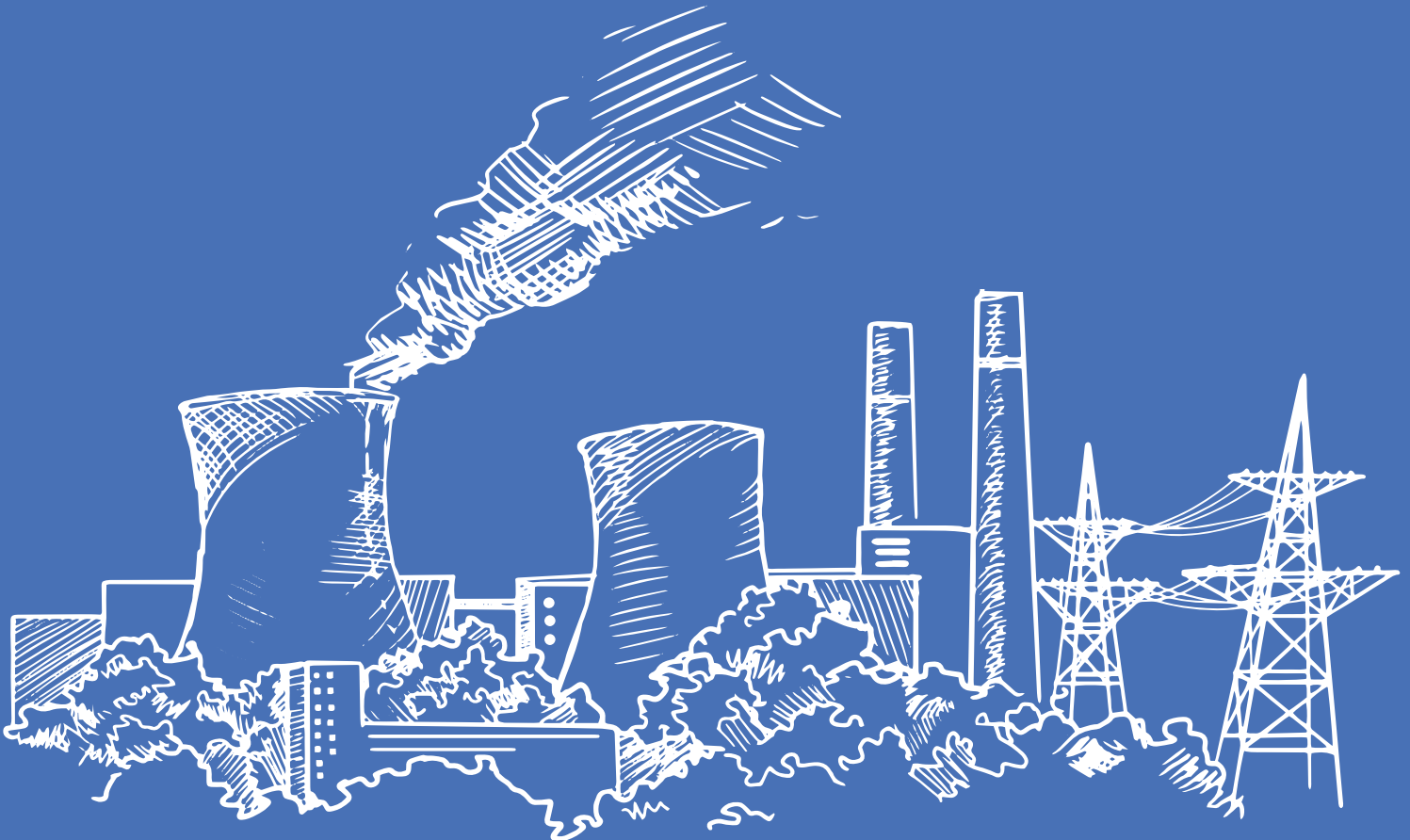


POLICY BRIEF

“ATOMIC” SANCTIONS: NO SIMPLE SOLUTIONS



Summary

The issue of sanctions against the Russian nuclear energy industry has become not only a matter of reducing the aggressor’s revenues which it uses to finance military operations. Russia’s significant presence in the energy chains of many countries is already a matter of global nuclear security. The actions of the Russian Federation in the oil and gas segments directly indicate that it treats any cooperation in the energy sector as a tool of blackmail to solve political issues, and the seizure and destabilization of the Zaporizhzhia NPP with the involvement of representatives of Rosatom also indicates a terrorist component of Russia’s actions.

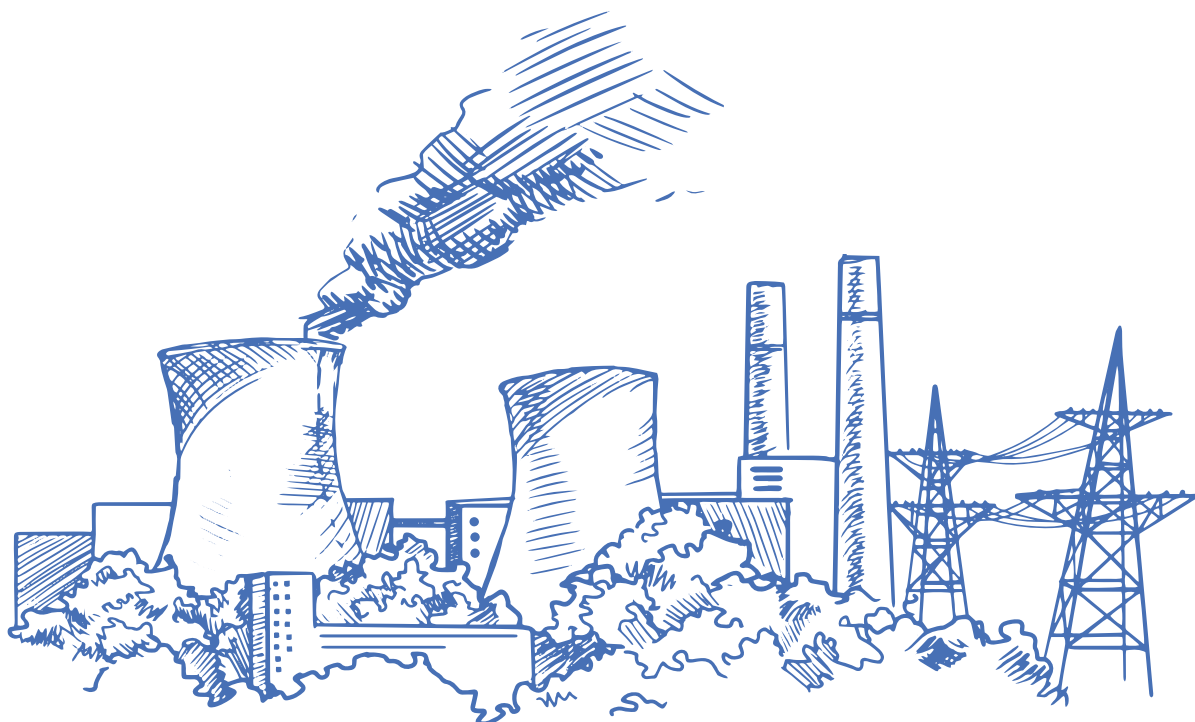
Rosatom has more than 300 enterprises in its structure, some of which closely cooperate with the military-industrial complex and [supply](#) materials and technologies for the production of weapons. These companies, without sanctions restrictions, are also able to import dual-use goods that can be diverted to meet military needs.

The optimal solution should include measures to counteract the Russian nuclear industry in all three dimensions: scientific research and participation in international organizations, contracts for operating nuclear power plants and new projects abroad.

Adding to the sanctions list those Rosatom’s organizations that are not directly involved in the operation of nuclear power plants and ensuring the nuclear fuel cycle should become a priority task for the allies of Ukraine to avoid threats to nuclear safety at facilities where representatives of the Russian nuclear industry are involved.

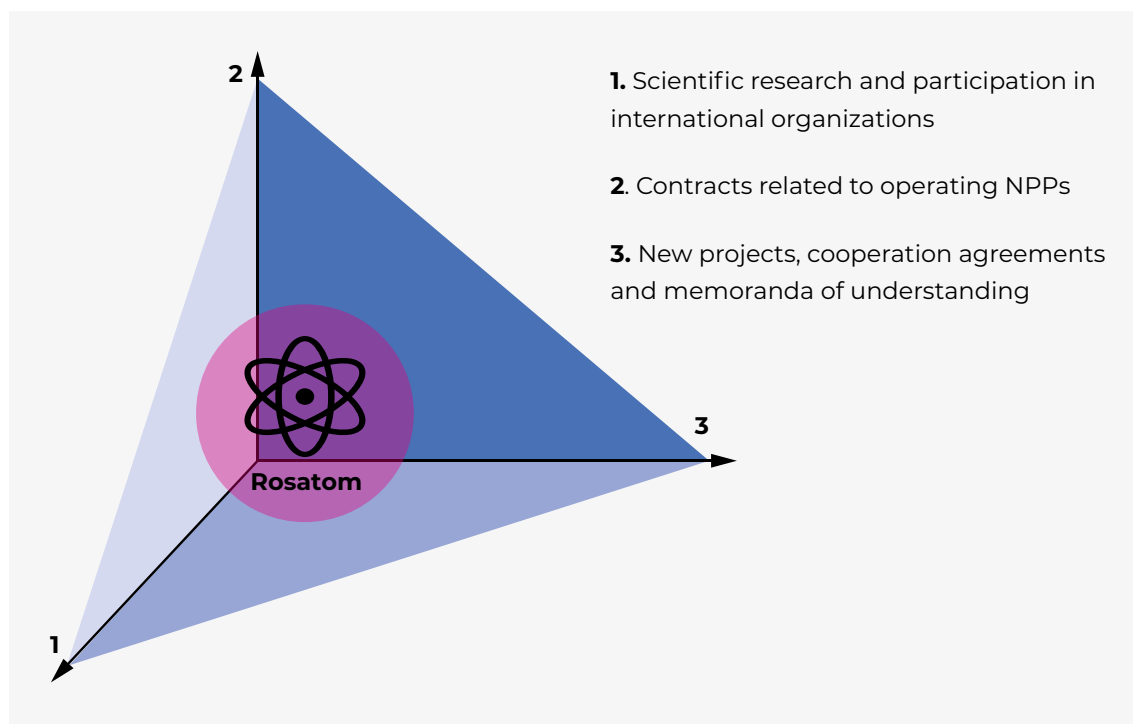
Another important step is the development and approval of plans to refuse from Russian nuclear fuel and enriched uranium, which will allow solving the problem of dependence, given the specifics of each individual facility as well as current market and political conditions. Approval and acceptance of such a program is especially necessary at the EU level as a complement to REPowerEU plan.

Moreover, important steps on the way to the abandoning of Russian goods and services on a global scale should be strict export controls with the expansion of the list of dual-use goods to block the supply of Western equipment and modern technologies to facilities built and/or operated by Rosatom, both in Russia and abroad.



3D dimension of the Russian nuclear problem

The dependence of energy industry in many countries on cooperation with Rosatom has an important feature: the company's activities cover the entire cycle of nuclear fuel production, design, construction and operation of nuclear power plants in many countries of the world. The Russian state corporation also conducts very active scientific research work and activities to expand its foreign presence: Russia [ranks](#) first in the global nuclear design market, and the portfolio of foreign projects as of the end of 2022 [includes](#) 34 units in 11 countries. This is qualitatively illustrated by DiXi Group's [study](#) last year, which analyzed the most important areas that the “tentacles” of the Russian giant tried to reach.



Dimension one: **scientific research and participation in international organizations**

One of Rosatom's international activities is scientific research. Its [key projects](#) are the development of fast neutron reactors and the implementation of a closed nuclear cycle based on this technology. Rosatom has developed a program for the development of engineering, technology and scientific research in the field of nuclear energy use, which includes the implementation of several projects:

- “Two-component nuclear energy”;
- “Experimental bench base”;
- “Thermonuclear and plasma technologies”;
- “New materials and technologies”;
- “Design and construction of reference units of nuclear power plants, including low-power nuclear plants”.

The main area of international cooperation in the scientific field is the participation of Russians in the international ITER [project](#) to create an experimental fusion reactor. [According to](#) Rosatom, supplies of equipment and main systems of the reactor by the Russian side make up 9.09% of

the total project’s cost. Other international initiatives where Rosatom representatives are still present are the [INPRO](#) project of the IAEA member states (dedicated to innovative nuclear reactors and fuel cycles), the [Generation IV International Forum](#) and the [SNETP](#) (Sustainable Nuclear Energy Technology Platform) projects.

The activities of many scientific and research organizations that are part of Rosatom’s structure are closely related to the Russian military-industrial complex. These organizations are [involved](#) in the development, testing and production of the country’s nuclear munitions, overhaul, modernization and expansion of the civilian fleet of icebreakers and submarines with nuclear engines.

Another aspect of the “Russian problem” is the membership of Russia in international organizations. E.g., the Russian Federation is part of the IAEA Board of Governors, which is one of the two governing bodies of the agency and has the authority to review financial information, the IAEA’s activity program and budget, admit new members and approve the agreement on guarantees. In addition, the IAEA member states [have access](#) to the unique software and databases of the Nuclear Energy Agency (NEA/OECD), where the membership of Russia has been suspended since May 11, 2022. The NEA/OECD database has multidisciplinary modeling and analysis tools, and datasets for nuclear research.

Dimension two: **contracts related to operating nuclear power plants**

The European Union member states are highly [dependent](#) on Russia under existing contracts in the nuclear industry. First, due to the supply of nuclear fuel or enriched uranium for its production (Bulgaria, Czech Republic, Hungary, Slovakia, Spain and Finland). Second, due to the construction of new nuclear power units (Paks II NPP in Hungary).

It is worth noting that a number of European countries have already [taken](#) the first steps to reduce dependence on Russia in nuclear energy. Thus, more than a year ago, Vattenfall (Sweden) announced its refusal to purchase a new type of fuel for the Ringhals NPP (the station tested the operation of TVS-K assemblies), CEZ (Czech Republic) signed a contract with Westinghouse Electric Company (U.S.) and Framatome (France) for the supply of fuel to the Temelin NPP. Moreover, in early April this year, information [appeared](#) on the conclusion of an agreement between CEZ and Westinghouse for the supply of fuel for the VVER-440 units of the Dukovany NPP.

Bulgaria and Finland have taken similar steps in diversifying nuclear fuel supplies. The latter [stopped](#) the implementation of the Hanhikivi NPP construction project after Russia’s full-scale invasion of Ukraine. Bulgaria, in turn, signed a contract with Framatome to [replace](#) Russian fuel in the VVER-1000 reactor of the Kozloduy NPP unit 5 in 2025-2034, and a 10-year contract with Westinghouse Electric Sweden to [switch](#) unit 6 to the American fuel. Intentions to get rid of dependence on a single supplier were announced in Slovakia and even Hungary.

Current agreements with Rosatom are not limited to the construction and operation of nuclear power plants. The state corporation [has](#) more than 40% of the world market for uranium enrichment services and 17% of the nuclear fuel market, including [plans](#) to increase it to 20%.

World conversion capacity, 2020

Country	Nameplate capacity, tons U	Capacity utilization, tons U
France	15 000	2 600
China	15 000	8 000
Canada	12 500	9 000
Russia	12 500	12 000
USA	7 000	0

Source: [World Nuclear Association](#)

World enrichment capacity

Country	Company	2020 capacity, SWU/year
France	Areva	7 500
Germany-Netherlands-UK	Urenco	13 700
USA	Urenco	4 900
Russia	Tenex	27 700
China	CNNC	6 300
Other		66
Total		60 166

Source: [World Nuclear Association](#)

A large-scale [study](#) of Russian expansion in the nuclear sector published by Nature Energy demonstrates a quantitative assessment of the level of cooperation with Russia. According to the authors' conclusions, two European countries were included in the list of countries with a high level of dependence: Hungary and Spain. The top most dependent countries are Iran, Belarus, India, China, Egypt and Türkiye.

The basis of Rosatom's foreign expansion is the expanding of international legal framework, which consists in entering into intergovernmental and interagency agreements. To strengthen such activities, the Russian state corporation opens its own foreign representative offices, which take the form of regional centers, national offices and business representations. Rosatom International Network is [responsible](#) for this direction in the structure of Rosatom, its activities are aimed at promoting Rosatom's services and products abroad, researching markets and forming a positive image of the company.

Rosatom continues to expand even after the Russia's invasion of Ukraine: e.g., on September 26-30, 2022, its representatives took part in the 66th Annual Regular Session of the IAEA General Conference held in Vienna. Rosatom representatives not only took an active part in the planned events but also signed new international documents: on September 27, 2022, a memorandum of understanding was [signed](#) with ENBPar (Brazil), which is responsible for the operation of the Angra NPP units.

[According to](#) Rosatom, the portfolio of foreign projects is 34 units, and the financial estimate of orders for the next 10 years [is](#) 130-140 billion USD. The construction of the Akkuyu NPP in Türkiye with a total capacity of 4800 MW, which will be able to [provide](#) an annual output of 35 billion kWh (10% of country's electricity consumption), looks the most ambitious and threatening in this list. According to the signed intergovernmental agreement, the project is implemented according to the BOO (build-own-operate) model, which provides that the Russian side will not only design and construct the NPP, maintain and operate it, but will also be the facility's owner. For this purpose, Rosatom has established a separate Akkuyu Nuclear JSC in Türkiye, which [cooperates](#) directly with the governmental authorities and acts as the general customer and investor of the project.

All the risks of such cooperation, as of 2016, were [outlined](#) in a study by the Centre for Economics and Foreign Policy Studies (EDAM), including the problem of exchanging sensitive information between a NATO member country and the Russian Federation, which is necessary to prevent potential terrorist and criminal threats. Further implementation of the project after February 24, 2022, looks even more risky given the fact that on November 21, 2022, the NATO Parliamentary Assembly [recognized](#) Russia as a terrorist state. Despite this, the Akkuyu NPP project is progressing rapidly: Rosatom [reported](#) that an agreement had been reached with the Minister of Energy and Natural Resources of Türkiye on the completion of construction already in 3Q2023. Nuclear fuel will be [delivered](#) to the facility already on April 27, 2023.

The corporation is also developing other areas of operation at the international level. E.g., on February 21, 2023, NovaWind JSC, the wind energy division of Rosatom, and the Ministry of Energy of the Kyrgyz Republic [signed](#) a Memorandum of Understanding, which provides for the development of cooperation in the field of wind energy. For more information on Rosatom's "non-core" activities, in particular its interest in lithium assets, see the [study](#) by DiXi Group.

The 3D dimension of the Russian "nuclear" problem requires a multifaceted approach to its solution. A separate approach to each of these dimensions may be most effective. The research activity must be limited primarily to cut off the aggressor from modern technologies and developments. The most difficult from the standpoint of sanctions mechanisms is to stop the construction of new facilities, which not only yield revenues to the Russian budget but also pose a direct political and potential terrorist threat.

Systemic problem – comprehensive solution

Avoiding sanctions restrictions enables Rosatom to perform actively at the international level: build and operate energy facilities, develop joint research projects and participate in the activity of the IAEA as Russia enjoys all the membership benefits. Many companies within the Rosatom structure (co-)operate with the defence sector and/or are able to import dual-use goods that can be redirected to meet [military needs](#).

The actions of the Russian army at the Chernobyl NPP site in the spring of 2022, the occupation of the Zaporizhzhia NPP with the participation of Rosatom representatives, the shelling of territories adjacent to the Zaporizhzhia NPP, which lead to the loss of backup power and increased the threat of a nuclear accident, and the regular missile attacks on the energy infrastructure of Ukraine clearly indicate that Russia and Russian companies are unreliable parties to concluded agreements and unsuitable for cooperation. The actions of Rosatom at the Zaporizhzhia NPP after the occupation of the facility are [construed](#) by experts as direct participation in the war against Ukraine. The employees of the Russian corporation not only interfere in the operation of the energy facility but also coordinate the actions of the military, authorize the placement of military equipment directly on the production premises and [interfere](#) with the work of the IAEA mission.

Our goal is to find an optimal solution to limit the aggressor’s influence on global nuclear energy sector without violating the safety of nuclear power plants operations and causing a significant shortage of electricity in countries dependent on supplies of Russian nuclear fuel or services. The leadership of the Russian Federation and officials of Rosatom must receive clear signals about the determination of the civilized world to refuse cooperation with the aggressor, which requires a consistent action plan to reduce Russia’s presence in the global nuclear industry.

The complexity of Rosatom’s structure, its monopoly position in many segments of the industry, the impossibility to quickly diversify the supply of resources and services force the introduction of a selective approach to sanctions. To do this, it is necessary to classify the enterprises and organizations of Rosatom, highlighting the structures that are still critical for the operation of nuclear energy facilities in the West.

This approach involves:

- 1. Personal sanctions and restrictions on individual Rosatom structures.** The step-by-step increase in pressure and the introduction of sanctions depends on whether specific companies and organizations are associated with the operation of active nuclear power plants outside Russia, participate in or cooperate with the Russian military sector and have potential opportunities to import goods for their further redirection to the military sector. Such categorization should include a number of other criteria as well.
- 2. Supplementing REPowerEU with a step-by-step action plan to reduce dependence on Rosatom at the EU level** with the definition of specific terms for refusing from Russian services, materials or equipment in the operation of nuclear power plants with a further ban on cooperation with Russian companies.
- 3. Blocking Rosatom projects abroad** to prevent the aggressor’s influence from expanding. First, it is necessary to introduce the openness of counterparties (especially Western companies) under current Rosatom contracts related to the operation and maintenance of nuclear power plants, research projects, disposal of spent nuclear fuel, uranium supplies and enrichment services, etc. Second, it is necessary to strengthen export controls at the level of each country, expand the list of dual-use goods that are prohibited to be exported to Russia as well as create a pan-European body to control the implementation of this part of the sanctions mechanism.

Preventive sanctions

The first step towards limiting the Russian “peaceful” nuclear programs was the [imposition](#) of personal sanctions on the top managers of Rosatom by the UK and partially by the U.S. The logical next step is to remove the company that represents the aggressor country and participates in its illegal actions from modern Western technologies and to include in the sanctions list all enterprises of Rosatom that are engaged in scientific research in the nuclear field.

A large number of organizations that are part of the Rosatom structure do not directly participate in the operation of existing facilities or in ensuring the cycle of production, supply and disposal of nuclear fuel. At the same time, the fact that these companies are not on Western sanctions lists creates [potential threat](#) of supplying materials and electronic components for the Russian military industry.

Based on data from open sources, DiXi Group created a list of 37 organizations that are part of Rosatom and work in the field of scientific research (see [Annex](#)). When searching for information, special attention was paid to reports regarding the connection of a specific legal entity with the Russian military-industrial complex (currently or in the past) and involvement in the operation or construction of nuclear power plants. Legal entities from this list should be subject to sanctions restrictions to reduce the risk that they supply goods for military purposes and to isolate Russia from modern technologies in the nuclear and energy sectors.

Even if it is impossible to simultaneously introduce significant restrictions against the Russian nuclear industry due to major risks for operating energy facilities in the EU and G7, Ukraine’s allies must introduce preventive restrictions against companies and organizations that are part of the Rosatom structure and are not directly related to the operation of active nuclear facilities. This will complicate further international Russia’s expansion and contribute to the strengthening of the aggressor’s isolation, in particular in scientific and research cooperation.

The decline in the role of Russia and its satellites in the IAEA deserves special attention. The EU [refused](#) to finance the IAEA projects that directly benefit Russia or Belarus as well as to send experts to IAEA meetings that will take place in these countries; and similar decision, according to our information, was adopted by the U.S. The next steps include the removal of Russian and Belarusian representatives from leadership positions in the IAEA, depriving them of access to data related to the Ukrainian nuclear energy and the voting rights in making relevant decisions, refusing invitations to events held by the IAEA, as well as the Agency refusing to organize events in the territory of Russia or Belarus.

Another important step is the closure of Rosatom’s regional representative offices, which are also part of active expansion in many countries around the world.

«Nuclear Protocol» to the REPowerEU Plan

To eliminate the threat of energy resources deficit after the Russia’s full-scale aggression against Ukraine, the EU developed and implemented the [REPowerEU](#) plan, which is a set of measures and policies in energy efficiency, demand reduction, acceleration of the green transition and diversification of energy supplies. The effectiveness of the approved action plan led to the [implementation](#) of REPowerEU provisions in the recovery and resilience plans of the EU member states.

Now is the high time to introduce a “nuclear protocol” to this plan, which will provide for a gradual reduction of the dependence of European countries on Russian services and goods in the industry. Such a document must contain a list of the following possible steps:

- ✓ Refusal to cooperate with Rosatom in existing NPP construction projects for the benefit of other suppliers;

An example of implementation is Poland’s decision regarding the projects of its first two nuclear power plants, which should increase the energy security of Eastern Europe and contribute to reducing the level of emissions. According to the agreements signed at the end of 2022, providers from the [U.S.](#) and [South Korea](#) will be involved in the construction of NPPs.

- ✓ Search for alternative solutions for facility maintenance and substitution of Russian-made equipment;

An example of implementation is Ukraine’s full [transition](#) to Westinghouse fuel as well as independent [maintenance](#) of VVER-1000 reactors with the support of the U.S. Department of Energy (DOE) and Argonne National Laboratory.

- ✓ Refusing from the supply of raw uranium from Russia, which can be introduced now without a significant threat of shortages and price fluctuations;

World production of uranium from mines and identified recoverable resources

Country	2020 production from mines, tons U	2019 identified recoverable resources, tons
Kazakhstan	19 477	907 000
Australia	6 203	1 693 000
Namibia	5 413	448 000
Canada	3 885	565 000
Uzbekistan (est.)	3 500	132 000
Niger	2 991	276 000
Russia	2 846	486 000
China (est.)	1 885	249 000
U.S.	6	48 000
Other	1 525	1 344 000

Source: [Center on Global Energy Policy](#)

- ✓ Diversification of conversion and enrichment services;

Examples of implementation are the *expansion* of current production capacity of the French uranium enrichment facility George Besse II (Orano) and the *restart* of the conversion facility Metropolis Works by Honeywell (U.S.).

- ✓ Substitution of nuclear fuel supplier and spent nuclear fuel storage and processing services provider.

An example of implementation is the *intentions* of Energoatom to start its own production line of nuclear fuel for own nuclear power plants, and later for exports (in particular, to the countries of Eastern Europe).

Even voluntary commitments of the EU member states taken at the European level will give a clear political signal and provide an opportunity to implement the provisions regarding restrictions on cooperation with the Russian Federation into the EU legislative framework in the future.

Taking into account the specific features of civil nuclear energy sector, in particular high requirements for the safety of operation, a limited number of suppliers of nuclear fuel cycle services and equipment for nuclear power plants, it is necessary to make all possible efforts to ensure that the process of refusing cooperation with Russia is permanent (non-reversible) and designed for a multi-year perspective.

Blocking projects abroad

Blocking supplies of Western equipment and technologies to Russia and to facilities built or maintained by Russian companies should be a powerful countermeasure to Russia’s “nuclear” expansion. The first example of such pressure is the *lack* of permission for Siemens to supply equipment for the Akkuyu (Türkiye) and Paks II (Hungary) NPPs from the German Federal Office for Economic Affairs and Export Control (BAFA). All the equipment and services that Rosatom planned to purchase in the countries of the sanctions coalition must be added to the list of dual-use goods in order to prevent it from entering Russia and/or at facilities that are, to one degree or another, under the control of the Russian nuclear giant. A similar ban must extend to modern technologies and IT solutions.

The *recommendations* of the International Working Group on Russian Sanctions headed by the Head of the Presidential Office of Ukraine Andrii Yermak and the Director of the Freeman Spogli Institute for International Studies (Stanford University) Michael McFaul are important theses in the proposed approach that complement our proposals. Experts of the group, inter alia, offer:

- ✓ Closure of Rosatom’s international representative offices in the EU and G7 countries;
- ✓ Extension of economic sanctions to critical supplies for nuclear energy, such as specialized carbon fiber;
- ✓ Promotion of an alternative to Russian nuclear technologies and simultaneous lobbying to reject the implementation of Russian NPP construction projects.

The implementation of these recommendations will give an important signal to third countries that are planning to cooperate with Rosatom or have already started the construction of nuclear power plants regarding the futility and unreliability of such agreements and the need to change suppliers of equipment and services to more reliable companies with no ties to the aggressor.

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