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.

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 November 2023.

Follow the links to read the last three digests for November, October and September. Subscribe to our mailing list to make sure you don’t miss the next digest.
Nuclear Events in Ukraine and the War

Zaporizhzhia NPP. Event timeline for December 2023

On 2 December a complete cutoff of external power took place at the ZNPP for the eighth time since the plant was occupied – the main 750 kV Dniprovska power line and the backup 330 kV Ferosplavna-1 line. The plant switched to the reserve diesel generators. At power unit 4, which is in hot shutdown mode, the main cooling pumps stopped running for a short time.

The power from the 750 kV line was restored several hours later, but because of shelling of the Ukrainian territory where the power cut took place, it took over two weeks to restore the connection to the reserve power line. On 15 December, the IAEA reported that the Zaporizhzhia NPP once more had two alternative external power sources.

On 5 December, a rotation of the IAEA group took place, and the 14th mission since September 2022 began working at the plant. The experts continued to observe work on maintenance at the plant, including measures taken after boron was detected in November in the secondary cooling circuit of unit 5, after which the reactor of this unit was switched from hot shutdown to cold shutdown. Regarding this situation, in mid-December IAEA experts at the ZNPP reported that the levels of boron concentration in the secondary cooling circuit of all 24 steam generators of the plant were within established limits, and that no further actions would be taken at present.
The IAEA mission also was informed that there are no plans to switch unit 5 to hot shutdown. In December, four new mobile diesel boilers were installed at the ZNPP to produce additional steam, required for various functions at the site, including for processing waste. As well as these boilers, there are already nine mobile boilers at the site, eight of which provide heating in winter.

The IAEA team at the ZNPP continues to make walkdowns of the premises and territory of the plant. On 7 December, a group of experts made a walkdown of the turbine halls of all six reactor units. However, access was provided with restrictions, and it was not possible to inspect all parts of the turbine halls. At the areas that were inspected, experts did not detect any mines, explosives, military equipment or transport vehicles. On 18 December, the experts inspected the turbine hall of unit 5, but noted that despite the request submitted before the visit, access was once again not provided to the north-western section of the turbine hall, and since mid-October the IAEA has not been able to inspect the north-western section of any one of the six turbine halls.
On 19 December, an inspection was planned of rooftops of the reactor buildings of units 1, 5 and 6. Despite numerous requests, in the past months members of the IAEA were only able to inspect the rooftops of reactor buildings of units 2, 3 and 4. But this time the inspection was also not carried out, it was cancelled “due to security concerns”, and an alternative date was not scheduled. In addition, in the last weeks of December, inspectors were unable to gain access to the reactor halls of power units 1, 2 and 6. For the first time, the IAEA experts were not allowed into the reactor halls of power units that was in cold shutdown.

As well as difficulties with access to the turbine halls and rooftops of reactor buildings, it was reported that in December the IAEA mission was not given access to the isolation gate of the cooling pond, and yet again was denied the opportunity to inspect the 330 kV open switchyard at the Zaporizhzhia TPP located next to the ZNPP (In March 2023, the Russian Federation informed the IAEA that it would carry out restoration works at the thermal power station, and that restoration of the open switchgear would allow to ensure the power supply of the ZNPP from the energy system of Russia. In June 2023, during a visit to the Zaporizhzhia NPP, after the destruction of the Kakhovka dam, IAEA director general Rafael Grossi visited the ZTPP, where he saw significant damage on the territory of the 330 kV open switchyard).
On 12 December, an emergency communication drill was held at the plant involving on-site and off-site representatives from different Russian organizations, and IAEA experts were able to observe part of the drill.

On 20 December, without preliminary notification, a fire drill were held at the ZNPP site. The drill scenario involved a hypothetical oil leakage at the transformer of reactor unit 2, which resulted in a fire. Regional, city and on-site fire departments took part in the drill. The IAEA team was only made aware of the drill afterwards.

On 2 December, during the UN Climate Change Conference (COP-28) in Dubai, the director general of Rosatom Aleksey Likhachev met with IAEA director general Rafael Grossi, and full-scale consultations was planned for January-February 2024.

On 20 December, the advisor to the general director of the Rosenergoatom concern Renat Karchaa reported that at the ZNPP in 2023 repair of safety systems had been carried out. According to Karchaa, work “was completed from the standpoint of applying federal (Russian – author’s note) standards and rules, and from the technical standpoint”, and that the plant was continuing to move to Russian standards. One of the stages of this process is preparing applications for receiving licenses from the Rostekhnadzor board for each power unit, a complex for processing radioactive waste, a dry storage facility of spent nuclear fuel and other facilities of the Zaporizhzhia NPP.

Karchaa also noted that technically, the plant was prepared to put power units into operation, but that this would become possible under two conditions: a ceasefire and ensuring that the cooling pond was kept at the necessary level and had a sufficient water supply, "which should involve restoring the Kahkovka hydro-power plant or creating some alternative water supply".

On 29 December, the ZNPP and Enerhodar were visited by the first deputy head of the Russian presidential administration Sergey Kiriyenko and senator Dmitry Rogozin, where a meeting was held to discuss development plans for the plant in 2024.

Commentary by Bellona: For the first time in history, a war is being fought in a country with an abundance of nuclear and radiation sites. In the events surrounding the ZNPP, the two warring sides and the IAEA are involved. Each side has its own interests and tasks, which are not fully revealed. Therefore, we often have to make assumptions.

For example, it is reported that a meeting is planned between IAEA director Rafael Grossi and Rosatom head Aleksey Likhachev with the goal of carrying out full-scale consultations. Firstly, the question arises – what exactly are full-scale consultations, and what is the goal of carrying them out? Assumptions or guesses are pointless here. We will see what report is made after the meeting.
What is the real interest of the IAEA at the ZNPP, and what can this organization do? We may assume that its main interest is for nuclear and radiation incidents not to take place (not to mention accidents and disasters), but it cannot do anything other than share limited information, given the nature of its mission, about what is taking place at the ZNPP.

Rosatom’s interest comes down to the military and political interests of Putin’s current policies. Rosatom cannot exist in these conditions in any other way. Rosatom also does not have particular strategic capabilities in this situation. Rosatom is pretending (or perhaps even doing something in reality) that it is trying to maintain NPP units in a technically safe condition. And this is all. Nothing more is required from Rosatom, and nothing more depends on it.

Thus, the event with the grandiose title of full-scale consultations is from all appearances a discussion about how to maintain the units technically as long as the two warring military political groups do not start active warfare. If the Ukrainian armed forces start to attack, then no technical measures may no longer be necessary.

If (which is highly improbable) Ukraine and Russia suddenly reach a peace agreement (a ceasefire does not count) and liberate the ZNPP, then all technical measures will be Ukraine’s responsibility. Rosatom does not decide any military and political issues, it is an executor within the limits of its own functions and capabilities. Sometimes it appears that for Rosatom, the ZNPP is an unnecessary burden and headache forced on it by the war. But on the other hand, one might say that it consented to this burden itself... although it is unclear if it really had a choice. Perhaps for this reason, Likhachev devoted more attention in his report for 2023 on raising money for residents of Enerhodar and social policy, and not about what to do with the ZNPP.

We may further propose several possible scenarios, but there is hardly likely to be one where Putin says that he intends to give everything back and that will be an end to it. So in 2024 we should expect this region to bring us rather unpleasant news in the nuclear and radiation sphere. But even if such events do not take place, it is always pleasant to be in a situation when one expects bad news, but receives good news instead. A “fog” continues to surround the situation at the ZNPP.
Events in the nuclear sector in Ukraine

Energoatom purchases equipment for new unit at Khmelnitsky NPP

On 17 December, Energoatom and Westinghouse Electric Company signed an agreement to purchase equipment for unit 5 of the Khmelnitsky NPP. It will be built according to US technology with AP1000 reactors.

Two agreements on cooperation with the goal of realizing a pilot project for the construction of AP1000 power units at the Khmelnitsky NPP were signed in November 2021, and a decree on developing a feasibility report for building a nuclear facility using the technical characteristics of the AP1000 type reactor was signed by the Ukrainian government in January 2023. The agreements signed with the Westinghouse company propose building up to 9 power units in Ukraine with AP1000 reactors. The first two will be built at the Khmelnitsky NPP site.

Commenting on the signed agreement, Petro Kotin noted that the equipment of the reactor island in question has already been manufactured and is ready for delivery. The agreement is priced at USD 437.5 million. Petro Kotin also noted that as soon as the Supreme Rada of Ukraine passes a law to build power units with AP1000 technology, Energoatom will commence construction work at the Khmelnitsky NPP site. The total cost of construction will come to around USD 5 billion.

Detailed conditions of the deal are classified as a commercial secret. This probably concerns the reactor island manufactured for power unit 2 of the Virgil C. Summer NPP, construction on which was suspended in the USA in 2017. In 2021 the president of Energoatom visited the site where this equipment is stored.

Forbes Ukraine reports that the agreement on the purchase of the equipment has raised questions among several Ukrainian independent experts. One of their objections is the premature nature of this agreement, as it violates Ukrainian legislation on the standards and rules for NPP construction.

Preparation for building a nuclear power unit should include a feasibility study and coordination with several channels, consultations with neighboring nations under the Convention to assess environmental impact in the transborder context; and developing a bill for stationing, planning and building an NPP power unit, planning a reactor, and receiving permission for construction. This process usually takes several years, and at present these stages have not been completed.
Energoatom responded to this that in December 2023 it had completed a feasibility study for the construction of power units 5 and 6 of the Khmelnitsky NPP with AP1000 reactors and had submitted it for consideration to the Ukrainian cabinet of ministers according to established procedure. This issue will soon be submitted for consideration by members of government and presented to parliament for passing a law on construction of the power units.

**Service life of unstable structures of “Shelter” facility at Chornobyl NPP extended for 6 years**

At the end of November, the State Nuclear Regulatory Inspectorate extended the license by 6 years giving the Chornobyl NPP the right to conduct activity on processing and storing existing and generated radioactive waste in converting the “Shelter” facility into an environmentally safe system. According to the new license, dismantling unstable structures of the facility should be carried out before 31 October 2029. In the preliminary version of the license, it was stated that these unstable structures should be dismantled by 31 October 2023.

However, for a number of reasons (lack of full and stable financing of works, the spread of COVID-19, Russia’s full-scale war against Ukraine, including the occupation of the plant in February-March 2022), the ChNPP was unable to carry out these works.
For this reason, the ChNPP and contracted organizations held an additional inspection of the building structures, and made calculations of stability and the support ability of structures. Technical reports on the results of these works were used as the justification for extending the operation period of the Shelter facility. Based on the justification, the State Nuclear Regulatory Inspectorate passed the decision to permit changes to the license.

At a meeting in October 2023, the Board of the State Nuclear Regulatory Inspectorate proposed the ChNPP to pass additional measures immediately to strengthen control of the state of localizing structure of the Shelter facility. The Board’s statement noted that the Ukrainian State Agency for Exclusion Zone Management and the ChNPP must ensure the planning and commencement of realizing work on dismantling unstable structures in a period up until 31 October 2025.

At the same time, it is necessary to develop and introduce measures for additional stabilization of individual structures of the Shelter facility, in particular in the case if dismantling works begin after 31 October 2025. The State Nuclear Regulatory Inspectorate reported that it would establish according conditions in the present license of the ChNPP for operation of the complex of the New Safe Confinement and the Shelter facility.

Central spent fuel storage facility prepared to receive SNF of Ukrainian NPPs

On 20 December, Energoatom reported that it had begun transportation of spent nuclear fuel from functioning reactors to the new and commissioned Central Spent Fuel Storage Facility (CSFSF), designed by the Holtec company.

The facility, located in the Chernobyl Exclusion Zone, is a dry storage facility of spent fuel assemblies of VVER-1000 and VVER-440 reactors. Its total capacity is 16,530 used fuel assemblies, including 12,010 VVER-1000 assemblies and 4,520 VVER-440 assemblies. Contracts for its construction were signed with the American company Holtec International in 2005, but construction only began in 2017.

Energoatom announced that the new facility would make it possible to save USD 200 million per year, which was previously paid for transportation and storage of spent fuel in Russia. This will also help to avoid risks of plant operation stopping because of a lack of capacities for safe storage of spent fuel.

Energoatom and Holtec plan to organize a joint enterprise for creating a production complex in Ukraine for localizing manufacture of equipment for the storage and transportation of spent nuclear fuel, and also equipment for the Holtec small modular reactor.
Energoatom reported receiving a separate permit for putting the CSFSF into operation in April 2022, and autonomous tests of CSFSF systems in cold mode were completed earlier, in January 2022.

In June 2023, the IAEA published information that in May 2023 Ukraine had sent the first batch of spent fuel from the Rivne NPP to the CSFSF site.

Discussing the results of 2023, the head of the State Nuclear Regulatory Inspectorate Oleg Korikov reported that last year test operation of CSFSF began. The operating organization developed transport and technological operations in treating spent nuclear fuel under modified technology at the NPP power units, and routes by which spent nuclear fuel is delivered from the Rivne, Khmelnitsky and South Ukrainian NPPs to the CSFSF (note – the Zaporizhzhia NPP has its own dry storage facility).

After successful test operation and required safety analysis, the operating organization will be able to submit an application to the State Nuclear Regulatory Inspectorate to receive a license for commercial operation.
Commentary by Bellona to the section “Events in the Ukrainian nuclear sector”: Any operations on conducting construction works on nuclear facilities, transportation of radioactive and nuclear materials, carrying out special works on radiation hazardous facilities during wartime entail additional risks. Military operations and regular shelling of the entire territory of Ukraine from Russia with missiles and long-distance drones pose a threat of intentional or random attacks on the facilities themselves or transported materials, and also indirectly puts their power supply at risk, and delivery of necessary materials by attacks on the infrastructural sites of the country.

Additionally, during wartime there is a critical reduction in the possibility of independent public control and access to important information on the real state of affairs at sites, and the transparency of procedures for decision-making in the nuclear sector drops, arising from political expediency or military censorship, which causes additional risks of taking ineffective decisions. Ukraine, including its energy sector, is in a very difficult situation. So it is important that representatives of society and the energy sphere find a consensus, or at least mutual understanding, and do not descend to quarrelling about a certain issue.

Rosatom structure delivers electricity to occupied territories of Ukraine from subsidies from the budget and surcharges for payments in Russia

On 28 December, the Russian government passed a decree making changes to the Rules for the wholesale market of electrical power and capacities, establishing a surcharge on the price of NPP capacity in the first price zone, which includes the European part of Russia and the Urals, for subsidizing deliveries of power in Russian-occupied territories of Ukraine (the DPR, LPR, Kherson and Zaporizhzhia Oblasts) at reduced rates.

Kommerzent reports that the lost revenue of LLC “Yedyny Zakupshchik” (a structure of Atomenergosbyt, part of the Rosenergoatom concern) – a Rosatom structure that received the status of electricity supplier on these territories, may come to 36 billion rubles in 2024.
From this sum, 3 billion may be allocated from the budget, and 33 billion rubles will be raised through a new surcharge on power prices for industry in the above-mentioned price zone. Gradually, by 2028, it is proposed to include the occupied territories in the first price zone. It is planned that electricity prices and rates on these territories will increase and reach economically justified levels within 10 years, eliminating the need for subsidies.

Commentary by Bellona: The participation of an affiliated structure of Rosatom in distributing electricity on the occupied territories is another example of the full involvement of the state corporation’s involvement in the war in Ukraine, described in detail in Bellona’s recent report, “Rosatom during the war in Ukraine: how militarization of the Russian nuclear giant took place”. Subsidizing these deliveries from the federal budget and surcharges on payments within Russia is yet another cost that all citizens of Russia must pay for this war, regardless of how they feel about it.
International nuclear news and its connection with Russia

The nuclear topic at COP28: 22 countries pledge to triple nuclear energy capacity by 2050, and the Sapporo-5 alliance intends to allocate USD 4.2 billion to increasing western deliveries in the nuclear sphere

On 30 November to 12 December, the COP28 UN Conference on climate change was held in Dubai. On 2 December, as part of the International summit on climate activity, the heads of several countries announced the signing of a Ministerial Declaration, to triple nuclear power capacity. It recognizes the key role of nuclear energy in achieving the goal of carbon neutrality by the middle of the century, and restricting the rise in temperature at a level of 1.5 °C.

Key elements of the declaration include joint work on achieving the goal of tripling nuclear energy capacity worldwide by 2050, mobilizing investments in nuclear power, inviting shareholders of financial institutions to encourage including nuclear energy in the policy of energy lending, ensuring stable delivery chains, including fuel.

At the end of the conference, the declaration was supported by 25 countries: Armenia, Bulgaria, Canada, Croatia, Czech Republic, Finland, France, Ghana, Hungary, Jamaica, Japan, Republic of Korea, Moldova, Mongolia, Morocco, Netherlands, Poland, Romania, Slovakia, Slovenia, Sweden, Ukraine, the UAE, the UK and the USA.
Following this declaration on 5 December over 120 companies of the nuclear industry with headquarters in 25 countries and operating in over 140 countries made a pledge to support the goal of tripling nuclear energy generation by 2050, and called for governments, development banks and the World Bank to provide nuclear energy projects with access to climatic financing on an equal level with other clean energy sources.

The pledge states that it is the nuclear industry that will take responsibility for realizing these political goals, and the signatories:

- Consider that nuclear energy should grow at a rate faster than the increase in global electricity demand;
- Commit to mobilize and/or support investments in nuclear power, including through innovative financing mechanisms;
- Will work with "governments, regulators and other stakeholders to maximize the contribution from existing operating nuclear power plants and accelerate the pace of new nuclear deployment in a safe, responsible and secure manner".
This statement by companies of the nuclear sector (Net Zero Nuclear Industry Pledge) was joined by Rosatom, whose representatives were also present at COP28 events.

Also during the COP28 on 7 December, the USA, Canada, France, Japan and the UK announced plans to mobilize USD 4.2 billion in the form of state investments for developing a secure and reliable global supply chain of nuclear energy. The statement notes that these five countries of the G-7, which form an alliance known as the “Sapporo 5” bear collective responsibility for 50% of world production capacity for uranium conversion and enrichment. Their investments will be directed towards increasing capacity for uranium enrichment and conversion over the next three years, in order to create a stable global market of uranium deliveries free from Russian influence.

**Commentary by Bellona:** The signing of the ministerial declaration at COP28 by the governments of a number of the world’s largest economically developed countries gives a clear signal to the Western nuclear industry itself for future investment and development. The absence of Russia and China among the signatories of this declaration indicates the political nature of the statement, which can be considered a continuation of the initiative of the countries of the Sapporo-5 alliance to strengthen the Western nuclear industry and reduce its dependence on Russia, even if this does not explicitly follow from the text of the declaration.

Nevertheless, the achievement of the stated goals for a multiple increase in global nuclear capacity at the current stage is unrealistic without the participation of Russia and China, which account for almost 70% of the world’s new nuclear power plant units built over the past 20 years and more than 90% of nuclear constructions started over the past 5 years. At the same time, Russia and China undoubtedly share goals to increase nuclear capacity, and Rosatom, among other 120 companies, signed a similar declaration at the level of industrial companies, not governments.

Thus, on the one hand, such statements provide a basis for strengthening the independence of the Western nuclear industry. On the other hand, the designation of ambitious goals creates risks of increasing hidden contacts within the global nuclear industry with Russia and China, as well as their open cooperation in nuclear projects in developing countries, which may receive additional stimulus for development, including financing under the climate agenda.
Urenco announces second major expansion of capacity for uranium enrichment in a year

Urenco has announced that it will be expanding capacity for uranium enrichment at its site in the Netherlands. As part of the project for the existing plant in Almelo several new cascades of centrifuges will be added.

This plant has been operating since 1973, and its capacity at present is 5.1 million separative work units (SWU) per year. The complex includes five enrichment plants, and at present two of them are operating, SP4 and SP5. The first three plants have been fully decommissioned. SP5 has been operating since 2000 and produces more than 80% of the total production capacity of Urenco Nederland.

As a result of expansion, Urenco plans to increase the production capacity of the complex by 15%, around 750,000 SWU per year. The first new cascades are planned to be put into operation approximately in 2027.

In June 2023, Urenco already approved its first expansion project at the site in New Mexico, USA, which will ensure additional capacity of 700,000 SWU per year.

Source: live feed from Net Zero Nuclear
Additionally, in May 2023 it was reported that Urenco would reequip its enrichment plant in Gronau, Germany, with more modern centrifuges. This will slightly increase the capacity of the plant, which is currently 3.7 million SWU per year.

**Commentary by Bellona:** The EU and the US are still dependent on Russian uranium enrichment services by at least 25%-30%, which explains the absence of drastic sanctions on Russian supplies in this field after 2 years of war. After a number of political signals and statements, the main Western market players have developed their strategies in this situation and made investment decisions to expand their capacities in order to gradually reduce their dependence on Russia.

If we sum up the announcements to increase the capacity of Urenco plants in the US and the Netherlands, as well as Orano in France, we estimate that within the next 5 years Western companies will be able to increase capacity by at least 4.1 million SWU, which will make it possible to replace up to two thirds of the 6.6 million SWU currently purchased by the EU and the US from Russia.

**Ban on import of Russian uranium to the USA**

The US House of Representatives on December 11 approved a bill banning imports of Russian uranium. The bill must be passed by the Senate and signed by President Joe Biden before it becomes law. Then imports of low-enriched uranium for nuclear fuel would be banned 90 days after the law takes effect.

However, the phase-out of Russian fuel would be gradual. The bill provides exceptions that would allow uranium imports from Russia if there are no alternative supplies for US reactors or if the supplies are in the US national interest. For such exceptions, the allowed imports of low-enriched Russian uranium (including low-enriched uranium obtained under separation contracts) would be gradually reduced to 459 tons in 2027 from about 476.5 tons in 2024. But from January 1, 2028, imports will be banned entirely.

Russia remains the leader in supplying uranium enrichment services for US nuclear power plants. In 2022, Russia’s share in this segment amounted to 33% of imported services (24% including the USA’s own production), or 3.4 million separative work units (SWU). The remaining supplies came mainly from the EU and the UK, where the Urenco plant is located. The volume of deliveries from Urenco’s sole US enrichment plant totaled 3.9 million SWU.
One of the bill’s co-authors, Congresswoman Cathy McMorris Rodgers, stated that Russia now accounts for more than 20% of nuclear fuel used in US reactors and that Rosatom and its subsidiaries received more than $800 million from the US nuclear industry in 2023.

On December 14, Bloomberg news agency, citing unnamed sources, reported that a number of US electric utilities, including Constellation Energy Corp., Duke Energy Corp. and Dominion Energy Inc. had been warned by the US division of Russian uranium company Tenex (subsidiary of Rosatom) that in response to the law banning imports of low-enriched uranium from Russia, the Kremlin could preemptively ban exports of its nuclear fuel to the United States.

On December 15, a refutation of this report appeared in the Russian media: “Neither Tenex nor its subsidiaries have provided such notices to their foreign customers. We have always met our contractual obligations in full and on time and will continue to do so in the future,” the Rosatom press-release states.
Commentary by Bellona: The US bill to ban the import of enriched uranium from Russia could be the largest unilateral act of withdrawing from ongoing cooperation projects with the Russian nuclear industry since the beginning of the war in Ukraine, comparable only to Finland’s withdrawal from the Russian Hanhikivi NPP project and Ukraine’s complete rejection of Russian fuel deliveries. At the same time, US purchases of enriched uranium from Russia have become a long-standing practice which will not be so easy to abandon for a country that does not face a direct military threat.

Nevertheless, the bill gives a 5-year grace period for adaptation and allows uranium purchases until 2028 from Russia at the same volumes and limits that also existed before this bill. But the long preparation of this bill has already sent an important signal to the industry, and the main enrichment companies Urenco and Orano have already announced expansion plans. These plans (see above) will cover the drop-off in Russian supplies to the U.S. during these 5 years. It is possible that discussion of a similar ban on uranium imports from Russia and the EU could trigger additional expansion of capacities that could also close this gap.

All this has naturally had quite a nervous reaction in both the Kremlin and Rosatom, as shown by leaks in the media. At the same time, Rosatom itself does not want to lose these export flows, and it is important to maintain its image as a reliable supplier. This is why Rosatom is eager to refute possible rumors about retaliatory measures and unilateral rejection of fuel supplies, and shifts all responsibility for them to the Kremlin and the country’s political leadership.

Taken together, the declared changes in the uranium enrichment services market by major Western buyers and suppliers could significantly reduce Western countries’ dependence on Russia in the nuclear sphere by the end of the decade.

Rosatom extends operation of Armenian NPP

Rusatom Service and Haykakan Atomayin Elektrakayan signed an agreement on the repeat extension of the service life of unit 2 of the Armenian NPP until 2036. The agreement was signed on December 15. The cost of the project will come to USD 65 million.

The Armenian NPP consists of two power units with VVER-440 reactors. The first power unit of the ANPP was put into commercial operation in 1976, the second in 1980. The installed capacity of the power units is 407.5 MW, with a planned service life of 30 years. Power unit №1 is in long shutdown mode. It is not planned to restart the power unit. The share of the Armenian NPP in the total electricity generation in the country is about 30%.
Rosatom has already carried out modernization of the Armenian NPP since 2015, and work was completed in 2021. As a result of the modernization, the capacity of the power unit was increased from 380-390 to 440 MW. The current service life of the Armenian NPP ends in 2026; and relevant license was issued by the Armenian State Committee for Nuclear Safety Regulation in 2021.

**Commentary by Bellona:** Rosatom has experience and technologies for extending the service life of VVER-440 reactors, which are widely represented not only in Russia but also in European countries. However, the Russian corporation is rarely involved in this works on reactors in EU countries. Therefore, the choice of Rosatom to work on the Armenian NPP shows that there are long-standing technological ties, and that Russia’s political influence on Armenia has not yet fallen to its lowest level.

Additionally, Armenia had a limited choice of contractors to carry out work to extend the life of their old nuclear power plant, which was built by Minatom during the Soviet era. This agreement may increase the likelihood that Rosatom will receive an order to build a small nuclear power plant in Armenia, a possibility currently being examined by the Armenian authorities.

Armenian NPP.
Source: Armenian NPP website
Preparation for extending the service life of Paks NPP

Péter János Horváth, head of the Hungarian company MVM Paksi Atomőrőműn, announced that Hungary has notified the European Union that it has started the process of extending the service life of the Paks NPP. This is the first step in a ten-year process that will extend the plant’s operating license until 2052-2057.

The four operating units of the Paks plant with VVER-440 reactors were put into operation between 1982 and 1987. Their intended service life is 30 years, but this was already extended in 2012-2017 by 20 years, until 2032-2037.

Horváth also said that although the plant’s Russian supplier has been a reliable partner for four decades, the plant is looking for ways to diversify its supply lines. Pál Tóth, deputy director of the Paks NPP, said the extension will require the completion of about 250 reconstruction projects, half of which are expected to cost more than 2.6 million euros. Modernization of electrical and control systems will cost 1.5 billion Euros. It is expected that a project implementation plan could be submitted in 2028.
Commentary by Bellona: As mentioned above regarding the extension of the service life of the Armenian NPP, close political ties and influence can guarantee the participation of Russia and Rosatom in this project. In this case, the modernization of Paks NPP with 4 VVER-440 units may become Rosatom’s second largest project in Hungary after the construction of the Paks-2 NPP. However, the final selection of the main contractor has not yet been made.

Fortum seeks alternative fuel suppliers

The Finnish Ministry of Employment and Economic Affairs has published a report by Fortum, the energy company that owns the Loviisa NPP with two VVER-440 reactors, on future purchases of nuclear fuel for the plant. Providing information on how Fortum will purchase fresh fuel and move away from relying solely on Russian producers was one of the conditions for receiving permission to extend the service life of the NPP until the end of 2050, which was granted on February 16, 2023.

The report states that the fuel was originally purchased under contracts signed during the construction of the plant (the units were put into operation in 1977 and 1980); the current supplier under these contracts is TVEL. Uranium for these contracts was also mined and enriched in Russia.
Between 1995 and 1998, together with the Paks power plant in Hungary, Fortum carried out licensing of fuel from another supplier, British Nuclear Fuels Limited (BNFL, the company was the owner of Westinghouse Electric from 1999 to 2006). As a result of the post-licensing tender, BNFL supplied seven replacement batches of fuel to the Loviisa Power Plant, so that in the first decade of the 2000s, one power unit at the Loviisa Power Plant primarily used fuel supplied by BNFL and the other unit used fuel supplied by TVEL. The uranium used in BNFL fuel production was obtained from Russia.

Later, BNFL abandoned production of fuel for VVER-440s, and TVEL remained the only supplier for this type of reactors.

A fuel supply contract was last signed in 2006 when the previous license was extended. Following a tender, Fortum entered into an agreement with TVEL to supply fuel for Loviisa-1 until 2027 and Loviisa-2 until 2030.

In order to diversify fuel suppliers, in November 2022 Fortum signed an agreement with Westinghouse Electric Company to design, license and produce alternative fuel for the Loviisa NPP based on BNFL developments. (Also note that Fortum is one of the participants in the APIS project, which aims to develop fuel for European Soviet-designed VVER reactors.) During the last annual maintenance in late summer 2023, the Loviisa-2 reactor was loaded with the first test batch that did not contain real uranium pellets. The report also shows that Fortum has entered into uranium purchasing and enrichment agreements with Western suppliers.

Additionally, according to the report, Fortum will hold a tender for fuel supply for the period after 2027-2030 and will explore the possibilities of other Western suppliers besides Westinghouse Electric. The current contract with the US company and the fresh fuel held in storage ensure that Loviisa will be supplied with fuel until the tender is held.

Commentary by Bellona: Finland, following Ukraine, is setting an example of abandoning deliveries of Russian fuel for VVER-440 reactors. There are 19 such reactors operating in EU countries, and not all of them have signed agreements on alternative fuel supplies, unlike the operators of VVER-1000 reactors. For the latter type, fuel from an alternative supplier has been successfully used in Ukraine for a long time. Therefore, converting reactors in the Czech Republic and Bulgaria to alternative fuel will be somewhat easier and will begin as early as this year. An alternative to Russian fuel for VVER-440 reactors was previously used only in Finland itself almost 10 years ago, and only since the end of 2023 has been loaded into one of the VVER-440 units at the Rivne NPP in Ukraine. Nevertheless, additional work on its licensing in Finland will simplify the process of future conversion of the remaining VVER-440 reactors in Europe to alternative fuel.
Events in the Russian nuclear sector and in Rosatom projects abroad

First floating NPP has steam generators repaired with spare parts from warship decommissioned over 20 years ago

On December 19, scheduled and preventive maintenance of reactor unit 1 of the Akademik Lomonosov floating power unit was completed at the floating nuclear thermal power plant (FNTPP) in Pevek. As part of this work, nuclear fuel was reload. The repair of the second reactor unit of the Akademik Lomonosov, also with reloading of nuclear fuel, is scheduled for 2024.

The general director of the Rosenergoatom concern Alexander Shutikov stated that the work included repair of the unit’s steam generators. On December 26, in an interview with the corporate publication “Strana Rosatom”, he said that according to the project, the replacement of steam generator internal units was to be carried out in factory conditions after the equipment had completely exhausted its service life, and that 12-15 years were allotted for this purpose.
However, when the floating unit was put into operation four years ago, the heat exchange tubes in the steam generators began to fail. It was decided to repair the steam generators locally. Steam generators were ordered for the Baltic Plant, where they were originally manufactured, but such long-lead equipment cannot be delivered quickly.

As Kommersant reports, during repair in 2023, the internal devices of two steam generators at unit 1 were to be replaced, while three steam generators at unit 2 are scheduled for repair in 2024. By 2025, the plant will reach a capacity of 70 MW, Rosatom claims.

According to Alexander Shutikov, in connection with the repair of the FNTPP, Rosenergoatom decided to extend the operation of the Bilibino nuclear power plant, which together with the FNTPP is part of the isolated Chaun-Bilibino energy hub, by three years until December 2025. For repairs, they found “practically new” steam generators that were previously used on the decommissioned nuclear warship “Ural”. According to Atomenergoremont, which is involved in the repair of the FNTPP, the steam generators were transported from Fokino, Primorsky Krai, to Murmansk and Polyarnye Zori after preliminary hydraulic tests.

To carry out work safely for replacing the old internal devices of the steam generator with new ones, special containers are used that protect the tube of the new devices from damage in transportation and assembly.

Source: Atomenergoremont Telegram channel.
The twin-reactor warship “Ural” of 1941 project was launched in 1983 and decommissioned from the Navy in 2001. In 2008, it began to be scrapped at the Zvezda plant in Bolshoi Kamen. In June 2012, the Director General of FSUE Rosatomflot announced plans to use the ship’s steam generators and other spare parts to repair functioning nuclear icebreakers.

In 2024, Rosenergoatom plans to carry out repairs on the other side of the FNTPP and immediately replace all defective internal devices and restore the capacity of the left side unit to 35 MW.

December 2023 also marked 4 years since the FNTPP was put into operation, in 2019. During this time, the plant has been steadily increasing electricity generation: from 127 million kWh in 2020 to 222 million kWh in 2023 (as of December 19, 2023). However, this still amounts to no more than half of the maximum possible output of the plant in combined heat and power generation mode. These limitations may be related to both technical problems at the FNTPP and the limited electricity needs of this region. According to Victor Yelagin, director of the FNTPP, by the end of 2023, the plant will cover about 55% of the demands of the Chaun-Bilibino energy hub, and together with the Bilibino NPP, the share of nuclear power generation will reach 88%.
Commentary by Bellona: The fact that Rosenergoatom is starting to look for old equipment for use at the FNTPP (of which it never tires of being proud) is bad news. Bellona has also previously drawn attention to the problems that could arise in the operation of the FNTPP as a result of the VERY protracted construction of this facility and the physical aging of the equipment.

The “Ural” ship was not used intensively, so the steam generators may indeed have a short number of service hours. Steam generators belong to the first category of equipment affecting the safety of a nuclear facility. Evidently, the situation was hopeless if the decision was made to use steam generators manufactured 45 years ago and stored in unknown conditions for 15 years since the ship’s nuclear device was dismantled.

Additionally, it should be remembered that steam generators of the first and second generations of transport nuclear units were not very reliable, and in many respects their operability was determined by the correctness of operation (for example, how strictly the water mode of the 1st and 2nd circuits was observed). No one can say for certain how correctly the Ural nuclear units were operated. Therefore, such decisions as using old equipment on which the safety of the nuclear plant directly depends may be made out of desperation or in order to wait things out for a while. But in any case, this poses a threat to the safe operation of the FNTPP.

Kola NPP examines possibility of extending service life of first two units to 65 years

Vasily Omelchuk, the director of the Kola NPP in the Murmansk Oblast, announced that the possibility of extending the operation of the plant’s first and second units with VVER-440 reactors until 2038 is being considered. These units were first put into operation in 1973 and 1974 respectively. “The first and second units of the Kola NPP will operate until 2033-2034, but there are instructions from the country’s leadership to consider the possibility of extending their service life... Whether this will be possible or not, it is impossible to say at present,” Omelchuk said.

He noted that the decommissioning of units 1 and 2 could be synchronized with the launch of the new Kola NPP-2 plant, which is scheduled to begin operation by 2035 (the general plan for power facilities includes commissioning one VVER-600 reactor).
According to plan, construction and installation works for power unit 1 should start by November 16, 2028, and for power unit 2 by November 16, 2030. The first concrete is scheduled to be poured by January 31, 2030 and January 31, 2032 respectively. The physical launch of unit 1 is scheduled by December 31, 2034, of unit 2 by December 31, 2036, and they will be put into operation by December 31, 2035 and December 31, 2037 respectively.

In October 2023, the plant management reported that the future Kola NPP–2 may consist of four units instead of two. Rosatom agreed to this and sent an updated “roadmap” to the Russian government, where power units 3 and 4 are scheduled to be put into operation in 2041 and 2044.

The old KNPP power units 3 and 4 are scheduled for shutdown in 2041 and 2044 respectively.

Commentary by Bellona: For the first time, the management of Kola NPP has discussed the possibility of extending the service life of the plant’s first two units for an additional period beyond the declared 60 years. This may be caused by difficulties with Rosatom’s fulfillment of the task from the country’s leadership to increase the share of nuclear power generation to 25%. It is characteristic that the director of Kola NPP says that the idea of extension arises from an order from the country’s leadership, rather than from its direct management in the Rosenergoatom Concern or in Rosatom itself.
The power generation of Russian NPPs decreased in 2023 by about 2% compared to 2022. This was the first decline in Russian NPP power generation in almost 20 years, not counting the COVID year of 2020. This is caused by the aging of the nuclear fleet and the decommissioning of old RBMK-1000 units in recent years, which are not being replaced by new capacities in the form of units with VVER-1200 reactors. That is why in the next 10 years, according to Bellona’s own calculations, it will be difficult for Rosatom not only to raise the share of NPP generation to 25% of the country’s energy balance, but even to keep it at the current level of 20%. This explains the ideas to extend the life of the remaining RBMK units to 50 years instead of 45, and now the old VVER-440 units to 65 years instead of 60.

Extending the operation of power units requires serious work on inspection and modernization of equipment and may not always be economically justified. Nevertheless, this is a global practice, and for many units in different countries it is technically and economically feasible to implement. For similar units with VVER-440 reactors in Finland, last year the Loviisa NPP was granted a license to operate for up to 70 years.

However, initially the first units of the Kola NPP were not planned to be extended beyond 60 years, and at present judging by the statement of the plant director, there is no certainty that such an extension is possible. All this shows that the decision is a forced measure to fulfill a task set by country’s leadership. It remains in question whether this task will be fulfilled at any cost, or if it will prove technically or economically inexpedient and will not be fulfilled after all.

Rosatom’s foreign projects in brief

In early December, the first reactor assembly inspection – an operation required to confirm that the assembled reactor meets the design specifications – was completed at the first unit of the Akkuyu NPP under construction in Turkey. Reactor assembly is carried out twice before nuclear fuel is loaded. On December 12, the Board of the Nuclear Regulatory Agency of the Republic of Turkey granted permission to put the first power unit into operation. The permission makes it possible to start commissioning works. The next stage in the licensing of the plant will be obtaining a license for the operation of unit 1, which will allow the loading of nuclear fuel into the reactor and the start of pre-start-up control operations.
The Turkish government plans to start generating electricity at unit 1 of the Akkuyu NPP on October 29, 2024, timed to coincide with Turkey’s Republic Day. The rest of the units are planned to be commissioned at one-year intervals, with construction of the NPP due to be completed by 2028.

On December 18, the European Union’s 12th package of sanctions against Russia came into force. They explicitly made exceptions for the Paks-2 nuclear power plant under construction in Hungary. Paragraph 21 of the document states: “In view of the importance of the Paks II project for the interests of Hungary in relation to security of energy supply, the exemptions and derogations in this Decision concerning civil nuclear projects are fully applicable to all goods and services needed for that project”. The Paks-2 project was also named specifically in all paragraphs describing exemptions relating to the security of the civil nuclear sector.

On December 21, Vitaly Polyanin, the new director of the Paks-2 project who was appointed in November and until recently was in charge of the construction of the Belarusian NPP, stated that the first concrete for the foundation of the future NPP could be poured ahead of schedule in December 2024 instead of March 2025. The main construction work on the facilities, including the nuclear island, is planned to be completed by 2028. Then equipment installation and preparation for commissioning will begin. The two power units are to be put into commercial operation in the early 2030s.
Commentary by Bellona: Rosatom continues to implement foreign NPP construction projects in Turkey, Bangladesh, Egypt, India and China, which have been virtually unaffected by sanctions and restrictions imposed on Russia by Western countries. Rosatom’s only NPP construction project in the European Union – the Paks-2 NPP in Hungary – is also moving ahead despite delays and has now received a separate mention as a project protected from restrictions in the EU’s 12th package of sanctions.

All of this points to an obvious fact – in the sanctions pressure on Russia, Europe and the U.S. have so far been more successful in reducing their own dependence on Russia in the nuclear fuel sector than in influencing Rosatom’s foreign projects in third-party countries. And these goals are achieved not primarily through direct international sanctions, but through the decisions of individual countries or companies, and require at least several years for implementation.

Rosatom continues to expand assets

On December 8, Rosatom received 89.4% of federally owned shares in Solikamsk Magnesium Plant (SMP), Perm Krai, as an asset contribution from the Russian Federation. The SMP will become part of the corporation’s Mining Division. SMP shares were transferred to state ownership in the fall of 2022 after they were confiscated from private shareholders on the initiative of the Prosecutor General’s Office. According to the supervisory body, the privatization of the plant in the first half of the 1990s was carried out illegally, without the permission of the federal government. Now the Prosecutor’s Office is trying to obtain a court decision to confiscate shares in the state’s favor from more than 2,000 minority shareholders of SMP.

Earlier in May 2023, following the state transferred the controlling stake in the charter capital, the Mining Division already included the Lovozero Mining and Enrichment Combine. This asset also became the property of the state after the former owners were taken to court. The Lovozero combine is the only enterprise in the country that mines and enriches loparite ore, which is a raw material for the production of many rare-earth metals. Loparite is supplied to the Solikamsk Magnesium Plant, which processes it and produces rare earth metal concentrate, tantalum, niobium, and titanium sponge.

As a next step, Rosatom plans to build a separation facility to provide a complete raw material cycle of rare earth metals, from mining to production.
Commentary by Bellona: Rosatom continues to expand its own assets and authority within Russia, taking over new industries and sectors. In the previous digest, we already described the transfer of the Far Eastern Shipping Company (FESCO) to Rosatom and the consolidation of the largest assets in Russia’s transportation and logistics industry in the hands of the state corporation.

In addition to Rosatom’s expansion of non-core (non-nuclear) assets capable of contributing to Russia’s military-industrial complex, as well as greater centralization and essentially nationalization of certain elements of economic activity within the country, this process is increasingly accompanied by dubious procedures of seizing property and transferring assets from private owners to a state corporation using the repressive apparatus of the state. In an autocratic state during wartime, these processes do not have any real constraining factors and can swiftly escalate.
Recommended publications

On 10 December, Bellona published the report “Rosatom during the war in Ukraine: how militarization of the Russian nuclear giant took place”, studying the process of how one of the world’s largest nuclear corporations was transformed into a tool for Russia to achieve its military goals.

On 4 December, Bellona published the expert article on its website, “The Nuclear legacy of the Arctic: a cleanup will be difficult without international assistance”, with a survey of the history of the legacy of Soviet nuclear military and civil programs in the Arctic region, what was been done in the past 30 years, including with Bellona’s involvement, and how the situation at these sites has changed since the outbreak of war in Ukraine and the withdrawal of foreign donors from these projects.