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Bellona Nuclear Digest. August 2023

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Bellona Nuclear Digest. May 2023

Published by: Bellona Foundation, Vilnius

About Bellona:
The Bellona Foundation is an international environmental NGO working on the major climate and environmental problems. Founded in 1986 as a direct action protest group, Bellona has become a recognised technology and solution-oriented organization with offices in Oslo, Brussels, Berlin, and Vilnius, and representatives in USA and several EU Member States.

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After Russia's full-scale invasion of Ukraine in February 2022, Bellona ceased its activity in the aggressor country. On 18 April 2023, the Russian general prosecutor's office declared Bellona to be an undesirable organization.

However, we continue to monitor events in the field of nuclear and radiation safety relating to Russia and Ukraine, which we believe are of interest to foreign readers. We analyze the situation in order to assess the degree of Russia's international influence on other countries and the risks connected with this. We present you with a survey of these events for August 2023.

Follow the links to read the digests for July, June and May. Subscribe to our mailing list to make sure you don't miss the next digest. Download a PDF copy of the digest here.

Nuclear risks and the war in Ukraine

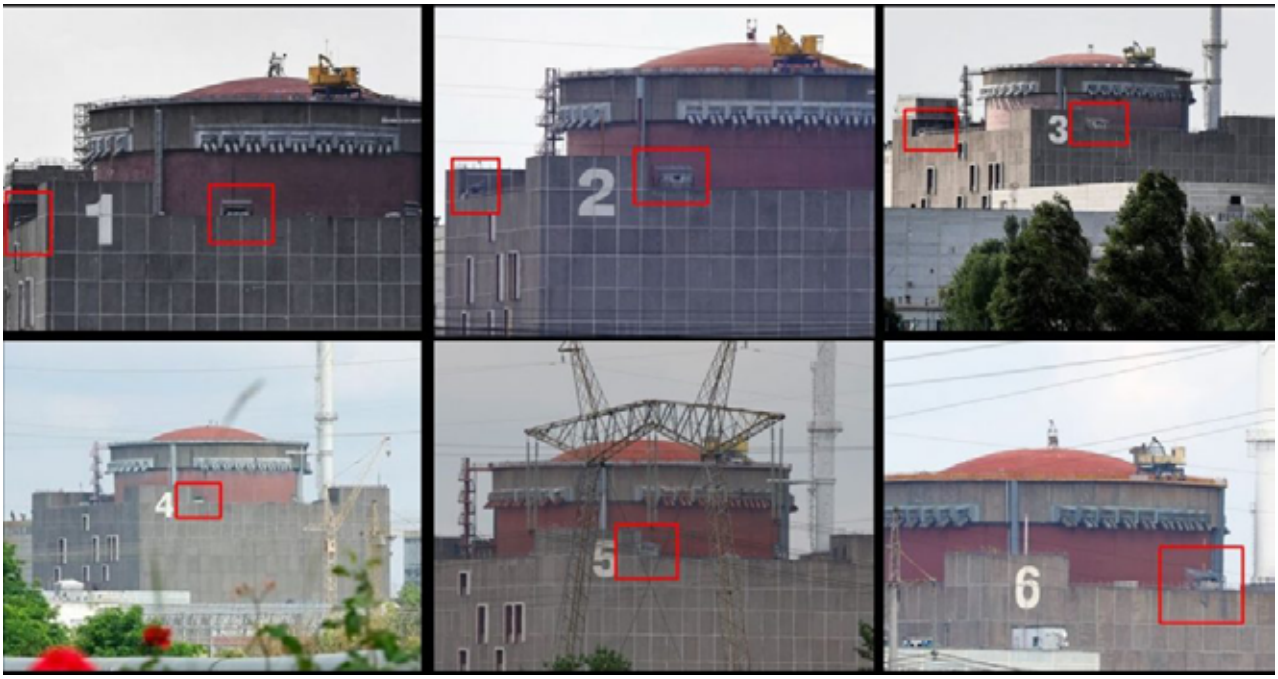
Zaporizhzhya NPP. Event timeline

1 September marked a year since the IAEA Support and Assistance Mission to Zaporizhzhya (ISAMZ) was established. At the end of August, the tenth rotation of IAEA experts took place at the ZNPP.

In August, IAEA experts continued to make inspections of the territory and the plant facilities. On 3 August, after numerous requests made in July, access was granted to the rooftops of Unit 3 and Unit 4 reactor buildings and the turbine halls. Mines and explosives were not found there. Additionally, two fresh fuel storage facilities at the plant were inspected, and also the dry spent fuel storage facility, where the safety of storage and the integrity of the fuel tasks were confirmed. In an inspection of the facilities of Unit 2 on 8 August, the team noticed several military trucks in the turbine hall. In the second half of August, in an inspection of various facilities of Unit 1, military trucks were also found in the turbine hall. Previously in July, the IAEA had already reported the presence of trucks in the Unit 1 and 2 turbine halls, and also in the Unit 4 turbine hall. During the inspection, the experts saw no mines, apart from those detected earlier in July, or any explosives.

The IAEA team continues to report regular signs of military activity in the area around the plant. On 14 August, a strong detonation shook their room windows, and gunfire was heard two days later. Another explosion near the site occurred on 17 August, and five detonations

were heard some distance from the ZNPP on 20 August, and five more on 21 August. The IAEA reported https://www.iaea.org/newscenter/pressreleases/update-180-iaea-director-general-statement-on-situation-in-ukraine of a Ukrainian drone on the morning of 18 August in Energodar, where most of the ZNPP personnel live, with several casualties. The IAEA experts did not hear of any injuries to plant personnel, and damages at the ZNPP site were not recorded. According to Russian information, on this day the building was attacked where the commandant's office and police station are located, but no one was killed or injured.



Firing positions detected on the roofs of reactor sections of all six ZNPP power units, recognized by Bellona experts from photos by Russian correspondents of RIA Novosti for May-June 2023.

On 23 August a drone hit a residential building in Energodar, but no casualties were reported. According to reports by the Permanent Mission of the Russian Federation at the IAEA, 207 aircraft were "detected and suppressed" near Energodar in August, which Russia claims were launched by Ukraine.

Additionally, Russia reported to the IAEA that on 1 and 3 September drones of the Ukrainian army had attacked the town of Kurchatov in the Kursk Oblast, located 2 km from the Kursk NPP – the closest Russian nuclear plant to Ukraine, just 60 km from the border. Russia emphasizes that Kurchatov is "the same kind of NPP satellite town as Energodar". According to media reports, an FSB building was damaged in the attacks.

Commentary by Bellona: *Military activity and the increase in the number of explosions in the region of the Zaporizhzhya NPP may be explained by the growth in the use of strike drones on the territory around the plant. Strikes on the site of the plant itself have not taken place for several months, but the presence of targets there which may be regarded as military (soldiers, trucks concealed in turbine halls, reinforcement positions etc.) increase risks of possible strikes on the NPP site (as was the case in July 2022 when as the Defence Intelligence of Ukraine admitted, the Ukrainian armed forces carried out a drone strike on Russian equipment and soldiers on the plant site) and military operations being conducted on its territory if the situation changes on the surrounding fronts. Such targets in Energodar are already becoming objects of attacks. These risks also arise in areas near nuclear facilities in Russia, where the FSB building was attacked in the satellite town of the Kursk NPP. All of this shows that nuclear sites and the territory around them should not be places for stationing soldiers and special services.*

On 10 August at ZNPP power unit 4, which had been in "hot shutdown" mode for just two weeks, since 24 July, a water leak from the first to the second circuit at steam generator 3 was detected, and the unit was switched back into "cold shutdown" mode. The leak was caused by a hairline crack in the weld of the primary header vent pipe of the steam generator.

On 13 August, it was replaced by power unit 6 that was put into "hot shutdown" mode, after being in "cold shutdown" since 21 April. The Ukrainian permanent representative at IAEA stated in a report published on the IAEA website that from the technical standpoint, the actions of the Russian side in switching units from hot to cold shutdown and back will lead to the destruction of steam generators because of the violation of the water chemistry regime, which subsequently creates the risk of small or medium coolant leakage from the primary-to-secondary circuit of the power unit.

In recent weeks, the IAEA has strongly encouraged installing an external source of process steam for the plant's needs. On 10 August the IAEA was informed that the ZNPP has initiated a process to buy an external steam generator by sending technical requirements to possible vendors.

In August, as was the case after the destruction of the Kakhovka dam, the water sources used for the plant's needs were the cooling pond, the discharge channel of the Zaporizhzhya Thermal Power Plant (TPP) and underground water from the drainage system. The rate of water level decrease in the cooling pond remains constant – within 1 cm per day (according to Energoatom data, in August the level dropped by 23 cm). The IAEA continues to monitor the isolation gates of the cooling pond, which were reinforced with concrete blocks and soil to a total thickness of up to 4 meters. The water level in the discharge channel rises from time to time from pumps pumping water from the ZTPP inlet channel, which receives water primarily from groundwater.

In early August near the ZNPP port at the cooling pond, a pilot well was drilled to receive an additional water source for the sprinkler ponds. It was also planned to drill an additional well within the perimeter of the ZNPP site. On 22 August, the IAEA reported that the ZNPP had begun to pump water from the new well. Experts were informed that the new well, with a location near the sprinkler ponds that was chosen after consultations with geologists, had been put into operation, and was now providing about 20 m^3 of water per hour. At the end of August, four wells were in operation, and it is planned to drill 10-12 wells in total around the sprinkler ponds, which will subsequently become the main source of cooling water for the six shutdown reactor units and spent fuel pools.

On 10 August, the plant was cut off twice in one day from the main 750 kV Dniprovska power line, and received power from the 330 kV Ferrosplavna-1 backup line. The IAEA team reported that the disconnection occurred 5.5 km from the open switchyard on the southern bank of the river due to the activation of an overcurrent protection system.

On 18 August, Kommersant newspaper published an interview with Yuriy Chernichuk, the director of the Zaporizhzhya NPP appointed by Russia. Among other things, he discussed fuel from the American company Westinghouse, which four units of the ZNPP were switched to in early 2022: units 1, 2, 4 and 5. When asked about replacing this fuel with Russian fuel, Chernichuk replied: "We will only realize plans for operations with the fuel of any manufacture when peace comes to this territory."

Bellona believes that this statement may be a good sign, and shows that Russia has abandoned plans to put any units of the Zaporizhzhya NPP in power operation mode, or at least that the local personnel are not prepared to realize these plans under occupation.

> ***Commentary by Bellona:*** *Despite reports of the wide use of drones, one gets the impression that the ZNPP zone has become relatively calm. The territory of the plant itself has not been shelled for many months, but it is constantly receiving military reinforcement. At the same time, judging from reports from areas of military operations, this may be the calm before the storm. So we may expect that the events which may create a radioactive or even nuclear incident may occur if military operations are activated in this area.*
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> *As for the situation at the plant itself, Russia has evidently postponed plans to put the units into power operation mode, a procedure which has already been severely complicated by the loss of the Kakhovka reservoir. However, either accidentally or deliberately, as we wrote in the previous digest, with the unscheduled operation of units in "hot shutdown" mode and the lack of timely and full servicing of equipment because of a lack of parts and personnel, through its occupation of the plant Russia is bringing about its gradual degradation.*
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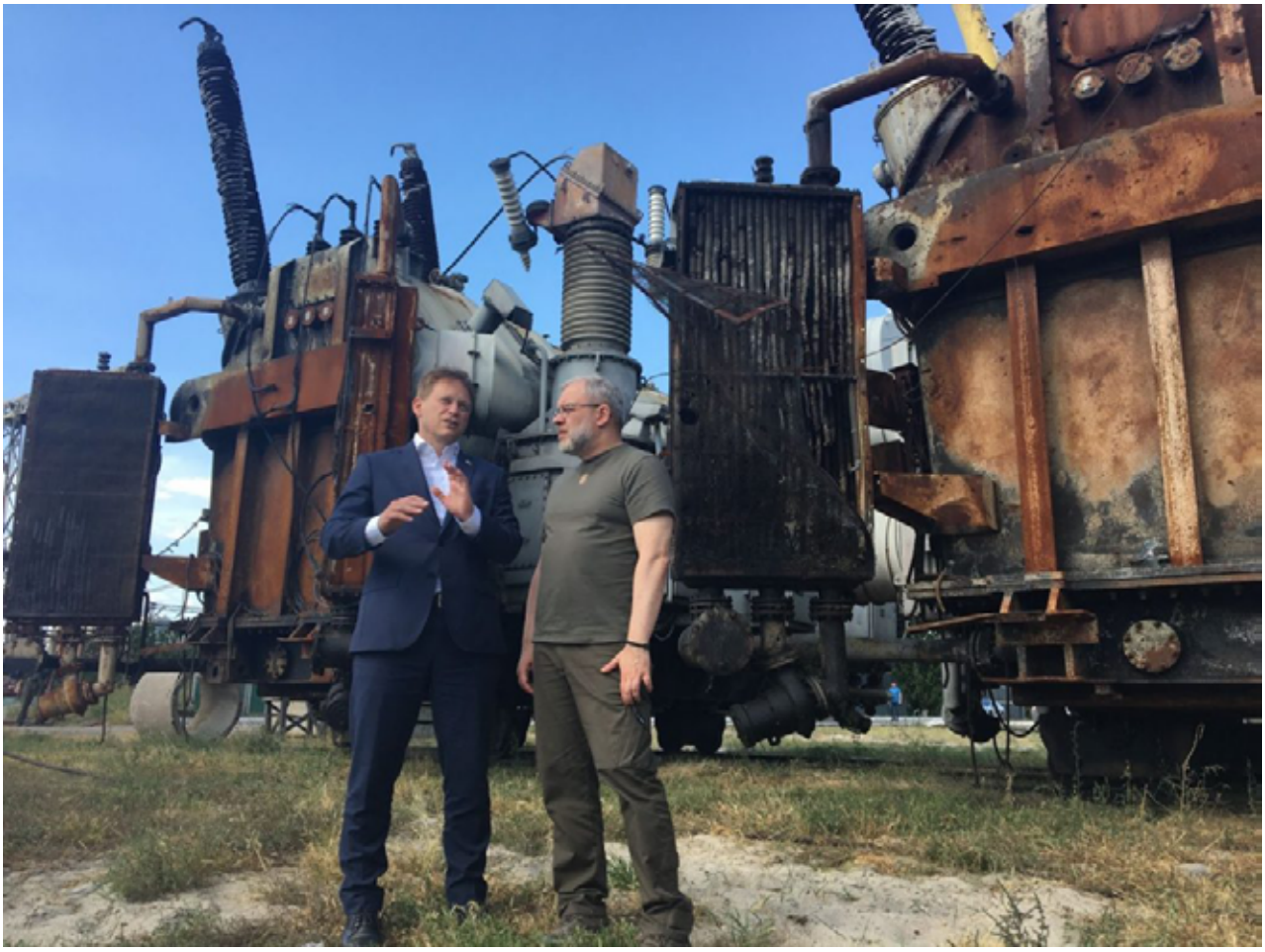
> *Over the year that the IAEA mission has been at the plant the IAEA inspectors were added "degrees of freedom", although the organization's diplomatic efforts have yet*

to solve the issue of reducing risks for the largest nuclear plant in Europe. But the presence of inspectors at the site for an entire year makes it possible to obtain more reliable and relevant information about the condition of the plant.

UK to assist Ukraine with uranium enrichment

During a visit to Kiev on 23 August, the UK Energy Security Secretary Grant Shapps (on 31 August he was appointed Secretary of State for Defence) announced that the UK intended to provide Ukraine with a GBP 192 million (USD 245 million) loan guarantee through UK Export Finance, enabling UK-headquartered Urenco to supply Ukraine's national nuclear company Energoatom with uranium enrichment services.



UK Energy Security Secretary Grant Shapps (left) and Minister of Energy of Ukraine German Galushchenko (right) in Kiev on 23 August.
Source: gov.uk

Urenco has been the supplier for Energoatom and Ukraine since 2009. In 2019, Energoatom and Urenco signed an agreement on supplies of enriched uranium, and in March 2023 the heads of the companies held talks on financing future supplies. This support will enable services to be provided in future, while a significant amount of supplies are made from the UK.

> ***Commentary by Bellona:*** *Over the course of the war, Ukraine has completely ceased deliveries of Russian nuclear fuel, and is actively switching to western supplies for all components of the fuel cycle. In June 2022 an expanded agreement was signed for delivering nuclear fuel for functioning NPPs in Ukraine from the Westinghouse company, and in early 2023 the contract conditions were agreed on for deliveries of uranium and services for its conversion with the Canadian company Cameco. Now additional financing from the UK will help to consolidate deliveries of uranium enrichment services. According to Bellona's own assessments, the size of the loan issued by the UK, taking into account current spot prices on enrichment services, will satisfy the needs for enriched uranium of all Ukrainian NPPs for around two years (excluding the occupied Zaporizhzhya NPP).*

International nuclear news and its connection with Russia

Bulgaria allows Atomstroyexport to take part in conservation of equipment for the Belene NPP.

On 23 August, the Bulgarian government approved an exception to the rule on restrictive measures introduced in connection with Russia's military operations in Ukraine, allowing the National Electric Company EAD (NEK EAD) to continue conservation of equipment supplied for units 1 and 2 of the Belene NPP, under the technical management of the Russian Atomstroyexport.

Conservation works continue at the site of the Belene NPP, with the purpose of maintaining equipment in the state required by the manufacturer. The contact for technical management of reconservation of equipment with a long service period ends on 31 December 2023. Continuation of the contract will be carried out in accordance with the Law on state purchases.

In October last year Bulgaria also made an exception from sanctions for the Atomstroyexport company, permitting the NEK and the Kozloduy NPP to continue work as part of agreements and contracts with Russian companies. On 24 September, unit 6 at the Kozloduy NPP was shut down for scheduled repairs, and only Russian companies can provide the necessary spare parts for it.

Commentary by Bellona: *These exceptions for Rosatom companies for servicing power units of Soviet design in Europe are made regularly. For example, in the July digest we wrote about these exceptions in the Czech Republic. They will inevitably also be seen in the future, including in Ukraine, in all likelihood, despite the political unacceptability and lack of publicity of these deliveries. Complete rejection of all services of Rosatom and Russian companies will be impossible, because of the lack of alternative suppliers for all the range of goods and services, and economically unjustified. At the same time, attempts at completely stopping these deliveries or replacing them with indirect deliveries through third-party countries or companies may lead to violations in safety standards and raise the risk of malfunctions and accidents. This situation requires a rational approach to countries' sanctions policies during wartime.*

Brazil expands its enrichment capacities

On 27 July, Indústrias Nucleares do Brasil (INB) signed a contract with Amazônia Azul Technologias de Defesa SA (Amazul) for engineering services for the second phase of the uranium enrichment plant at INB's nuclear fuel factory in Resende. The first phase was launched in late 2022, with 10 cascades of ultracentrifuges for uranium enrichment. This satisfies 70% of the requirements for the first of the two units of the Angra NPP, reducing dependence on foreign suppliers (at present most enriched uranium is still imported).

At the second phase the INB factory will operate over 30 cascades of ultracentrifuges, which according to the company will guarantee Brazil with self-sufficiency in enriched uranium. It is forecast that by 2033 the company will be able to satisfy fully the requirements of the first two units of the Angra NPP, and by 2037 the requirements for the unit Angra-3 that is under construction.

At present, Rosatom provides uranium enrichment services to INB. In December 2022, INB signed a contract with the German branch of the Tekhsnabeksport company (part of Rosatom), Internexco GmbH, to cover 100% of the requirements of the Angra NPP in the period from 2023-2027. Under the contract, Internexco will deliver 330 tons of uranium hexafluoride to Brazil and carry out uranium enrichment of over 1 million SWU (separative work units, the standard unit for measuring energy required to separate the U235 and U238 uranium isotopes in the enrichment process). In May 2023, INB signed another contract with Tenex, an affiliated company of Rosatom, for acquiring natural uranium.

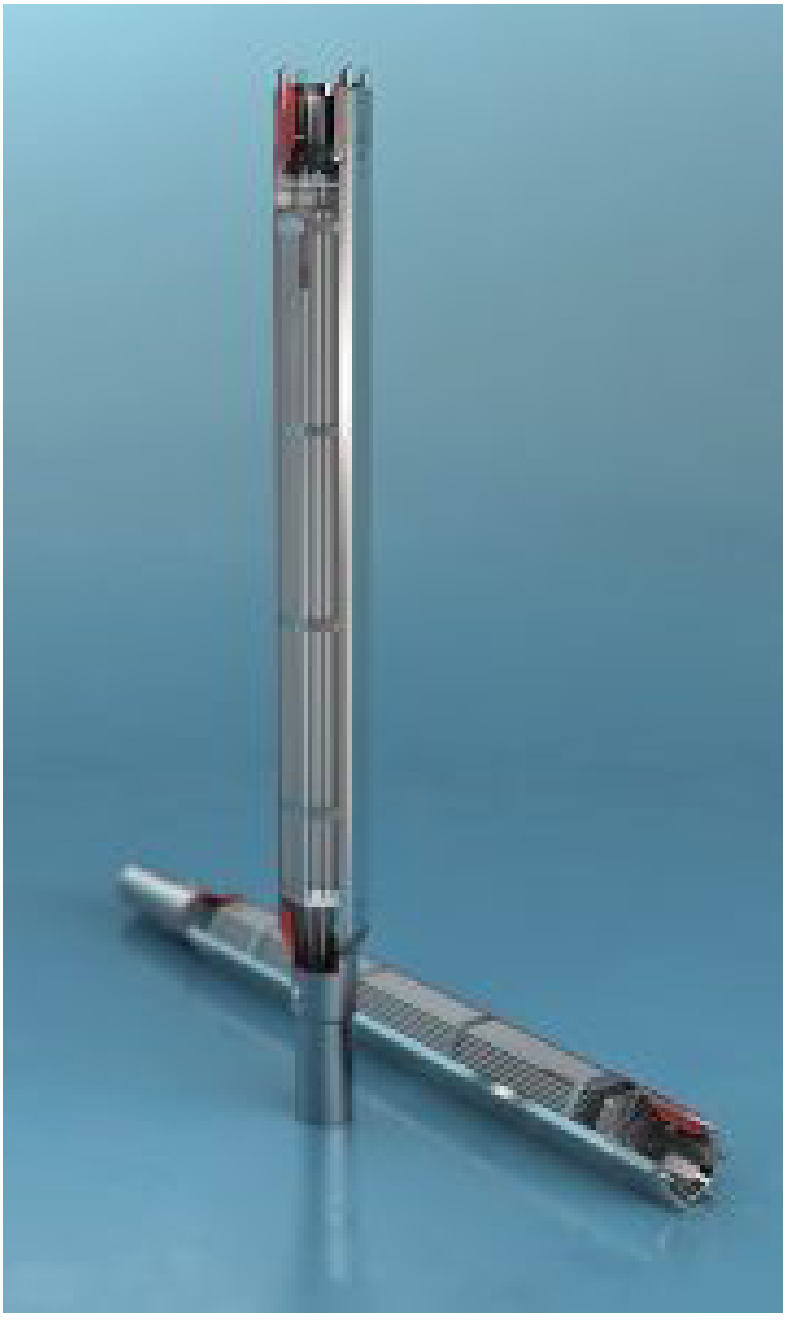
The Angra NPP.
Source: Eletronuclear

Commentary by Bellona: *Rosatom remains the largest supplier of uranium enrichment services in the world, and continues to sign new contracts for these services during the war in Ukraine. However, in several years' time Brazil's development of its own enrichment complex may put an end to long-term cooperation between Brazil and Rosatom in this sphere.*

Slovak Slovenské elektrárne signs agreement with Westinghouse on nuclear fuel deliveries

On 25 August, the Westinghouse Electric company signed a long-term agreement with Slovenské elektrárne on licensing and delivering VVER-440 fuel assemblies for nuclear power plants in Slovakia. It is planned that the first deliveries may begin one year after licenses are received. The diversification strategy of Slovenské elektrárne envisages at least two alternative suppliers of nuclear fuel and potential suppliers of materials and services in the chain of deliveries for nuclear fuel production. At present, five power units with VVER-440 reactors are operating in Slovakia, and the sixth is under construction. They all use Russian fuel.

Slovenské elektrárne is a participant of the APIS project for implementation of nuclear fuel manufactured by Westinghouse for VVER reactors of Russian design. Agreements on delivery of fuel for NPPs with VVER reactors have already been signed by the Czech company ČEZ, the Finnish company Fortum and the Bulgarian Kozloduy NPP for Unit 5.



VVER-440 fuel assembly rod manufactured by Westinghouse.
Source: APIS Project

Commentary by Bellona: *Slovakia is the last EU country using reactors of Soviet design, with the exception of Hungary, which has signed agreements on delivery or preparation for future deliveries of nuclear fuel from alternative suppliers. Taking into account the lack of direct sanctions from the European Union on deliveries of nuclear fuel, we can observe that countries are independently abandoning Russian deliveries of fuel, or ensuring the possibility of alternative deliveries. However, this process will continue for a number of years.*

Canadian uranium deliveries by the Trans-Caspian International Transport Route face delays

In its report on the results of activity for the second quarter of 2023, the Canadian uranium-mining company Cameco reported delays in deliveries of the first consignment of uranium produced in 2023 at JV Inkai, a joint enterprise with Kazatomprom in Kazakhstan, by the Trans-Caspian International Transport Route (TITR). It is expected that transit will begin in the third quarter.

"This year we may face further delays of expected deliveries from Inkai, if transportation on this route takes longer than expected," the report states. This may impact the Canadian profit share from this site, investments and timeframes for receiving percentages of dividends from Inkai.

The Canadian company decided to use this transport route to bypass Russia last year, as a consequence of Canadian sanctions against Russia. In the annual report of Kazatomprom for 2022, it states that in 2022 the first delivery of uranium produced by Inkai was made by the transport route, but this delivery also experienced delays, as the route passes through Azerbaijan and Georgia and requires agreements in different jurisdictions.

Part of the cargo belonging to Kazatomprom reached the Georgian port of Poti without hindrance. But the dispatch of "Canadian" materials of the JV Inkai, which is 60% owned by Kazatomprom, and 40% by Cameco, was delayed because Azerbaijan had to issue permits for transit.

Kazatomprom explained this by the fact that "when raw material of Kazakhstan origin is sent from the JV by the TITR to the second partner in the JV, the authorities of transit countries request details and appropriate documents for delivery between the JV and potentially the second partner in the JV. As the required documentation is examined in jurisdictions through which the TITR passes for the first time, there is a high risk of delays arising."

Source: Kazatomprom

Commentary by Bellona: Delays in uranium deliveries from Kazakhstan by an alternative route bypassing Russia are caused by difficulties which have not been fully solved during one and a half years of war. This is one of many examples of how logistical schemes have changed, and the rejection of cheap services from Russia on the nuclear market increases expenses and risks for participants, so most companies do not voluntarily agree to this without political pressure, legal restrictions or measures of support from governments.

Sanctions against Rosatom

On 22 August, Canada levelled additional sanctions against 4 individuals and 29 organizations who have direct links with the Russian military industrial complex, and also with its financial and nuclear sectors. They included the Troitsk Institute of Innovative Research (JSC SRC RF TRINITI), which is financed directly by the Russian State defense order for its research and development in the field of laser physics; RFNC-VNIIEF (All-Russian Research Institute of Experimental Physics), which has the primary task of ensuring the reliability and safety of Russia's nuclear arsenal; Rusatom Overseas – an affiliated structure of Rosatom responsible for building centers of nuclear science and technology abroad; NIKIMIT-Atomstroy (Research and Development Institute of Construction Technology Atomstroy), which works on development and application of technologies of nuclear sites, dismantling decommissioned nuclear structures, and is also a contractor on a number of Rosatom's sites abroad; Atomflot, the owner of Russia's nuclear icebreaker fleet; the Kurchatov Institute, which works on issues of nuclear science and technology; the Research Institute of Atomic Reactors (SSC RIAR), specializing in studies in the field of reactor technologies; the Start Production Association named after M.V. Protsenko, which produces automatic control systems and various equipment for nuclear power. All of these companies are already included on sanction lists of other countries.

Events in the russian nuclear industry and in Rosatom projects abroad

The Akkuyu NPP will be put into operation by the end of 2024. Is the Sinop NPP next in line?

The Turkish minister for energy and natural resources Alparslan Bayraktar reported that electricity generation at the first power unit of the Akkuyu NPP located in the southern Mersin province will begin on 29 October 2024, and the remaining units will be put into operation with an interval of one year. It should be noted that Turkey celebrates Republic Day on 29 October.

Bayraktar also said that Turkey planned to start realizing projects for building a second and third NPP in Sinop and the Thrace region, comparable in capacity with the Akkuyu NPP, over the course of five years. Construction of the second NPP interests Russia, South Korea and France, and talks have been held for several years with China for concerning the construction of the third NPP in the Thrace region. An intergovernmental agreement will be drawn up and sent it to parliament for approval.

On 5 September, after talks with Russian President Vladimir Putin, the Turkish President Recep Tayyip Erdoğan mentioned that they had discussed the project for Russia to build a second nuclear power plant in Sinop. He said: “Concerning the nuclear power station in Sinop: I believe that we will take this step together in building a new nuclear power station.” However, no more details or specific information were given.

The head of Rosatom Aleksey Likhachev who was present at the talks said afterwards that the turnover from sale of electricity from the Akkuyu NPP could become an investment resource for building a new nuclear plant in Turkey. The project for building the Akkuyu NPP is realized on the basis of the "BOO" (Build – Own – Operate") model. According to the contract, Rosatom will own the plant, and the Turkish state company EÜAŞ will undertake to purchase up to half of the power generated by the nuclear plant over the first 15 years of operation at a fixed price of USD 0.1235/kWh.

> ***Commentary by Bellona:*** *For many years, one of the important competitive advantages and attractive features of Russian proposals for building NPPs abroad was the possibility of receiving a state loan for their construction. In the present situation of sanction and economic pressure on Russia, which will only increase as the war continues, Rosatom may lose this lever of budget financing for its projects. However, after the Akkuyu NPP is put into operation in Turkey next year, a state loan may become a source of foreign revenue for Rosatom, and may be used for financing new construction, and play a part in selecting Russia as the contractor for the second NPP in the country.*

Rosatom acquires part of the Budenovskoye uranium field in Kazakhstan

The Rosatom general director at a meeting with the Russian president on 14 August thanked Putin for "support in acquiring the Budenovskoye field in Kazakhstan", adding that Rosatom now held second place in the world for uranium supplies. Thus, for the first time Rosatom publicly confirmed a deal which had been the subject of rumors since late 2022. It also turned out that the deal had the Russian president's support.

Details of this deal have not been revealed, but it probably concerns the purchase by Rosatom's affiliated structures of the Stepnogorsk Mining and Chemical Combine, which has a 49% share in the charter capital of the Budenovskoye joint venture. Only this deal is confirmed by documents that were publicly available in August 2033. According to the financial reports of the Budenovskoye JV for 2022, as of 31 December 2022 the new owners of the combine were two Rosatom companies: AO Uranium One Group with a share of 99.99% and AO Logisticheskiy Tsentr YATTS with a share of 0.01% of the charter capital of the combine.

According to this report, the former owners of the combine (as of 31 December 2021) were two companies registered in the UK, Ganberg UK Ltd and Gexior UK Ltd, owned by businessmen from Kazakhstan and Russia – Yakov Klebanov and Vasily Anisimov. The

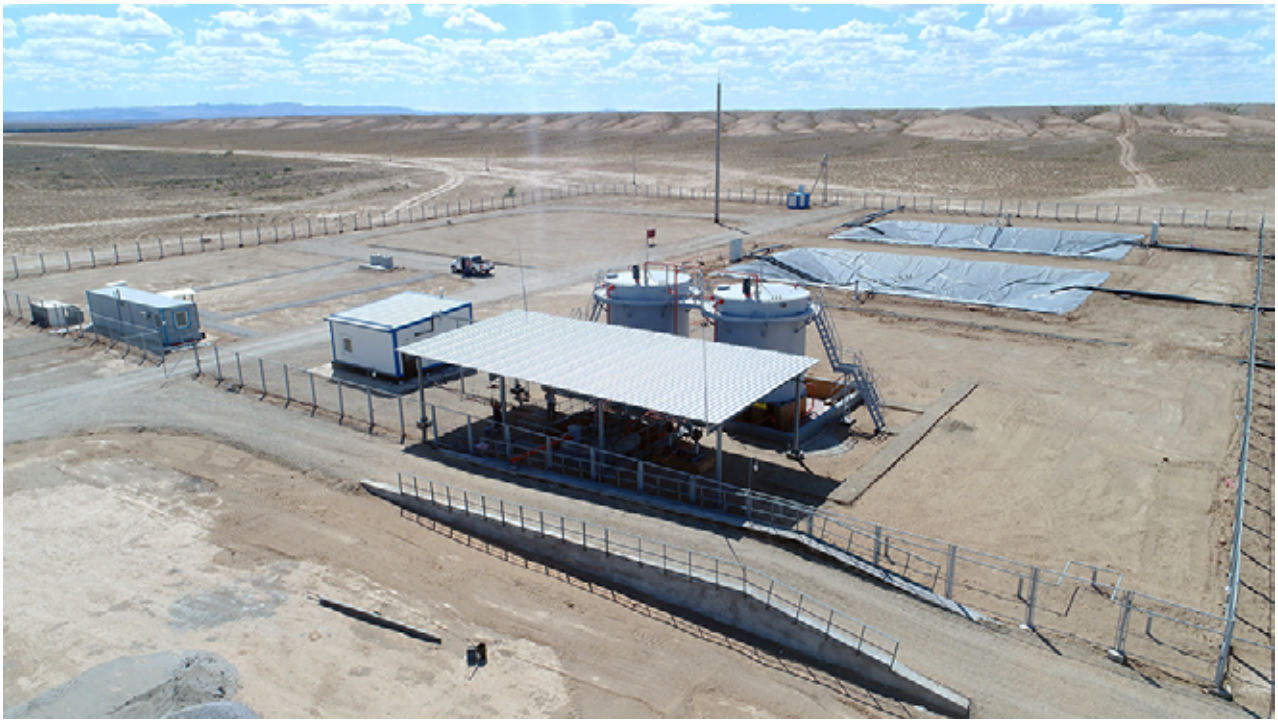
latter was ranked 54th on the list of the richest businessmen in Russia according to Forbes magazine. In 2009, Anisimov already sold shares in two other joint ventures to affiliated structures of Rosatom, which at that time owned other sections of the Budenovskoye uranium field. The sum of the present deal, according to estimates by the inbusiness.kz publication, could come to USD 1.6 billion.

The Budenovskoye field was opened in 1976. It is one of the largest fields of uranium ore in the world. The field is divided into seven sections, and according to the annual report of Kazatomprom for 2022 it is developed by three joint Russian-Kazakhstan companies. The first two of them, TOO Karatau and AO JV Akbastau are 50% owned by the Kazakhstan nuclear corporation Kazatomprom and 50% by the Rosatom affiliated structure AO Uranium One Group.

Now Rosatom owns a 49% share in the third enterprise, Budenovskoye JV, which develops sections 6 and 7 of the Budenovskoye field. Kazatomprom has a 51% share in Budenovskoye JV. Thus, this does not involve the purchase of an entire field, as the head of Rosatom announced, but only the purchase of a share in one of the JVs developing it, and a minority share at that.

At the same time, taking into account the large supplies of sections 6 and 7 (around 120,100 tons of uranium), Rosatom has increased the total volume of supplies of the fields it owns in Kazakhstan (including the shares in six JVs with Kazatomprom) by one and a half times – from around 100,000 tons to 160,000 tons. And taking into account the supplies of fields in Russia (around 500,000 tons), this strengthens Rosatom's position as the company with the second largest supplies of uranium in the world after Kazatomprom.

In 2022, Rosatom produced around 4,500 tons of uranium concentrate at its fields in Kazakhstan – this is around 20% of the total production in Kazakhstan. Development of the new field may increase this production by several times. In 2023 only test production of uranium began at sections 6 and 7 of the field owned by the Budenovskoye JV, and by mid-2023 only 118 tons had been produced. But next year, according to Kazatomprom's plans, production at the sections should reach 2,500 tons, in 2025 4,500 tons, and from 2026 full capacity will be reached with production of 6,000 tons. Including Rosatom's share, this may add up to 3,000 tons of uranium produced per year for the corporation, which will increase the current level of the company's production in Russia and Kazakhstan by one and a half times, which came to 7,100 tons in 2021.



The Budenovskoye field. Source: Kazatomprom

Commentary by Bellona: *The Russian media, with the backing of the head of Rosatom, portrays the deal as the Budenovskoye field coming under the full control of Rosatom. However, the deal actually only means an increase in Rosatom's total share in joint ventures, where the main owner remains Kazatomprom. It is interesting that in this case property owned by billionaires linked with Russia may be transferred to the state corporation, according to a procedure that has already been used in the past.*

In Russia itself, uranium production has decreased in recent years, and the activity of the Chinese companies CNNC and GGN, including in Kazakhstan, shifted Rosatom from the second to third place in total uranium production in 2022. Rosatom's percentage on the world uranium production market dropped from 15% in 2021 to 14% in 2022.

However, the purchase of a share in one of the largest and most promising fields in Kazakhstan and its development may allow Rosatom to increase uranium production significantly in the years to come.

Research reactor vessel delivered to Bolivia

On 13 August, Bolivian president Luis Arce Catacora reported on his Twitter account that a vessel and key components had been delivered from Russia for the first research nuclear reactor in the country, which Rosatom is building. The Bolivian Nuclear Energy Agency (ABEN) intends to complete assembly of the reactor vessel by the end of the year, and put the reactor into operation in 2025.

The pool-type research reactor with a capacity of 200 kW is one of the three key components of the Center for Nuclear Technology Research and Development (CNTRD), which Rosatom is building in El Alto near the Bolivian de facto capital of La Paz, creating the highest nuclear center in the world at an altitude of around 40000 m. The agreement for its construction was signed in 2016 with the government of Evo Morales. It was expected that the center would be built by 2019, and its approximate cost is estimated at USD 300 million. However, construction did not actually begin until 2021.

Executive director of ABEN Hortensia Jiménez Rivers alongside the research reactor vessel.
Source: ABEN

Besides the research reactor and laboratory complex, the CNTRD has a cyclotron complex which produces radiopharmaceutical agents for clinical studies, and a multipurpose irradiation center for treating agricultural produce, which according to Rosatom's information has already been put into operation. In March 2023, the CNTRD began deliveries of the first pharmaceuticals to the Bolivian center of nuclear medicine, fluorodeoxyglucose which contains the fluorine-18 isotope produced in the cyclotron complex. This pharmaceutical is widely used around the world to diagnosis cancerous tumors by the positron emission tomography method. The center has the capacity to examine up to 5,000 patients per year using the first pharmaceuticals of Bolivian manufacture.

> ***Commentary by Bellona:*** *The CNTRD project has a clear humanitarian component and is relatively simple and inexpensive compared with the project of a major NPP, which means it can be used to popularize and promote Russian technologies and the Rosatom corporation both in Bolivia and other Latin American countries.*
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> *A number of journalistic investigations, both in Russia (see the investigation by "Project" in 2019) and Latin America (see the investigation by the Centro Latinoamericano de Investigación Periodística (CLIP) for August 2023), show that Rosatom's activity in Bolivia as a promoter of Russia goes far beyond the bounds of purely commercial activity, and may also involve influencing public opinion, and direct intervention in election campaigns with the assistance of its specialists, in order to support candidates loyal to the Kremlin who can act as Russia's allies and oppose the USA. For example, former Bolivian president Evo Morales and his fellow party member and ally, current president Luis Arce Catacora.*
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> *It is characteristic that the company Rusatom Overseas, which is responsible for realizing the CNTRD project, was placed on US sanction lists in April 2023 – one of the first affiliated companies of Rosatom to be included.*
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> *Besides the realization of the CNTRD project, Rosatom, through its mining company AO Uranium One Group, signed a contract to develop a lithium field in the department of Potosi in July 2023. According to Kirill Komarov, the first deputy general director for development and international business of Rosatom, this is Rosatom's first major foreign project in lithium production, with investment of around USD 600 million.*
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> *Thus, Rosatom is demonstrating its political and economic influence in the Latin American region most actively and effectively in Bolivia, promoting its own economic interests as well as the political interests of the Kremlin.*

Rosatom begins new construction phase of the Paks-2 NPP in Hungary

On 18 August in Budapest, an amendment was signed to the EPC contract for building the Paks-2 NPP between the construction client, Paks II Nuclear Power Plant Ltd, and the general contractor of the project, the Russian company Atomstroyexprot (the engineering division of Rosatom). The ceremony took place in the presence of the Hungarian minister for foreign affairs and trade Péter Szijjártó and the Russian ambassador Yevgeny Stanislavov. The head of Rosatom Aleksey Likhachev took part in the ceremony online.

According to Szijjártó, the first preparatory phase of the Paks-2 NPP project has been completed, and investments may move to the second phase, the phase of physical construction. The amendments to the contract have not been made public.

As we reported in previous digests, in spring this year Russia and Hungary agreed on changes to the contracts for building the Paks-2 NPP, evidently caused by complications in realizing the project arising from the sanctions against Russia and the war in Ukraine. At the end of May these amendments to the contracts were approved by the European Commission. Over summer, Russia and Hungary approved the amendments in their jurisdictions, and in late July Russia made amendments to the law changing the procedure for Hungary to pay off the state loan for construction of the Paks-2 NPP.

These changes were accompanied by active talks between Hungary and the French authorities and nuclear companies, with the aim of increasing their participation in the project. This involved increasing the role of Framatome in delivering control systems in place of the German company Siemens Energy, whose participation is limited by delays in permissions from the German government. Additionally, France's participation increased after the French EDF recently purchased the GE Steam Power company for NPP turbine manufacture from the American company General Electric.

Meanwhile, construction began on the NPP building site on 3 July of a groundwater cut-off – an impervious wall in the soil with a depth of 32 m and a length of around 2.5 km, designed to prevent groundwater entering the foundation pit for the power units. As of 5 September, around 700 m of the wall had been built. The work is being carried out by the Hungarian branch of the German company Bauer, Bauer Magyarország Kft. The Hungarian company Duna Aszfalt Kft has begun preparation for excavating soil from the foundation pit for the future unit 6. It is planned to complete these works by the end of autumn this year.

The signing of the agreements on 18 August allowed Rosatom to begin another important phase – production of the main power equipment for the future NPP. Immediately after the agreement was signed, Atomstroyexport gave according instructions to the equipment manufacturers.

The Paks-2 construction site.
Source: AtomMedia

Commentary by Bellona: *The Paks-2 NPP project is Rosatom's only NPP construction project in Europe since Finland backed out of the Hanhikivi NPP project in early 2022, immediately after Russia's invasion of Ukraine. Although the Hungarian project has not been cancelled, and full-scale sanctions have not been placed on Rosatom in the EU, the project faces difficulties and has undergone serious changes, requiring agreements within the EU, and has been delayed by at least 2 years.*

In March 2021, the head of Rosatom reported that the first concrete at the Paks-2 NPP site would be poured in 2022. But despite the license received for building units in August 2022, this did not take place. At the agreement signing ceremony on 18 August 2023, Péter Szijjártó reported that it was planned to pour the first concrete before the end of 2024.

The progress of the Paks-2 NPP project and its adaptation to the new economic and political conditions are assisted not only by the active position of Hungary and Russia, but also by the participation of France.

It is characteristic that at the moment this digest was compiled, on 10 September, Hungarian Prime Minister Viktor Orban made a statement on the possible substitution of Russian fuel for French fuel at the NPP. Previously, Hungary was the only EU country in Europe operating reactors of Soviet design which did not mention the possibility of this substitution.

We will continue to monitor the development of the Paks-2 NPP project as a graphic example of how EU countries adapt to the new conditions of working with Rosatom.

Assembly of the second French facility for deconversion of depleted uranium hexafluoride begins in Russia

At the Electrochemical Plant (ECP), an enterprise of the Rosatom fuel company TVEL, work has begun on assembling equipment on the construction site of the W2-ECP facility, Russia's second facility for the deconversion of depleted uranium hexafluoride (DUHF). The contract for delivery of equipment for this facility was signed with the company Orano Projets (the engineering division of the French company Orano) in December 2019, with a cost of 40 million Euros. When the contract was signed, it was expected that the facility would be put into operation in 2022.

A similar facility, W-ECP, has been working at the enterprise since 2009. The second facility will double the capacity for deconversion of DUHF – from 10,000 to 20,000 tons per year. The first consignments of equipment for the construction project were delivered in December 2021. The assembly of the main equipment – ovens and reactors – is planned for late 2023.

The facility for uranium hexafluoride defluorination will convert DUHF, of which around 1 million tons has been accumulated in Russia at four enrichment plants, to a less chemically active and therefore safer state – uranium oxide in the form of powder. Rosatom has a program for safe treatment of DUHF that was approved in February 2020. According to this program, until 2028 it is planned to bring the total capacities of deconversion facilities at three sites to 50,000 tons per year. For more detail about issues of safe treatment and prospects for the use of DUHF, see the Bellona report of 2020.

W-ECP facility for DUHF deconversion.
Source: Strana Rosatom

Commentary by Bellona: *The project for building deconversion facilities is one of many French-Russian projects in the nuclear sphere. The French company Orano is a leading supplier of these facilities. Rosatom's attempts to create Russian equivalents have yet to be successful. The launch of facilities and the gradual deconversion of accumulated supplies of uranium hexafluoride at several sites in Russian in the Urals and Siberia may greatly increase the safety of these sites, and have a positive effect on the radioactive situation in places where supplies of depleted uranium are stored. At the same time, as the process of construction and operation of deconversion facilities is unprofitable and expensive for Rosatom, and cooperation with France may be stopped for political reasons at any moment, realization of the project for the safe treatment of DUHF may be stopped or suspended in the near future.*

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