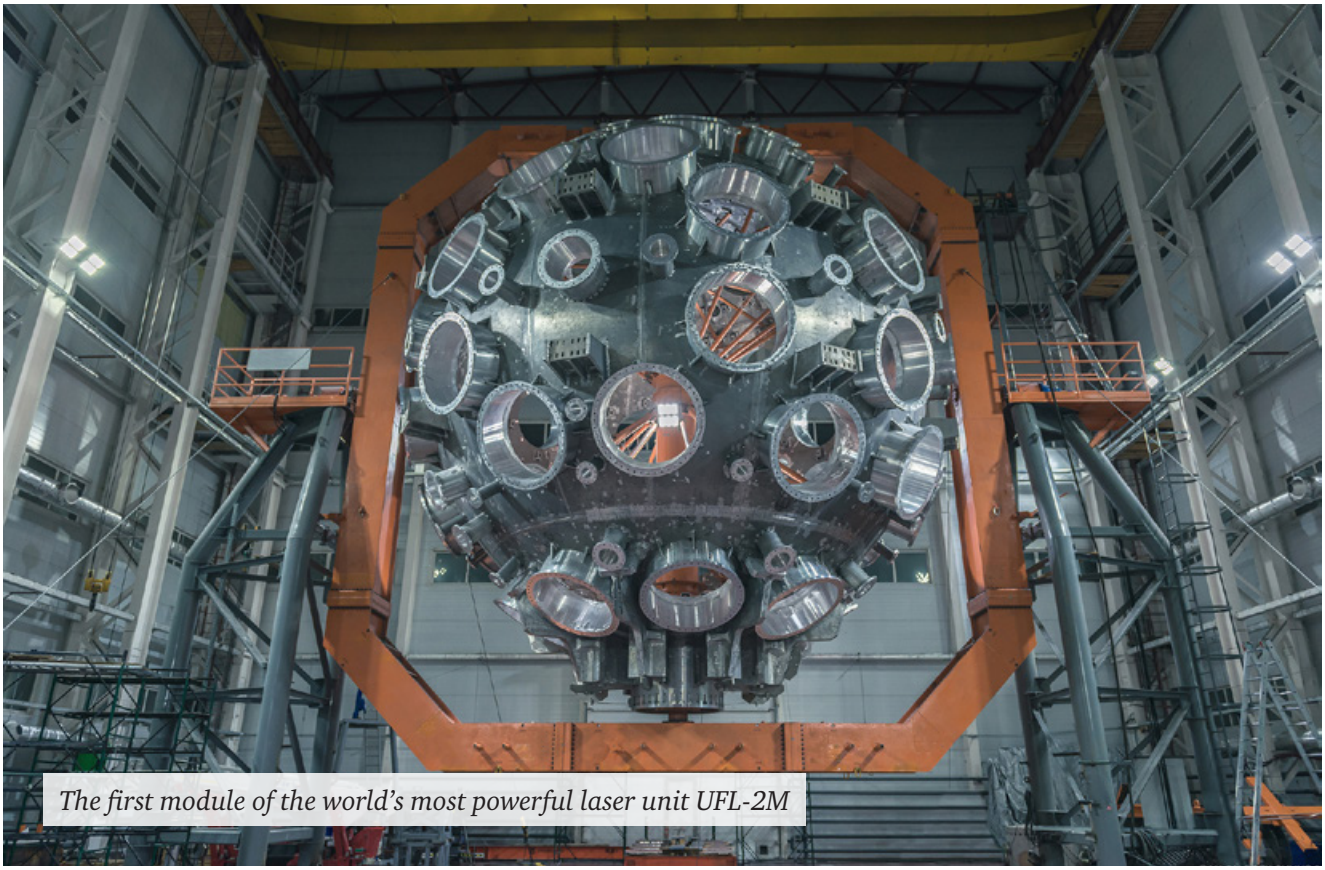
Dr Rainer Goehring, *Site Director for Hanhikivi 1 at RAOS Project OY:*

— This year Christmas is different and other than planned. Due to the second wave of coronavirus, my wife and me have decided to stay in Raahe for Christmas and New Year. Finland has its own imaginations and beautiful Christmas traditions. There are 24 specially designed (really wonderful) windows in Raahe, the Christmas tree and lighted roads.

We will see our children and grandchildren only via Internet, but they (and we) are already used to it, as we have not seen each other for almost a year.

At Christmas days, the work is stopped at the site, each of the workers will have their quiet and reflective Christmas time — whether with or without family is not decided by him, but by the Corona restrictions.

Merry Christmas and a Happy New Year!



The first module of the world's most powerful laser unit UFL-2M

Thermonuclear Predictions

Saxo Bank believes that the future does not belong to renewables, but to thermonuclear sources of energy, which are environmentally friendly, cheap and could be produced in large amounts. Rosatom is already creating the future by participating in the international ITER project and studying properties and capabilities of thermonuclear energy in Russia. Despite Saxo Bank's predictions, this future is not likely to come in 2021, but in about 30 years.

In its annual 10 Outrageous Predictions, Saxo Bank says that 'revolutionary fusion design catapults humanity into energy abundance.' Peter Garnry, Head of Equity Strategy of Saxo Bank, is confident that humanity is not yet able to adopt new technologies because of electricity shortage. Writing about electric power, he said, **"From wood to coal to fossil fuels, higher-density energy makes whole new industries possible, as well as higher productivity and more wealth for society. And when we look at tantalizing future technologies, from hyperloop trains and AI, to hydrogen production by electrolysis and water desalination, cheaper and higher-density energy is the chief constraint. The world will need much more energy if our economy is to continue growing at anything approaching historical rates."**

In his opinion, new alternatives to renewables will not be able to dramatically reduce costs and increase the scale of energy generation. **"Yes, they may be less harmful**

to the environment, but their system-wide effects from lower energy density mean they are really a big step backwards. The world urgently needs a disruption in energy technology."

Thermonuclear fusion can be a solution to the problem. **"Enter 2021, in which an advanced AI algorithm solves the super non-linear complexities of plasma physics, clearing the way for commercial fusion energy."** Energy density in thermonuclear fusion is truly the highest among the known sources of energy and amounts to 645 million MJ per kilogram. To compare, energy density of an internal combustion engine (less generator weight) is 8 to 10.5 MJ/kg.

Peter Garnry's predictions are inspired by SPARC, an experimental thermonuclear reactor developed by the Massachusetts Technology Institute with support from the US Department of Energy.

The USA is not the only country doing research in thermonuclear fusion and its practical application — China, Russia and Europe are keeping pace.

Russia conducts research in thermonuclear fusion both independently and as part of the International Thermonuclear Experimental Reactor (ITER) project. At Rosatom, two organizations are engaged in thermonuclear research — the All-Russian Scientific Research Institute of Experimental Physics (VNIIEF) in Sarov studying inertial confinement fusion, and Kurchatov Institute specializing in magnetic confinement fusion.

Inertial fusion at VNIIEF

Conventionally, inertial thermonuclear fusion is achieved as follows: a spherical fuel target containing several layers of fuel and shells is compressed to a density that exceeds normal density by three orders of magnitude. The target is compressed using high-energy lasers or ion beams. Their energy evaporates the outer layer of the fuel target, producing a reaction force against the inner layer and compressing the target. The resulting shock wave should be strong enough to increase the fuel temperature to a level sufficient for a thermonuclear reaction to start.

In early December 2020, VNIIEF launched the first module of the world's most powerful laser unit UFL-2M needed to conduct experiments on inertial confinement fusion and study properties of material in extreme conditions (at ultra-high pressure and temperature).

The first module has eight laser channels. In total, UFL-2M will have 192 laser channels. It means that 192 laser beams will hit the target from different sides. Thermonuclear targets placed inside the unit will receive 1.5 times more impulse energy than at the US-based National Ignition Facility (NIF), which is for now the most powerful laser generator among those commissioned or under construction.

"VNIIEF keeps enhancing its computational capabilities to model the behavior of the fuel target during inertial confinement fusion, studies physical processes inside the target, and optimizes process parameters of thermonuclear ignition. In the years to come, we expect to obtain more experimental data on the laser unit we are building," said Artyom Gnutov, Head of Research and Development at the VNIIEF Theoretical and Mathematical Physics Institute.

New knowledge will give more understanding of the stellar processes and allow for finding possibilities of creating new sources of energy. Experiments on the new laser unit will start in 2021. **"VNIIEF has every chance to be the first in the world to achieve thermonuclear ignition in targets,"** said Sergei Garanin, a member of the Russian Academy of Sciences, VNIIEF Deputy Director for Laser Physics, and a general designer of laser systems.

Magnetic confinement fusion at Kurchatov Institute

Magnetic confinement fusion, as the name implies, uses a magnetic field to keep high-temperature plasma inside the tokamak without touching its walls. The tokamak is a transliteration of the Russian acronym that stands for 'toroidal chamber with magnetic coils'.

In December 2020, a team of researchers from Kurchatov Institute created a concept design of a hybrid unit that will use both thermonuclear fusion and nuclear fission. Thermonuclear fusion will be used as a source of neutrons to control nuclear fission in the core of a conventional nuclear reactor. **"Feeding plasma with thermonuclear fuel (heavy hydrogen isotopes, deuterium and tritium), removal of fusion products (helium) and, what is more important, the possibility of repeated use of the fuel mixture in the refueling process will ensure continuous operation of the hybrid system and thermonuclear reactor,"** Sergei Ananyev, a senior researcher at Kurchatov Institute, explained advantages of the hybrid unit.

Another advantage of the hybrid technology developed by Kurchatov Institute is that it can burn long-lived nuclear waste of nuclear power plants, such as minor actinides, and obtain new fuels for fission reactors.

The next step is to build a pilot facility with a thermal capacity of up to 500 MW.

ITER

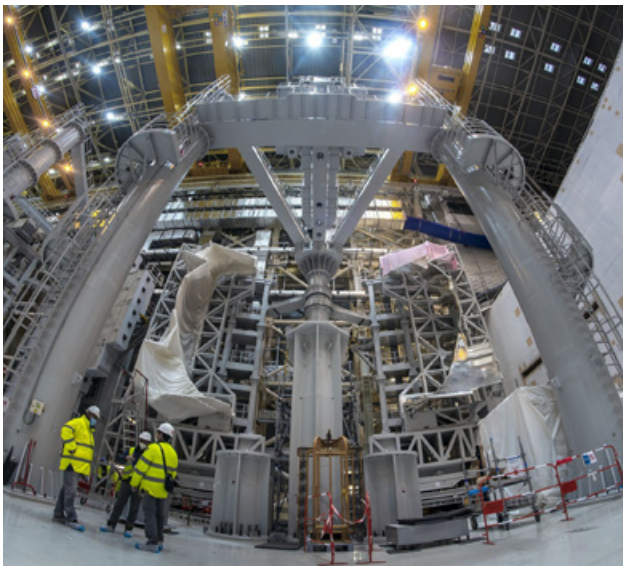
Russia continues its participation in the ITER project. The goal is to build a tokamak-type thermonuclear reactor and demonstrate the possibility of using controlled fusion in commercial applications. The countries participating in the project are Russia, India, China, USA, South Korea, Japan, and the European Union countries.

According to the contract, Russia undertakes to supply 25 hi-tech equipment systems for

the ITER. Two of them — Nb3Sn and NbTi superconductors — have been manufactured and supplied right on time. Russian-made superconductors were recognized to have the highest quality in the world.

In November 2020, Rosatom made the first shipment of switchgear for the power supply system of the ITER superconducting electromagnet coils. The first shipment consisted of ten switchgear devices and ten control racks. They are designed to protect AC-DC converters in emergencies.

The shipment also included fiber optic probes for measuring temperature of electrical contacts and monitoring the busbar condition. **"Fiber optic probes ensure natural galvanic isolation and are resistant to electromagnetic interference and magnetic field fluctuations. They also make it possible to build systems with thousands of measurement points at long distances from each other — this is very important for the ITER whose busbars have a total length of over 5,000 meters,"** explained Maxim Manzuk, Head of BI-4 Unit at Sintez Science and Technology Center of Rosatom's Efremov Research Institute.



And other international research projects

Researchers from Kurchatov Institute take part in the Borexino Collaboration. Recently, scientists have found evidence that helium in the Sun is synthesized from hydrogen not only in the process of proton-proton chain reactions, but also in the reaction involving carbon, nitrogen and oxygen (the CNO cycle). German-American physicist Hans Albrecht Bethe, who received a Nobel Prize for his discovery in 1967, developed the theory describing this reaction. The share of this reaction in the Sun is about 1%.

"Future research will help us to understand stellar processes better and obtain more knowledge about the chemical composition of the Sun," Mikhail Skorohvatov, Head of Neutrino Physics Division at Kurchatov Institute, stressed.

Thermonuclear prospects

Peter Garnry of Saxo Bank believes that thermonuclear fusion is a new and abundant source of very cheap electricity, **"The mastery of fusion energy opens up the prospect of a world no longer held**

back by water or food scarcity, thanks to desalination and vertical farming. It's a world with cheap transportation, fully unleashed robotics and automation tech, making the current young generation the last required to "work" by necessity. And hey, how about a bit of CO2 sequestration on the side, dialing back the climate change clock in the process? Best of all, fusion energy allows nearly every country to become food- and energy-independent, and sees the most rapid and largest upgrade in living standards ever witnessed."

However, taking into account the position of Mr. Garnry, we might assume that his main goal is to redirect investments. **"Even more importantly, a massive investment from public and private sectors would allow the implementation of the new fusion design within a few short years,"** Peter Garnry said.

Even a brief overview of the works on thermonuclear fusion by Russian scientists shows that the current research tasks go far beyond power generation for businesses and households and reach closed-cycle power generation and research into the nature of stars. **"Controlled thermonuclear fusion is a hard nut to crack in science. Research in thermonuclear fusion is conducted in many countries and serves as one of the symbols of technological development. It often stimulates progress in other areas, such as fundamental science, material studies, lasers, plasma technology, and others. Russia keeps abreast of the times, developing its own projects and continuing research,"** Artyom Gnutov said.

The possibilities of thermonuclear generation for commercial purposes need yet to be studied — it is a task for international partnerships. No wonder that Russian

researchers believe that a new world powered by commercial thermonuclear energy is neither a reality of 2021 nor of the years to come.

"On the one hand, the knowledge we have accumulated brings us closer to practical applications of thermonuclear fusion. On the other, we realize more clearly how difficult this task is. Scientists have many times failed to predict even when they will achieve a significant thermonuclear reaction in laboratory conditions — a difficult but much simpler task than building a thermonuclear reactor. This is the reason why commercial use of thermonuclear energy is not what will happen in the coming years. One should be very optimistic to believe that we will harness it in 20–30 years," Artyom Gnutov said.

He agreed, however, that thermonuclear energy — when it becomes a reality — would bring dramatic changes to the power industry and economy, open up access to power intensive technologies and, generally, change our life for the better.

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Atom Inspires

Apart from producing clean and safe energy, nuclear power plants serve as a source of inspiration for creative professionals. Among those inspired are Turkish photographers who have won the international ASE Photo Awards 2020. Meanwhile, Rosatom is working to make information about nuclear technology available to every local resident.

Turkish photographers are among the winners of ASE Photo Awards 2020, an international photo contest organized by the Rosatom engineering division. The award ceremony took place in Moscow in December. Names of the photographers and the best photos selected by the jury were announced online.

The contestants included over 400 photographers from the countries constructing or operating Russian-designed nuclear power plants — Bangladesh, India, China, Egypt, Hungary, Finland, Turkey, Bulgaria, Slovakia, Belarus, Uzbekistan, and Russia.

This year, the photographers competed in six categories titled My Country, Still Frame, Dialogue with Nature, We Are What We Eat, Portrait, and Atom Is Near. Turkey was the third in terms of the number of filed applications. Two photographers from Istanbul, Alpay Erdem and Kayhan Güç, won the first prizes in the My Country and Atom Is Near categories with the pictures 'The Turk'

and 'Atom Is Here', respectively. Zehra Çöplü was the third in the Still Frame category with her work 'Flyboard.' **"Regardless of the circumstances, a photographer must be impeccable and do the best he can for a few hours of shooting. Some shots are born in the stream of life, and you will never have a chance to make another, better shot,"** Alpay Erdem said in an interview to the Turkish daily Hurriyet.

Raising public awareness of nuclear science and technology is part of Rosatom's mission. In order to make information about nuclear available to every Turkish resident, the Russian nuclear corporation has launched a Turkish-language online project titled "You've Got Question? We Answer. All You Wanted to Know About Nuclear Energy". The project gives answers to the 70 most common questions about nuclear energy, ranging from the basic concepts of nuclear physics, atomic structure, radiation and radioactivity to the principles of NPP design and various practical applications of nuclear technology.

How do nuclear power plants work and what benefits do they bring? What safety measures are taken at nuclear facilities? How do people live in 'nuclear' cities? Is it possible to grow crops near NPPs? Where is nuclear technology used and how does it help in our daily life? Answers to these and many more questions can be read or listened to on the project website at https://www.bizimicinnukleer.com/ (Nuclear Energy for Us).

Since the project is designed for a broad audience, answers to the most challenging questions are presented in an animated format.

"All fears and concerns about nuclear energy are usually associated with the

lack of knowledge among people and, as a result, with numerous myths and prejudices. Knowing this, we concentrated our efforts first on presenting fact-based information about the present-day nuclear industry and innovations being used for the benefit of humanity. Nuclear is much more than just a clean source of energy — it is also an advanced technology working to change people's lives for the better. We are confident that our project will help learn the industry with rich history and dispel the myths that surround it," said Alexander Voronkov, Regional Vice President and Director of Rosatom Middle East and North Africa.

Meanwhile, work at the Akkuyu site to build the country's first nuclear power plant continues. In mid-December, the core catcher was installed in its design position in the reactor building of Akkuyu NPP Unit 2. The core catcher is a device designed to catch the corium in case of a core meltdown accident, retain it inside the containment building and prevent it from escaping into the environment.

The core catcher will protect the Akkuyu NPP from severe accidents. Earlier, a similar core catcher was installed at Akkuyu Unit 1. These devices are used at advanced

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Russian-designed nuclear power plants with Generation III+ VVER-1200 reactors. Being relatively simple and easily installed, the core catcher ensures maximum safety of the reactor by improving its seismic resistance, hydrodynamic and shock strength, and resistance to floods.

In late December, the first tier of the containment building was completed at Akkuyu Unit 2. The installation took 7 days and required the use of tower cranes. Upon completion of the installation, the height of the ICS at Unit 2 reached the level of +4.950 m. During the next step, the sections of the first tier will be welded together.

The containment building is one of the key elements of the nuclear reactor's defense-in-depth systems. Being airtight, it serves as a barrier to radioactive release.

At Unit 1, a structural support for the reactor pressure vessel was installed using a Liebherr LR13000 heavy crawler crane. The support is a 145-ton welded metal structure consisting of radial beams embedded in special-grade concrete. With an outer diameter of 9.16 m, it is made of carbon steel and designed to securely fix the reactor pressure vessel in the concrete pit. The support is capable of protecting the RPV from mechanical stresses or seismic loads in any operating mode of a nuclear power plant. The installation of the RPV support took a total of 6 weeks, including 3 weeks spent to pre-assemble the structure.

"I am pleased to note that this year we have completed all the key activities provided for in the Akkuyu NPP construction schedule. Installation of the first tier of the Unit 2 containment building and the RPV support at Unit 1 was completed in due course; the installation personnel did their job faultlessly, which was confirmed by a special acceptance commission. I am sure that next year we will continue to move forward keeping up the pace," said Sergei Butskikh, First Deputy Director General and Director for Akkuyu Construction.

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