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Digital Outfit for Nuclear Stations

Rosatom's electric power division Rosenergoatom developed two products to digitalize nuclear power plant operations: Operation Template and Data Centers. These are powerful tools changing the approach to business process management at nuclear power plants.

The Operation Template is a package of integrated digital solutions for nuclear operators. It supports basic business processes within the plant operation universe, spanning from construction to decommissioning and covering maintenance management, human resource management, relations with grid operators, vendors, consumers, and so on. Each of the processes is managed through a 'digital assistant', which is a suite of software applications solving specific tasks.

The Data Center is a dedicated building used to house servers and network hardware.

Operation Template: smart support

The Operation Template consists of three basic components — Technical Documents, Maintenance and Repair Management, and Competency and Knowledge Management. The first component is used to file and store documents and manage access rights. The second component monitors equipment performance, accumulates relevant data and informs the operator when maintenance or repair is necessary. The third component stores information about training programs and employee competencies. These basic components could be supplemented with other digital assistants.

They solve a variety of tasks associated with day-to-day operations of a power plant. For instance, the health monitoring component detects health conditions or anxiety in employees. The smart access control system assigns access rights to employees and grants them access to certain areas inside the plant. Sound alarms of the personal protective equipment (PPE) video monitoring system recommend employees to put on or adjust a PPE item if the camera has detected a violation of PPE guidelines.

The maintenance management component is an AI-based system used to predict maintenance and repairs. It analyzes equipment performance data using mathematical algorithms and provides recommendations if a certain part or assembly needs repairs or replacement. Data accumulation and analysis enable condition monitoring and preventive rather than scheduled maintenance. The preventive approach is expected to extend the service interval.

The HR management component includes a package of onboarding and advanced training programs involving digital and VR simulators. Information about training courses completed by employees, their grades, qualifications, radiation doses and other data is accumulated in employees' digital IDs.

Some of the Operation Template components have been piloted at the Smolensk and Balakovo nuclear power plants. Starting 2020, the Operation Template will be introduced across all the nuclear power plants in Russia.

Rosatom's subsidiary Rusatom Service will offer the Operation Template to the companies operating Russian-designed nuclear power plants abroad. Along with selling user licenses, it will also offer consulting services to be provided by the Moscow Technology Excellence Center, related information security solutions, and cloud-based storage and infrastructure services to be provided by Rosenergoatom's data centers.

Safe and reliable data center

Rosatom's electric power division Rosenergoatom offers space in its data centers and, if necessary, could build a data processing center at the customer's premises. The launch of the very first data center at the Kalinin NPP showed that it was a lucrative business.

Commissioned in 2018, the data center has 4,800 racks and a total capacity of 48 MW. Investments in the project exceeded RUB 6 billion. In 2019 alone, Rosenergoatom generated RUB 500 million (USD 6.5 million as of April 6, 2020) in revenue from leasing out space, server capacity and cloud-based infrastructure of the data center. The revenue forecast for 2020 is around RUB 1 billion (USD 14 million as of April 6, 2020).

Having reviewed results of the first project, Rosenergoatom decided to build several more

data centers. Three of them will be large-capacity facilities, a 500-rack data center in Innopolis (a satellite town of Tatarstan's capital Kazan), the second one in Saint Petersburg or Leningrad Region (500–1,000 racks), and the third one in Moscow (2,000 racks). Apart from three large data centers, there is likely to be a smaller one (its capacity is yet to be specified). It will back up the data processing capacity of the situation center at the Russian Institute for Nuclear Power Plant Operation.

The possibility of storing large amounts of performance data is the primary advantage of colocating a data center and a nuclear power plant. There is almost no risk of power outage or data access interruptions. What is more, the colocation eliminates security risks since nuclear stations are among the highest security sites in any country.

Another advantage is compliance with carbon-free requirements, which is necessary to achieve SDG 13 (Climate Action) of the 17 UN Sustainable Development Goals. Electricity powering the data center is generated by the nuclear power plant, so there are no greenhouse emissions.

Finally, data storage and cloud services could be provided not just to nuclear stations, but to other companies and non-commercial organizations as well. The data center is a key component of the infrastructure needed for the digital technology development. All this means that the new data center also contributes to the achievement of SDG 9 (Industry, Innovation and Infrastructure).

Digital assistants of the Operation Template

- NPP document repository and information model
- Predictive analytics for equipment maintenance
- Voice control and biometry
- PPE video detection
- Health monitoring
- Smart access control system
- Digital X-ray inspection
- Remote crane control
- Fuel assembly loading monitoring
- Robotic fence intrusion detection
- Employee Digital IDs
- VR learning platform
- NPP startup simulator
- 3D hologram and positioning
- 3D drawings and knowledge model
- Robotic process automation (RPA) platform
- Trusted mobile environment

Armenian NPP

Rosatom Supports Commissioning and Upgrades of Nuclear Stations Abroad

Rosatom Group companies Rusatom Service (an integrator of NPP maintenance services) and Atomenergoremont (a repair, retrofit and upgrade service provider) are expanding their operations. In February 2020, Rusatom Service registered a local subsidiary in Turkey. Negotiations are underway for Atomenergoremont to set up its Turkish office.

Local offices enable Rosatom's subsidiaries to promptly respond to customer needs on the international scale. One of them, Rusatom Service, acts as an integrator of NPP-related services, including pre-commissioning, commissioning, maintenance, repairs, upgrade, redesign, operation support, staff training, and supply of equipment. The scope of services provided by Atomenergoremont covers maintenance, repairs and retrofit of nuclear power plants.

Commissioning

Activities of Rosatom Group companies in Turkey are an example of their commissioning services offer. On February 11, 2020, Turkey's Chamber of Commerce and Industry registered a local office of Rusatom Service under the name of Rusatom Service Joint Stock Company Merkezi Rusya Mersin Merkeez Subesi. Its primary function is to arrange for the commissioning of the Akkuyu nuclear power plant and support the development of local businesses.

This is the fifth office set up by Rusatom Service outside Russia. The other four are located in Hungary, Armenia, Bulgaria and Belarus. The sixth office is awaiting registration by the Bangladesh Investment Development Authority.

The office of Rusatom Service in Turkey is looking to recruit highly qualified professionals and managers with a track record in the commissioning of nuclear power plants in Russia and other countries.

As part of the commissioning contract with Turkish nuclear project owner Akkuyu Nükleer, Rusatom Service will arrange for the commissioning process, develop operation and maintenance documents, and supply materials, equipment and instruments for the plant's commissioning. It will also arrange for pre-commissioning inspections of metal condition and equipment. Rusatom Service will have to organize supervision and support of the commissioning process from developers and engineers, as well as calibration and certification of instruments

and measurement channels. The staff of the plant will be trained to improve their skills and capabilities. It is also planned to supply simulators and training systems for this purpose. During the pre-commissioning phase, the company will arrange for the acceptance of systems and equipment and their registration with the local regulator.

Rusatom Service has already prepared over 80 documents defining rules and procedures for the commissioning phase, requirements for the documents, and deadlines for the completion of this phase. The next step is to develop a commissioning schedule for Akkuyu Unit 1 and have it integrated into the general project schedule. The commissioning schedule already contains over 10,000 interconnected operations, which need to be coordinated in the near future, and deadlines need to be defined for the installation of each system. The first equipment-related operations are scheduled for late 2020.

Some of the operations are categorized as repairs and therefore Atomenergoremont will be engaged in this work. Rosatom's service companies will establish contacts with local government agencies and organizations to acquire expertise in local legal and regulatory requirements for licensing, staff recruitment, workplace health and safety.

The ongoing coronavirus pandemic made Rusatom Service and Akkuyu Nükleer find effective ways and means of interaction to prepare the necessary documents and have them approved on time. In particular, the company has piloted the first modules of Rosatom's E-Commissioning system that will connect all the stakeholders of the commissioning process in a shared information and process environment.

Retrofit and upgrade

Another core competence of Rusatom Service and Atomenergoremont is retrofit and upgrade of operating nuclear power plants. For instance, an extensive retrofit program was completed at Smolensk NPP Unit 3 in March 2019. Last November, Kalinin NPP Unit 1 was shut down for capital repairs and retrofit. An example of a similar project delivered in a foreign country is the Armenian NPP. Preparations for the project began in 2017; materials and equipment for the retrofit were also purchased back then.

"We are gaining experience in working internationally, and Armenia has become our first try," Alexey Chernikov, First Deputy CEO at Atomenergoremont said.

The work in Armenia started with improving workplace and living conditions. First, Atomenergoremont reconstructed a canteen and fitted it with professional cooking equipment to cater to the local staff and employees, who came from Russia. Then, an administrative building was renovated and fitted out to accommodate the engineering and technical staff.

Armenian NPP

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Work on the plant's site began in 2018. In 2018–2019, Rusatom Service designed, delivered, installed and tested power generating machinery and equipment at Unit 2. The company replaced all core components of two turbine generators, including turbines, steam condensers, generators, separators, superheaters, transformer units, condensate pumps and other equipment. Experts inspected the plant and confirmed that the replaced components can be connected to the existing systems. Lifting equipment was also retrofitted.

The site of Akkuyu NPP, Turkey

For the retrofit and upgrade project to be completed, the company is yet to reconfigure the emergency core cooling system and anneal the reactor pressure vessel to restore its initial properties. When all the work is done, the plant's capacity will be increased from 390 to 440 MW, with the service life to be extended. NL

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From Steam Locomotives to Ethane Evaporators

Rosatom Newsletter proceeds with a series of stories about Rosatom Group companies. This issue is dedicated to ZiO-Podolsk, which celebrated its centennial anniversary last year.

One might ask, how could a nuclear industry company be a hundred years old when the entire nuclear industry is 75 years of age?

A century-old manufacturer

For one hundred years, ZiO-Podolsk manufactured a variety of machinery and equipment for thermal and nuclear power plants and oil refineries, but initially it was a steam locomotive maintenance depot. Opened on May 2, 1919, the plant repaired locomotives until 1930.

Why is it called ZiO-Podolsk? ZiO is an acronym of the Russian phrase 'Plant named after Ordzhonikidze'. It was named after Sergo Ordzhonikidze, then the Soviet minister of heavy industry, and ZiO has become its trademark since then. Podolsk is a small city in the Moscow Region where the plant is located.

In 1931, ZiO-Podolsk was converted to manufacture cracking units, narrow-gage locomotives for industrial facilities, and other railroad equipment. Its name was changed to Cracking and Electric Locomotive Plant.

During World War II, the plant and some of its employees were evacuated to the Urals. The machinery and equipment that remained in Podolsk was used to make grenade shells, repair tanks and guns, and install armor on IL-2 strike fighters. In 1942, Taganrog Boiler

Plant was relocated from Southern Russia to Podolsk. As a result, ZiO-Podolsk acquired expertise in the maintenance and repairs of steam boilers and began their production in 1946. For 70 years, the plant produced over 700 different boilers for 152 Russian and foreign power plants with a total capacity of 66 million kilowatts.

In 1952, the plant began manufacturing thermal and mechanical equipment for nuclear power plants. Since 2007, ZiO-Podolsk has been part of Atomenergomash, Rosatom's power engineering division.

The energetic present

The machinery and equipment produced at Podolsk are installed at every nuclear power plant constructed in the former Soviet Union. They are also used at nuclear power plants with VVER-440 and VVER-1000 reactors operating outside Russia. Over the last years, the plant has been manufacturing equipment for power plants with VVER-1200 reactors. Reactor pressure vessels, steam generators, separators, superheaters, high and low pressure heaters for STP regeneration systems, water preheaters, various heat exchangers, ion exchange filters, trap filters, removable insulation and evaporators are just a few of the products for nuclear power plants manufactured at ZiO-Podolsk.

A recent example is a separation tank developed and produced for the Rooppur nuclear power plant in Bangladesh. The separation tank is designed to collect moisture from the separator. Similar devices have been manufactured for new reactor units at Novovoronezh II, Leningrad II and two reactors of the Belarusian nuclear power plant.

ZiO-Podolsk has also produced machinery and equipment for BN-350, BN-600 and BN-800 fast neutron reactors.

Thermal equipment is another group of items manufactured at the plant. It has many years of experience in the production of boilers for power units. Along with manufacturing, ZiO-Podolsk provides boiler design, retrofitting, installation supervision, adjustment and commissioning services. Similar services are provided for boiler islands produced and installed by other vendors at power plants outside Russia.

ZiO-Podolsk also manufactures machinery and equipment for waste incineration plants. Two shipments are scheduled for this March. The first one includes a set of boiler equipment for Russia's first waste-to-energy plant in the Moscow Region. The second shipment includes superheaters for steam boilers of the Riverside energy-from-waste plant in the UK. In April, the first batch of equipment was delivered to the country. Russian-made superheaters will replace similar devices during a major plant upgrade.

The third group of ZiO-Podolsk's products is machinery and equipment for the oil and gas industry. This group includes columns,

reactors, adsorbtion, absorbtion and desorbtion units, tanks, receivers, shell and tube heat exchangers, tube furnaces and coil tubing for them. The equipment is used at new production facilities and for the upgrade of operating ones. Some oil refineries have been purchasing ZiO-Podolsk equipment for more than half a century. New projects are underway as well. In 2019, the plant manufactured an ethane evaporator and an LNG pump for the Yamal LNG project. The ethane evaporator will be installed at the LNG plant in the Port of Sabetta in Russia's north. The plant will have a capacity of one million tons of LNG per annum.

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Nuclear Responds to Coronavirus

The coronavirus pandemic has affected the nuclear power and uranium industries. Systemic quarantine measures cause electricity consumption to decline, while shutdown of uranium mines has driven up the price of uranium. Falling incomes of both retail and corporate consumers might result in the tidal wave of unpaid electricity bills.

Uranium and fuel market

In March and early April, large uranium manufacturers announced their production plans against the coronavirus pandemic.

Kazatomprom, Kazakhstan manufacturer, which accounted for over 42% of U3O8 produced globally in 2019, said on April 7 that the output of uranium would decline 18% year-on-year on the back of staff reduction. Lower staff numbers will be maintained for the next three months. **"The company expects its uranium production to decrease by more than 4,000 tons in 2020,"** Kazatomprom's press release read. According to earlier estimates, Kazakhstan was expected to produce 22,750–22,800 tons of uranium.

Canada-based Cameco said turn that it might produce up to 600,000 pounds (around 272 tons) of U3O8 less. Inkai in Kazakhstan remains the company's last mine in operation. Earlier Cameco announced that its Cigar Lake uranium mine, the largest in the world (6,900 tons of uranium in 2019) and Cameco's only operating mine in Canada,

**Information provided in this article is relevant for April 16, 2020.*

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Inkai uranium miner, Kazakhstan

was placed into care and maintenance for at least four weeks. In April, Cameco extended the conservation of the mine for an indefinite period, with its lift depending on the epidemiological situation and the instructions of the regulator.

In early April, Cameco also announced that it suspended production at its Port Hope Conversion Facility for about four weeks. The company plans to use the time of shutdown to carry out repairs planned for the coming summer.

Following the shutdown of Cigar Lake, Orano (France) announced the suspension of production at McClean Lake Plant, which processes uranium ore from Cigar Lake, first for the same four weeks, and then for an indefinite period.

The Government of Namibia imposed a quarantine in the regions of Khomas and Erongo for the period from March 27 until May 4. According to Minister of Mines and Energy Tom Alweendo, they had to suspend production at local uranium mines. In particular, the quarantine affected operations of the Rössing Uranium Mine and the Husab Mine located in Erongo. In 2019, the two mines produced around 6,000 tons of uranium. **"As from March 28, 2020 the Rössing Uranium Mine will discontinue normal mining operations and enter a period of minimal mining operations. As a safety measure, critical maintenance work will continue,"** the corporate website read.

Energy Resources of Australia Ltd (ERA), which operates the Ranger mine (2,000 tons in 2019), announced it would not transport workers from the city of Darwin to the mine until requirements of the Human Biosecurity Emergency Declaration of the Australian Government were met. At present, the company is holding negotiations with stakeholders to maintain the production and other operations as part of the mine rehabilitation program.

Russia's ARMZ Uranium Holding did not suspend its operations, but some of the employees, whose jobs were not critical for the production process, shifted to remote working. Starting from mid-April, they are returning to their onsite workplaces. **"We take all reasonable measures to minimize the effects of the epidemic on our supply chains and meet our obligations to customers in full and on time — exactly as provided for in the contracts. For now, ARMZ continues operating as usual,"** an ARMZ spokesperson said.

With many mines mothballed, American uranium producers try to take advantage of the situation. Energy Fuels and Ur-Energy, which describe themselves as 'small businesses', wrote a letter to the US president in an attempt to portray the situation with uranium supplies as critical, **"This current pandemic crisis is exposing the vulnerability of our nuclear fuel supply chain,"** the letter read. The goal is to secure the government support by invoking the

Defense Production Act, which offers a variety of support measures, including direct purchases from domestic manufacturers.

It is unlikely that the US companies concerns are grounded in market reality. Take Kazatomprom's press release published in March, for example. The company assured that even **"if the situation affects uranium mining or delivery, our inventories (products and materials available on stock) are sufficient for Kazatomprom to continue production and meet contract obligations."** According to the company data as of December 31, 2019, Kazatomprom had over 8,500 tons of uranium in stock, which is roughly equal to its eight-month output in 2020 (in proportion to the ownership share). These figures might indicate that the uranium market remains oversupplied.

Inoperative uranium mines have not yet affected the market seriously. According to UxC data as of March 30, 2020, the spot price of uranium rose from USD 24.80 to USD 27.62 per pound of U3O8 over the previous month. The growth was not consistent, though. On the next day, the price went down to USD 27.25 and recovered to only USD 27.70 per pound during the first three days of April. Kazatomprom's statement pushed the price further up, but just a little: the possibility of the market missing 'up to 4,000 tons of uranium' raised the price by little more than one dollar to USD 28.88.

Inkai uranium miner, Kazakhstan

Then the price continued to rise: the April statement made by Cameco to extend the conservation of Cigar Lake for an undefined period raised the price from USD 29.75 (transactions on April 13) to USD 31.38 per pound (transactions on April 14).

The situation is paradoxical: according to March data from UxC, the largest buyer in the spot market is Cameco. For several years, the company has been producing less than selling. In 2019, domestic production was 9 million pounds of nitrous oxide (only Cigar Lake is included here), and sales were 31.5 million pounds. And if Cigar Lake is stopped, the volume of purchases is likely to increase.

In these circumstances, a rise in spot prices for a Canadian company is a growth of expenses that is unprofitable for the company itself.

"We are sure today that the shutdown of uranium mines in 2020 will sweep away some of the stocked uranium, which puts pressure on the price," Anna Bryndza, Senior Vice President Policy at leading uranium research and analysis company UxC, told Interfax.

This sentiment is shared by Andrey Tovstenko, the first Deputy Director General of TENEX, Rosatom company dealing in nuclear fuel cycle products. He noted that due to restrictions related to the spread of COVID-19, production of uranium raw

materials was reduced. **"The suspension of production at the world's largest uranium mine, Cigar Lake, for an indefinite period and similar restrictions imposed on mines in Namibia and Kazakhstan, led to an increase in spot prices for natural uranium over the past month by more than 25%. In April 14, the spot price surpassed the psychologically important level of 30 USD per pound of nitrous oxide. I believe that the price dynamics in the coming months will strongly depend on the duration of the restrictions imposed due to COVID-19,"** Andrey Tovstenko said.

However, the question remains how much will the production decrease. Resuming production at the idle mines is a matter of several months — which is enough to return to previous production levels and even compensate for the temporary shortfall. This point is stressed in Kazatomprom's press release saying that they could only provide estimates at this point. The resulting production cuts might be lower than one would expect based on the average output and days in shutdown or reduced production. It is impossible to make forecasts for 2020 as it is not yet clear how the pandemic will unfold.

Nuclear generation

Nuclear power plants around the world have not been shut down over the epidemic as they belong to infrastructural facilities ensuring stable work of businesses and comfortable life of people. In order to minimize health risks for their staff, nuclear operators in many countries asked their non-critical employees to work from home. The remaining workers have their temperature taken regularly and the rooms are disinfected.

Social distancing measures put in place at Hinkley Point NPP, UK

"All nuclear power plants and other facilities work properly," Rosatom's Director General Alexey Likhachev said.

In order to ensure continuous operation of nuclear power plants in Russia, control room operators were provided accommodation at countryside health resorts belonging to the plants. They are being transported to work in buses that are disinfected before each ride, and enter the station through a separate gate. The surfaces inside the control room are cleaned and disinfected several times a day. Everyone wears masks. Employees from different shifts do not meet in canteen, which is also disinfected after each shift. Meals are cooked at the health resort and delivered to the plant in lunch boxes. Deliveries are contactless: canteen workers take boxes only after the delivery service leaves the site.

ČEZ (Czech Republic) also isolates shifts at the Dukovany and Temelin nuclear power plants.

Refueling and repairs might pose a challenge for nuclear operators. These operations are obligatory and cannot be postponed. Things might get complicated if the number of employees has been reduced or if any of them has contracted the virus.

For example, the authorities of Montgomery County (Philadelphia, USA), which is home to the Limerick Generating Station, has requested its owner Exelon, to postpone refueling operations involving 1,400 people, due to coronavirus. The company refused saying that it would be otherwise unable to meet demand for electricity at summer peak times. Exelon had bad luck: one of its employees engaged in refueling operations fell ill and was tested positive for coronavirus. The company stepped up health protection measures and continued its operations despite criticism.

Arizona Public Service, operator of the Palo Verde Nuclear Generating Station in Arizona, has decided to cut the number of people who had to do maintenance work during refueling. The company has limited the scope of maintenance making sure it will run safely until the next shutdown in September 2020.

There could be more complications in the near future as according to the US-based Nuclear Energy Institute (NEI), the share of people in self-isolation may reach 40% within the next one or two months.

Slovakia's Slovenske Elektrarne extended shifts and reduced the number of employees working at the Mochovce nuclear station to mitigate the risk of infection spread. With fewer workers on the site, the company had also to decrease the scope of work done during the shutdown of Unit 1. It will carry out maintenance on the core cooling system and transformer substations only. Non-destructive testing of wields at one of the six steam generators and overhaul of one primary coolant pump are also on the agenda. Some of the initial capital investment programs have been suspended,

Temperature checks put in place to keep workers safe during the coronavirus pandemic, Hinkley Point NPP (UK)

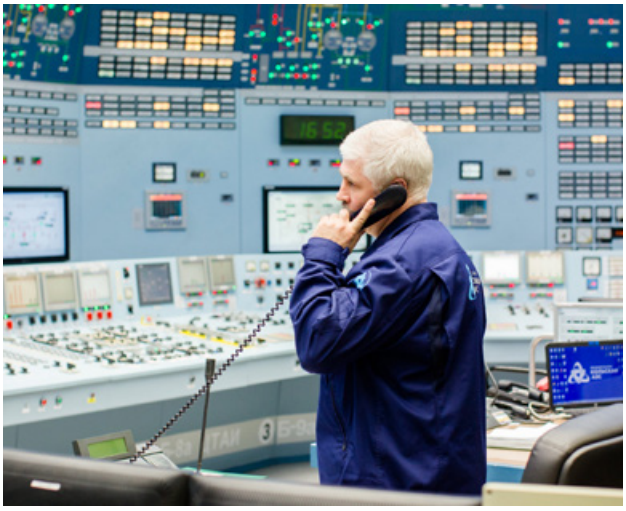
but the long-term seismic reinforcement project at the nuclear power plant continues as planned. The scope of work was approved by the Slovak Nuclear Regulatory Authority.

In Canada, the Bruce Nuclear Generating Station in Canada reduced its Major Component Replacement Project to several key tasks for the station to be able to continue power generation and fabrication of Co-60 for medical purposes.

The Bilibino nuclear power plant in Russia completed partial refueling, which took place on March 20–30. On April 5 — one day ahead of schedule — Unit 2 was brought online. According to the plant's press service, they did not have to reduce the initial scope of work or the number of employees involved.

The situation is different at nuclear stations under construction. The number of employees at the Hinkley Point construction site in the UK decreased twofold, and the work slowed down.

Some workers have asked to be returned back to Russia from Rosatom's construction sites abroad. On April 6, 178 employees and



subcontractors engaged at the Rooppur NPP returned to Russia from Bangladesh. Their departure will not affect the construction process as there are more than 4,000 people working on site. **"Our construction projects abroad are running as scheduled. For the time being, we see no major risks preventing us from meeting our plans for this year. Unfortunately, we could not predict how the situation will develop in a particular country,"** Rosatom's Director General Alexey Likhachev said.

Some nuclear facilities, which are not involved in the power generation, might suspend their operations. After the first cases of coronavirus were detected at the Magnox Reprocessing Plant in Cumbria (England), around 8% of 11,500 employees self-isolated. In response to the infection, its owner Sellafield Ltd decided to begin controlled shutdown of the plant.

This article was not meant to assess the impact of the pandemic on power consumption across the globe. In March 2020, electricity production in Russia decreased 1.8% year-on-year, while consumption declined 1.6% over the same period. However, this decline cannot be directly attributed to the pandemic as Russia did not feel its effects until the last week of March. Much of the decline could be explained by warmer weather.

Since many businesses were ordered by the authorities to close for the period of the coronavirus epidemic and some people and companies lost their sources of income, the nuclear power plants as electricity producers are facing lost profits.

Energy companies have already begun publishing information about changes in payment procedures. For example, Électricité de France announced that small and micro businesses severely affected by the crisis were allowed to delay the payment of their commercial electricity bills. This applies to the bills due from March 12 until the end of the emergency situation. Companies receiving aid from the Government's Solidarity Fund can pay their bills in installments within six months after the emergency is over.

Atomenergosbyt (Rosatom's power distribution company operating in four Russian regions) is ready to consider the circumstances of individual customers. **"We see that some consumers are already trying to use the current situation in order not to pay their [existing, pre-pandemic] debts. We find that unacceptable. Electricity consumers must fulfill their existing obligations in full. It is important to prevent debt from growing in order to maintain the existing balance in the energy market — energy companies need money to purchase fuel and carry out repairs otherwise the security of energy supply will be threatened,"** a representative of the company said.


Inkai uranium miner, Kazakhstan

Fighting coronavirus

On April 1, the IAEA announced it was dispatching the first batch of testing equipment for rapid coronavirus detection to more than 40 countries. The equipment includes diagnostic machines and kits, reagents and laboratory consumables, personal protective equipment, and laboratory cabinets for the safe analysis of collected samples. Over 90 countries have sent support requests to the agency. The testing technique uses radioactive isotope markers to detect virus' genetic material.

The IAEA is using its own resources as well as extrabudgetary funding for its emergency assistance. Large financial contributions have been announced by Russia, the United States, Canada, the Netherlands, Australia and China, which has donated detection equipment, kits, reagents and other medical materials worth USD 2 million.

China Nuclear Energy Industry Corporation (a subsidiary of CNNC) has purchased medical materials and is planning to send them to Iran, South Korea, Japan, Spain, France, Austria and the United Kingdom.

Since Rosatom's activities are not limited to nuclear power generation, the Russian state nuclear corporation has developed a number of products and services to help fighting the pandemic.

The Troitsk Institute for Innovation and Fusion Research (a subsidiary of Rosatom's research division) has developed mobile ozone generators to disinfect clothes and equipment. The device is comparable with a home ozonizer in its size. In order to disinfect clothes or tools, it is enough to place the ozone generator in the room where the items are stored. They will be sterile in just 15 minutes. One ozone generator can treat an area of up to 100 square meters.

Rusatom Additive Technologies (Rosatom's integrator for 3D printing techniques and services) announced that the company was ready to manufacture valves for artificial lung ventilation devices and had produced the first valve samples.

Sterion, a joint venture of Rusatom Healthcare and a private investor, provides 24/7 mask sterilization services. By April 2, the company has treated the first batch of 92,000 masks, with its design capacity reaching up to 10 million masks per week. The company is based at Rosatom's Research Institute of Instrumentation and uses a linear particle accelerator developed at Rosatom's Efremov Research Institute for irradiation.

Given the input of nuclear industry companies in fighting the pandemic, certain statements made by international organizations like the International Energy Agency seem quite puzzling, **"Large-scale investment to boost the development, deployment and integration of clean energy technologies — such as solar, wind, hydrogen, batteries and carbon capture (CCUS) — should be a central part**

of governments' plans." Nuclear power plants coupled with desalination facilities or nuclear science and technology centers with agriculture irradiation facilities and medical isotope fabrication reactors could be more than just a source of electric power at a stable price. Countries owning such facilities could educate young talents and train industry professionals, as well as provide people with safe medical products, water and food.

Thankfully, individual countries see the importance of nuclear technologies. Speaking to Teol.hu, János Süli, Hungarian Minister in charge of the Paks nuclear power plant expansion, confirmed that Hungary considered the two new units at Paks II to be strategically important for the country. A domestic source of power and a stock of fuel for continuous power generation are essential for the country amidst closed borders and possible import restrictions. Nuclear energy meets a third of Hungary's needs for electricity. In addition, construction of a nuclear power plant means creation of many new jobs. **"Large capital investment projects such as construction of two new reactor units might become a lifeline for many Hungarian companies and a source of living for many Hungarians,"** the minister stressed.

Rosatom is ready to manufacture valves for ventilators needed to fight coronavirus

Finally, today's utmost priority is to maintain lives, health and, as far as possible, incomes of people. NL

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