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RUSSIA'S NUCLEAR ENERGY EXPORTS: STATUS, PROSPECTS AND IMPLICATIONS

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I. INTRODUCTION

Rosatom, Russia's state-owned nuclear corporation has become the world's leading supplier of nuclear reactors. After signing a $30 billion contract in December 2017 for the construction of four reactor units at the El Daaba nuclear power plant (NPP) in Egypt, Russia signed a contract for four such units with China in June 2018 and a contract in September for a two-unit NPP in Uzbekistan.[1] Construction began in Turkey at the Akkuyu NPP in April and in Bangladesh on the second unit of the Rooppur NPP in July.[2] Domestically, two reactors were connected to the grid in 2018 and the world's first floating nuclear power plant, the Akademik Lomonosov, commenced fuel loading operations.[3]

Rosatom is increasingly seeking to market its wares in countries that are new to nuclear energy. These states, such as Bangladesh and Turkey, are embarking on a nuclear power programme and choosing to do so with Rosatom. The prospect of a global surge in Russian-made reactors has raised concerns among some Western observers who equate the rise of Rosatom with a potential weakening of nuclear governance standards and, due to the political support it receives from the Russian state, an increase in Russian geopolitical power.

This paper discusses this claim by investigating whether Russia's increased role in the nuclear export market has adversely affected global nuclear governance norms and whether Russian NPP projects overseas can be considered effective foreign policy tools for the Russian Government. Section II provides

[1] World Nuclear Association, 'Nuclear power in Russia', Updated Oct. 2018.

[2] Reuters, 'Erdogan, Putin mark formal start of work on Turkey's first nuclear power plant', 3 Apr. 2018; and World Nuclear News, 'Construction starts on second Bangladeshi reactor', 16 July 2018.

[3] World Nuclear Association (note 1).

SUMMARY

Russia's state-owned nuclear energy corporation, Rosatom, has become the world's leading supplier of nuclear reactors through a combination of flexible business models, attractive financial packages and diplomatic tools. Their long-term nature and crucial role in a country's economy as an electricity provider make nuclear power plants strategic assets. The prospect of a global surge in Russian-made nuclear reactors has raised concerns among Western observers who equate the rise of Rosatom with an increase in Russian geopolitical power and potentially a weakening of nuclear governance standards.

This paper discusses these claims by asking whether Russia's increased role in the nuclear export market has adversely affected global nuclear governance norms and whether Russian nuclear power plant projects overseas can be considered effective foreign policy tools for the Russian Government. It also assesses the instruments used by the European Union to address concerns, linked to nuclear governance and energy security, about the rise of Russian nuclear exports.

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an overview of Russia's position in the global nuclear market and of the main elements of its successful export strategy. Section III discusses the standards and conditions on supply set by Russia when conducting nuclear trade. Section IV assesses the rationale for and limits on Russia's use of nuclear energy projects as geopolitical tools. Section V examines the instruments used by the European Union (EU) in the area of nuclear governance and energy security to address concerns related to the increase in Russian nuclear exports. Section VI draws some conclusions.

II. RUSSIA'S POSITION IN THE GLOBAL NUCLEAR MARKET

Between 1992 and 2004, Russia's nuclear energy industry was under the control of the Ministry for Atomic Energy. It was then transformed into the Federal Agency on Atomic Energy, Rosatom, before becoming a state corporation in 2007.[4] Rosatom is responsible for the country's nuclear power industry, nuclear weapons division, nuclear-powered icebreaker fleet and nuclear research institutions, as well as ensuring nuclear and radiation safety.[5] Rosatom remains entirely under the control of the Russian state. The President of Russia sets Rosatom's strategic objectives, and appoints its director and the members of its supervisory board. Rosatom manages more than 300 companies and organizations involved in all stages of the nuclear weapon and power production chain. This includes front-end nuclear fuel cycle activities such as uranium mining, conversion, enrichment and fuel fabrication, activities related to the construction, operation and decommissioning of NPPs and back-end cycle activities such as spent nuclear fuel reprocessing and radioactive waste management.[6]

In recent years, Rosatom has strengthened its presence overseas and dominated the construction of new NPPs. According to Rosatom's 2017 annual report, the corporation's international revenue amounted to $6.1 billion, of which $2.5 billion came from NPP construction, and it has a portfolio of overseas orders worth $133 billion.[7] In 2018, Rosatom stated that it was currently implementing projects on the construction of 36 units in 12 countries.[8] The number of units under construction varies according to sources, as construction is deemed to have begun only after the first concrete has been poured.[9] For instance, the World Nuclear Association considers that seven units are under construction: one in China, two in Belarus, two in India, one in Bangladesh—where construction on a second unit has also started—and one in Turkey. In addition, 12 further units have been contracted for and 11 have been ordered.[10] Preliminary work is at an advanced stage on contracts in Finland and Hungary.[11] Additional NPP construction agreements have been signed with Armenia, China, Egypt, India, Iran, and Uzbekistan.[12]

Intergovernmental agreements, also known as 'framework' agreements, that provide a legal basis for negotiations and identify specific areas for bilateral cooperation have been signed with Algeria, Bolivia, Cambodia, Cuba, Ghana, Nigeria, Paraguay, Saudi Arabia, Sudan, Tajikistan, Tunisia, the United Arab Emirates (UAE) and Zambia.[13] Many more countries have signed an Interagency Memorandum of Understanding, usually between Rosatom and local atomic energy agencies or ministries for energy, education or foreign affairs. These serve as a declaration of interest in cooperation but do not have any legal status. Some lead to a framework agreement, or contracts on the construction of NPPs or a Nuclear Science and Technology Centre, as was the case in Bolivia and Zambia, or specific contracts related to training, education or capacity building.[14] Contracts can take several years, even decades, to negotiate and in some cases do not result in anything concrete.

Various countries have also signed specific contracts with Rosatom or one of its subsidiaries for front-end services. In 2017, Rosatom held 36 per cent of the global market in enrichment services and 17.7 per cent of the global nuclear fuel market.[15] TVEL Fuel Company

[4] Cesnakas, G. and Juozaitis, J., 'Nuclear geopolitics in the Baltic Sea region', Atlantic Council Issue Brief, July 2017, p. 2.

[5] Rosatom, *Performance of State Atomic Energy Corporation in 2016: Public Annual Report* (Rosatom: Moscow, 2017).

[6] Rosatom (note 5).

[7] Rosatom, 'Rosatom issues 2017 Annual Report', Press release, 13 Aug. 2018.

[8] Rosatom, 'Projects', [n.d.].

[9] Schneider, M. and Froggatt, A., *The World Nuclear Industry: Status Report 2018* (Mycle Schneider Consulting: Paris and London, Sep. 2018), p. 38.

[10] World Nuclear Association (note 1).

[11] Schneider and Froggatt (note 9), pp. 228, 244–45

[12] Schneider and Froggatt (note 9), p. 254; World Nuclear Association (note 1); and 'Russia, Uzbekistan hail $11 billion nuclear plant project during Putin visit', Euractiv, 22 Oct. 2018.

[13] Rosatom, 'Homepage', [n.d.].

[14] World Nuclear Association, 'Emerging nuclear energy countries', Updated Oct. 2018.

[15] Rosatom, 'Fuel and enrichment', [n.d.].

carries out uranium enrichment and conversion services, which Techsnabexport (TENEX) provides alongside the export of nuclear fuel assemblies. Rosatom subsidiaries supply nuclear fuel to 78 reactors around the world. These are mainly Russian-designed reactors such as the VVER-440 and the VVER-1000 (or in future the VVER-1200), but also a small number of research reactors.[16] Many Western and Asian states with an established nuclear energy industry, such as the United States, the United Kingdom, Belgium, France, Japan and South Korea, have contracts with TENEX for enrichment services.[17]

Nuclear export strategy

By covering the entire nuclear fuel cycle with its integrated national supply chain, Rosatom can effectively cater both to 'nuclear newcomers', which wish to embark on a nuclear programme from the ground up, and to established nuclear countries that require specific services. For the newcomers, the 'one stop nuclear shop' concept is very appealing. Rosatom has managed to position itself as the only supplier providing an 'all-inclusive' package, which can also include flexible financing options, training opportunities and support with developing nuclear infrastructures related to safety, security, non-proliferation and export control requirements. By addressing many of the challenges posed by the complex and expensive nature of an NPP project, Rosatom has been able to penetrate new markets that other suppliers have been reluctant to move into.

Spent-fuel take-back

In addition, Rosatom is the only supplier that can take spent nuclear fuel back from overseas clients. It brings it back to Russia for temporary storage and reprocessing before returning the radioactive waste to the country of origin and keeping the separated plutonium.[18] The legal basis for the current policy has existed since 2001, when legislation was passed to allow for the temporary storage and reprocessing of foreign spent nuclear fuel and to establish a mechanism to regulate such imports.[19] This is an added incentive for newcomer states that do not possess the necessary nuclear fuel cycle infrastructure to deal with spent fuel, as it limits the type and number of facilities needed to just those required to deal with high-level waste.[20] According to Russian researchers, Russia is increasingly pushing for the inclusion of take-back provisions in agreements with nuclear newcomers that lack the necessary infrastructure.[21] There is a clause on spent fuel take-back in the contract signed with Bangladesh.[22]

In the case of Akkuyu however, it was Turkey that insisted on a spent fuel take-back provision at the time of negotiations, but this provision is yet to be completed.[23] Since arrangements for these reactors are yet to be finalized, whether the take-back will actually take place remains to be seen. In the case of Iran, the take-back clause also seeks to avoid the proliferation risks associated with recovering plutonium from spent nuclear fuel so that it cannot be used by Iran for a nuclear weapon programme.[24] The Joint Comprehensive Plan of Action (JCPOA) establishes a 15-year restriction on Iran's reprocessing activities from January 2016.

Competition

Rosatom's Western competition has dwindled in recent years. Established nuclear suppliers such as Westinghouse in the USA and Framatome (formerly Areva NP, now owned by EDF Energy) in France have suffered numerous setbacks. Bankruptcies, construction delays and cost overruns have plagued their construction plans domestically and internationally.[25] At a time when nuclear suppliers depend on overseas exports, Westinghouse has not signed a new contract since 2007 and Framatome

[16] Rosatom (note 15).

[17] Rosatom/TENEX, 'History: Company history', [n.d.].

[18] Pomper, M., *The Russian Nuclear Industry: Status and Prospects* (Centre for International Governance Innovation: Nuclear Energy Futures Papers: Ontario, Canada, Jan. 2009), pp. 28–29.

[19] Feiveson, H. et al., *Managing Spent Fuel from Nuclear Power Reactors: Experience and Lessons from Around the World* (International Panel on Fissile Materials: Princeton, NJ, Sep. 20110, pp. 74–75.

[20] OECD Nuclear Energy Agency (NEA), *The Economics of the Back End Fuel Cycle* (OECD NEA: Paris, 2013), p. 57.

[21] 'The geopolitics of nuclear energy: new dynamics of supply and demand', IISS Workshop Report, 19 Dec. 2018, p. 7.

[22] Embassy of the Russian Federation in the People's Republic of Bangladesh, 'Russia and Bangladesh sign an agreement on spent nuclear fuel', Press release, 30 Apr. 2017.

[23] Stein, A. 'Turkey's nuclear program: Challenges and opportunities,' Atlantic Council, *Issue brief* (Dec. 2016), p.8.

[24] Kerr, P., 'Iran, Russia reach nuclear agreement' *Arms Control Today*, 1 Apr. 2005.

[25] 'The world relies on Russia to build its nuclear power plants', *The Economist*, 2 Aug. 2018.

has just one contract, for two European Pressurized Reactors to be built at Hinkley Point C in the UK, once it finishes projects well underway in Finland and China.

South Korean and Chinese suppliers have been gaining some ground. South Korea's KEPCO submitted the successful tender for the construction of four units at Barakah in the UAE, the first of which is scheduled to start operations in 2019, and is well placed to win a contract in Saudi Arabia, despite moves to phase out nuclear energy at home.[26] While Chinese nuclear exports benefit from strong political and economic support, China's main export reactor, the Hualong-1, is not a tried and tested technology, which deters potential buyers.[27] Rosatom therefore currently leads the way with its proven technology, flexible business models, attractive financial packages and diplomatic tools.

Business models

Rosatom's flexible business models form part of its appeal to interested countries. The Engineering Procurement Construction model, also known as the turnkey model, is the most common. Under a turnkey contract, the supplier designs and builds the reactors following regulatory requirements before effectively 'turning over the key' to the utility company. This model is used in Iran and Bangladesh and will be implemented in the projects in Finland and Hungary. In dealings with established nuclear countries such as India and China, the client country takes on additional tasks. In the case of the Tianwan NPP in China, Jiangsu Nuclear Power Corporation took on the civil construction and installation elements of units 1 and 2.

Rosatom is currently implementing the Build-Own-Operate (BOO) contractual model at Akkuyu in Turkey. Under this model, Russia maintains ownership of the plant and expects to make a guaranteed profit by selling electricity to the utility company. Since the supplier provides everything, a BOO contract removes many of the obstacles posed by the complexity of introducing nuclear energy. Such contracts are expensive for Russia: Akkuyu is costing at least $22 billion.[28] Russian experts have expressed doubts that the BOO model will be used again in the near future.[29] Rosatom's reluctance to commit to any further BOO contracts might be the reason behind Jordan's change of plans. It now intends to build a Small Modular Reactor instead of the $10 billion two-unit NPP for which it signed a contract with Rosatom in 2015.[30]

Financing schemes

Rosatom has been able to provide generous loans backed by government subsidies. Most of these loans come from Russia's Wealth Funds, which support the national pension system. In Bangladesh, Russia is covering 90 per cent of the costs of the Rooppur NPP by providing $11.85 billion in credit out of the total cost of $12.65 billion.[31] In Hungary, Russia even suggested that it could fund 100 per cent of the estimated $12 billion investment before settling on a $10 billion loan, which is to be repaid by 2026 regardless of whether the project is online by that time.[32] In Egypt, the total cost of El Daaba is estimated to be $60 billion, $30 billion of which is for reactor construction. Russia has agreed to supply a loan of $25 billion, to be paid back over 22 years starting in 2029.[33] In Bangladesh, the loan provided by Russia represents about half the country's total outstanding external debt.[34]

Diplomatic support

Rosatom's nuclear exports benefit from the full backing of the Russian Government. Such support can be channelled during overseas visits by President Vladimir Putin and senior members of government, and when welcoming foreign delegations to Russia. This is done by including cooperation on the peaceful uses of nuclear energy on the agenda during such visits, mentioning it in public speeches or signing a Memorandum of Understanding on the issue. In October 2018, for example, during a visit to Russia by the President of Egypt, Abdel Fattah el-Sisi, implementation of the NPP contract was a natural topic for discussion.[35] When cooperation is already at an advanced stage, President Putin or a senior member of the government will attend official ceremonies

[26] Gilinski, V. and Sokolski, H., 'Facing reality in the US–Saudi nuclear agreement: South Korea', *Bulletin of the Atomic Scientists*, 10 Apr. 2018.

[27] Wubbeke, J. and Ting, G., 'China's nuclear industry goes global', *The Diplomat*, 11 Feb. 2016.

[28] Schneider and Froggatt (note 9), p. 158.

[29] IISS (note 21), p. 3.

[30] Digges, C., 'Jordan turns down a Rosatom plant, but dangles possible small reactor collaboration with Russia', Bellona, 14 June 2018.

[31] Schneider and Froggatt (note 9), p. 153.

[32] Schneider and Froggatt (note 9), p. 245.

[33] Schneider and Froggatt (note 9), p. 161.

[34] Schneider and Froggatt (note 9), p. 153.

[35] 'Putin, Egyptian leader sign "strategic" partnership treaty', Radio Free Europe/Radio Liberty, 17 Oct. 2018.

celebrating certain landmarks in the construction of an NPP or invite their counterparts to Moscow. In April 2018, Putin joined the President of Turkey, Recep Tayyip Erdogan, to watch a ceremony marking the formal start of construction at Akkuyu by video link from Ankara.[36]

III. NUCLEAR GOVERNANCE AND EXPECTED STANDARDS

Global nuclear governance encompasses national and international treaties, laws, bodies, conventions and codes of conduct that address nuclear non-proliferation, safeguards, safety, security and export controls. These instruments serve to ensure the safe, secure and peaceful use of nuclear energy, which is a right enshrined in Article IV of the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (Non-Proliferation Treaty, NPT), the cornerstone of the international nuclear governance regime.[37]

The USA has played a leading role in the development and export of nuclear technology, which has enabled it to shape the construction of global nuclear governance frameworks and push for further non-proliferation conditions on exports in bilateral agreements on nuclear energy cooperation.[38] Some Western observers therefore equate the USA's decline as an exporter with a weakening of nuclear governance norms. They do not believe that certain suppliers, in particular Russia, hold their clients to the same stringent standards as the USA.[39] This section discusses the claim that Russia's rise in the nuclear export market will adversely affect global nuclear governance norms and examines issues of nuclear governance related to Russia's increasing influence in the global market for nuclear energy and technology.

Conditions of supply

Nuclear Suppliers Group guidelines and International Atomic Energy Agency safeguards

All the framework agreements signed between Russia and the states that it works with include provisions related to compliance with export controls and non-proliferation obligations, in accordance with Nuclear Suppliers Group (NSG) guidelines.[40] The NSG brings together states with significant nuclear technology and expertise in order to develop and implement best practices related to the trade in nuclear energy and technology and to preventing proliferation. It establishes guidelines that suppliers of nuclear technology agree to abide by as a condition of supply before proceeding with transfers. The NSG is an informal and non-legally binding structure, but its members commit to implement its guidelines on a national basis by developing domestic export control regulations and enforcement mechanisms. Such guidelines include guarantees that recipient states must provide to ensure that the technology will not be used for nuclear weapon purposes, will be physically protected and will be used in ways that comply with International Atomic Energy Agency (IAEA) safeguards standards.

Since 2011, Russian framework agreements have also reflected the updated NSG guidelines, which were strengthened by including further controls on transfers of nuclear enrichment and reprocessing (ENR) facilities, material and technologies. ENR technologies pose proliferation risks since they can be used both for peaceful energy purposes and in the production of nuclear weapons. The USA attempted to further restrict nuclear exports during NSG negotiations by preventing the sale of ENR equipment and technologies to states that do not already have ENR facilities and by making ratification of an IAEA Additional Protocol a condition of supply.[41] An Additional Protocol as an addition to existing safeguards agreements significantly strengthens the IAEA's ability to detect undeclared nuclear activities and signifies a reinforced

[36] Reuters (note 2).

[37] United Nations Office for Disarmament Affairs (UNODA), Treaty on the Non-Proliferation of Nuclear Weapons (NPT), 1 July 1968, Text of the treaty.

[38] Centre for Strategic and International Studies (CSIS), *Restoring US leadership in Nuclear Energy: A National Security Imperative*, CSIS Commission on Nuclear Energy Policy in the United States (CSIS: Washington, DC, June 2013).

[39] Saha, S., 'Russia's nuclear diplomacy', *Foreign Affairs*, 2 Apr. 2017.

[40] International Atomic Energy Agency (IAEA), Communication received from the Permanent Mission of the Republic of Korea to the International Atomic Energy Agency regarding Certain Member States' Guidelines for the Export of Nuclear Material, Equipment and Technology, Nuclear Suppliers Group, INFCIR/254/Rev.13/Part 1 NSG Part 1 Guidelines, 8 Nov. 2016.

[41] Viski, A., 'The revised Nuclear Suppliers Group guidelines: A European Union perspective', *Non-Proliferation Papers*, no. 15 (May 2012), p.7.

commitment to non-proliferation by a member state.[42] The NSG did not adopt either of these restrictions but the USA has implemented them unilaterally in a bilateral agreement signed with the UAE.[43]

In contrast to other nuclear suppliers, US law requires the signing of a nuclear cooperation agreement—known as a Section 123 agreement after the section of the US Atomic Energy Act—with third countries before any nuclear trade can take place. France, Japan, Russia and South Korea often sign nuclear cooperation agreements with third countries, but they are not a legal requirement.[44] Section 123 agreements are subject to Congressional review, which gives the US Congress a window of opportunity to hold hearings on the agreement and even reject it, in which case nuclear trade cannot take place.[45]

The US–UAE Section 123 agreement requires the UAE to have an Additional Protocol in place in order to import US nuclear technology.[46] The UAE has also agreed to forgo ENR technologies. This is referred to as the 'gold standard'. Neither are requirements of US law but many advocates in the USA believe that the gold standard should be the norm in all future nuclear cooperation agreements. The stress test for whether the USA will continue to pursue this restriction, or instead insist on customer states adopting an Additional Protocol, will be any nuclear agreement it signs with Saudi Arabia. The restrictions featured in the agreement with the UAE are, thus far, an exception rather than the rule among suppliers. Russia has not required an Additional Protocol from either Iran or Egypt, although Iran has been implementing one provisionally since 2015 under the terms of the JCPOA.

India is a nuclear possessor state outside the NPT regime but received an NSG exemption on the full scope safeguards requirement in 2008, which makes it an interesting case. Both Russia and the USA have engaged with India on peaceful nuclear cooperation. The NSG was originally created in 1978 in response to the first Indian nuclear explosive test in order to provide guidelines beyond the NPT on nuclear trade.[47] The guidelines were updated in 1992 to include a requirement on end-user states to adopt full-scope IAEA safeguards. Even so, Russia proceeded with its export plans to India, claiming that the deal had been finalized before 1992 and was therefore allowed under a 'grandfathering' clause—a claim that was strongly contested by the USA.[48] Driven by a commercial desire to export nuclear technology to India, the USA started negotiating a Section 123 agreement with India in 2005 and applied diplomatic pressure in the NSG for an official exemption for India. In contrast to other agreements, the Section 123 agreement with India allows the reprocessing of transferred nuclear materials. India's safeguards agreement with the IAEA also differs from the norm, limiting the number of facilities available for inspection by the IAEA. Russia and the USA, as well as other major suppliers such as France, Japan and South Korea, have since supported India's application for membership of the NSG. To a certain extent, these actions by major suppliers question whether the initial vision for the NSG—to go beyond the NPT and ensure strict export controls—has been overtaken by the commercial interests of a handful of suppliers.[49] The development of Saudi Arabia's nuclear plans could be another litmus test for major suppliers in terms of balancing competing commercial interests with strict non-proliferation norms.

Expected standards

Nuclear safety and security

Nuclear safety and security are at the core of the global nuclear governance regime. Nuclear safety norms are mostly outlined in the Convention on Nuclear Safety (CNS).[50] States join the CNS voluntarily but become legally bound once they have ratified it. The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

[42] IAEA, 'Additional Protocol'.

[43] NSG guidelines require instead recipient states to either bring into force an Additional Protocol or to be 'implementing appropriate safeguards agreements in cooperation with the IAEA, including a regional accounting and control arrangement for nuclear materials, as approved by the IAEA Board of Governors' (IAEA note 40, p. 3).

[44] Glasgow, J., Teplinsky, E. and Markus, S., 'Nuclear export controls: A comparative analysis of national regimes for the control of nuclear materials, components and technology', Pillsbury Winthrop, Shaw Pittman LP, Washington, DC, Oct. 2012, p. 49.

[45] Kerr, P. and Niktin, M. B. D, *Nuclear Cooperation with Other Countries: A Primer*, RS22937 (Congressional Research Service: Washington, DC, 3 April 2018), pp. 3–4.

[46] Agreement for Cooperation between the Government of the United States of America and the Government of the United Arab Emirates Concerning Peaceful Uses of Nuclear Energy, 21 May 2009.

[47] Hibbs, M., *The Future of the Nuclear Suppliers Group* (Carnegie Endowment for International Peace: Washington, DC, 2011).

[48] Hibbs, M., 'A more geopoliticized Nuclear Suppliers Group', *Strategic Trade Review*, 14 Dec. 2017.

[49] Hibbs (see note 47), p. 8.

[50] Convention on Nuclear Safety, 17 June 1994.

(Joint Convention) contains further provisions on the safe storage and transport of nuclear waste.[51]

International nuclear security norms, which focus on preventing the theft of nuclear material, insider threats and nuclear terrorism, are outlined in the Convention on the Physical Protection of Nuclear Material (CPPNM), its 2005 amendment and the International Convention on the Suppression of Acts of Nuclear Terrorism (ICSANT).[52] The international nuclear security conventions rely on voluntary implementation and do not include any mandatory assessments or reviews. Russia, along with all the major international suppliers (the USA, France, China, Japan and South Korea) is a signatory to all the nuclear safety and security conventions and encourages its clients to do the same. Russia's record in terms of adherence to international norms, however, is not always sufficient to persuade its customers to follow its lead.

Russian framework agreements do not require purchaser countries to be a signatory to any treaty or convention beyond the NPT (with the exception of India). They must have a Comprehensive Safeguards Agreement with the IAEA. However, few other suppliers officially call for purchasing countries to sign or ratify any further agreements. NSG guidelines explicitly call for commitments to IAEA safety standards and adherence to 'accepted international safety conventions', but only specifically mention the CNS in the context of ENR transfers (Article 6, a, vi).[53] On nuclear security, the guidelines only state under Article 13 that: 'Suppliers should promote broadest adherence to the respective international instruments, inter alia, to the Convention on the Physical Protection of Nuclear Material, as well as implementation of INFCIRC/225, as amended from time to time'. Requiring further commitments can be politically difficult when many 'nuclear have-nots' are already dissatisfied with the pace of nuclear disarmament on the part of the nuclear weapon states, which also happen to be the main suppliers of civil nuclear technology. When calls were made for the CNS to be made mandatory, suppliers were the ones that pushed back.[54]

[51] Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, 24 Dec. 1997.

[52] Convention on the Physical Protection of Nuclear Material, May 1980; Amendment to the Convention on the Physical Protection of Nuclear Material, 9 May 2016; and International Convention for the Suppression of Acts of Nuclear Terrorism, 2005.

[53] IAEA (note 40).

[54] IISS (note 21), p. 5.

Among Russia's main clients, India, Bangladesh and Turkey have ratified all but the Joint Convention and Belarus all but the amendment to the CPPNM. Iran and Egypt have signed few conventions and have not ratified any of the above-mentioned. Other countries that have a framework agreement in place with Russia have mixed records. Uzbekistan is not a party to the CNS and Sudan has not yet ratified any of the conventions. Prospective newcomers Nigeria and Ghana have been proactive in joining these conventions as well as undergoing an IAEA-led Integrated Nuclear Infrastructure Review, which carries out an assessment of the infrastructure required to initiate a nuclear energy programme, including legal and regulatory frameworks.

Other factors

While Rosatom claims to uphold strict nuclear governance norms and urges the countries it does business with to do the same, some elements are beyond its control. In the case of nuclear newcomers in particular, when determining whether they are equipped to handle the infrastructure required to produce nuclear energy and ensure the safety and security of nuclear material, other elements must be taken into consideration. These include domestic factors, such as export control implementation, level of corruption and political stability, and external threats. For instance, according to the Peddling Peril Index, which evaluates the robustness of a country's strategic export controls, Egypt, Sudan and Iran, which is no longer a newcomer, are classified as having non-existent or severely deficient legislation.[55] Some countries, such as Saudi Arabia and Zambia, are assessed as having serious deficiencies in their export control legislation. Moreover, threats from non-state actors are more severe in geographical areas where conflicts are ongoing, such as Nigeria or Sudan, and in countries close to conflict areas, such as Saudi Arabia or Turkey. Nuclear reactors can be prime targets for terrorist attacks. The Houthis might not have struck the Barakah NPP in the UAE as they claimed to have done in December 2017, but the falseness of the claim does not preclude the possibility that they might try to do so at a later date.[56] These domestic factors and external threats could pose serious proliferation risks

[55] Albright, D. et al. 'The Peddling Peril Index (PPI), 2017', Institute for Science and International Security, 31 Jan. 2018.

[56] 'Yemen's Houthis claim to fire missile toward unfinished Abu Dhabi nuclear reactor', *Japan Times*, 3 Dec. 2017.

that should not be underestimated when evaluating a country's readiness to initiate a nuclear power programme.

Singling out Russia as a supplier on the basis that it does business with countries that do not yet adhere to certain nuclear governance standards is disingenuous given that other suppliers engage with most of these countries, with the notable exception of Sudan. The USA has a nuclear cooperation agreement in place with India and Egypt, and is actively seeking to do business with Saudi Arabia. Claims that Russian nuclear export activities will lead to a weakening of global nuclear standards appear thus far to be unfounded. However, some of the countries with which Russia has engaged on nuclear cooperation more substantially than other suppliers present a worrying profile in terms of adherence to nuclear safety and security norms. The responsibility for ensuring that any nuclear trade with such countries is established in the fullest compliance with nuclear governance standards rests with the nuclear suppliers, who will need to address these issues in a practical way within the wider framework of the non-proliferation regime.

IV. GEOPOLITICAL IMPLICATIONS OF RUSSIAN NUCLEAR EXPORTS

Western observers often associate Rosatom's nuclear exports with a wider Russian geopolitical agenda. Russian nuclear power projects have been described as attempts 'to build spheres of energy dependence', or 'to influence and bind countries around the world to its irredentist and revanchist aims'.[57] While the strategic aspects of nuclear energy should not be downplayed, assessments of Russian intentions have at times been alarmist, and are often connected to ongoing tensions between the West and Russia on other strategic issues. This section examines the rationale for and limits to using nuclear energy as a geopolitical tool, before assessing how and to what extent Russia has been able to use NPP projects in this way.

The perception that NPPs can be geopolitical assets is based on the longevity of an NPP project and the degree of control it might provide over a critical element of a country's economy. NPPs generally have a planned operating cycle of 60 years. When other elements of the NPP's life cycle are taken into account, which range from design and construction to operation and decommissioning, this establishes a relationship between supplier and buyer that can last for almost a century. This will vary in length depending on the type of contract, whether fuel supplies are also part of the deal and the loan conditions. In most cases, the relationship will be 30–40 years at the very least, and help cement ongoing bilateral relations throughout that time.

In many cases, as has been the case in China, India and Iran, a successfully completed contract for a certain number of reactor units can lead the way to new contracts, further lengthening the bilateral relationship. The need for new contracts—with returning customers but especially with new ones—makes it difficult to use NPPs in foreign countries for geopolitical leverage. The export of nuclear reactors and services is a key part of Russia's export strategy and generates substantial tax revenues.[58] It provides a stable source of income for an economy highly dependent on the export of hydrocarbons that are subject to price fluctuations. Russia's domestic nuclear industry and overall economy benefit from the sale of reactors abroad and this in turn ensures that Rosatom can continue to develop its economies of scale, thereby improving its offer and competitiveness in the global market. Russia would greatly disadvantage its own industry, credibility and reputation if it were to use Rosatom and its overseas projects as geopolitical tools.

Given their long-term and expensive nature, NPP projects can provide a basis for further cooperation on similarly sensitive and costly projects. While it is difficult to determine whether the existence of NPP projects has served to facilitate other trade deals to a significant degree, arms agreements with Turkey and Bangladesh have been signed in parallel with the implementation of a Russian NPP project. In December 2017, Turkey signed an agreement with Russia worth an estimated $2.5 billion on the purchase of S-400 surface-to-air missile batteries.[59] Russia is not one of Turkey's major arms suppliers—the USA, Spain and Italy usually supply more.[60] Bangladesh, which buys

[57] Freeman, M., 'How Russia, China use nuclear reactors to win global influence', Defense One, 13 July 2018; and Saha, S., 'Russia's nuclear diplomacy', *Foreign Affairs*, 2 Apr. 2017.

[58] Minin, N. and Vlcek, T., 'Determinants and considerations of Rosatom's external strategy', *Energy Strategy Reviews*, vol. 17 (Sep. 2017), p. 38.

[59] Gumruku, C. and Toksabay, E., 'Turkey, Russia sign deal on supply of S-400 missiles', Reuters, 29 Dec. 2017.

[60] Wezeman P. D. et al. 'Trends in international arms transfers, 2017', SIPRI Fact Sheet (Mar. 2018), p. 6.

most of its arms from China, has purchased various systems from Russia, such as Yak-130 training and light attack aircraft, R-77 BVR missiles and Mi-17 helicopters.[61] Some of these purchases were financed through a $1 billion loan that was granted alongside an initial $500 million loan for the construction of the Rooppur NPP in 2013.[62]

Concerns about Russia's possible use of overseas NPP projects as geopolitical tools also stem from the BOO business model, which Rosatom is implementing in Turkey. In contrast to turnkey projects, under a BOO model ownership of the plant remains with the operator, which is Russian-owned. Two US nuclear specialists recently wrote that this is an attempt to build 'valuable Russian assets on foreign soil, creating defensible grounds for the Kremlin to introduce a physical troop presence in regions of strategic interest'.[63] The importance of Akkuyu to Russian–Turkish relations was demonstrated when the Turkish Air Force shot down a Russian jet in November 2015. Preparations were put on hold but the project's commercial and political value played a role in avoiding an escalation in tensions. Akkuyu is the only Russian NPP project to be implemented using such a model. While other countries have expressed an interest, Rosatom is unlikely to implement further BOO projects in the near future due to the significant financial strain they would put on the organization.

Russia's past use of other energy resources as leverage is a major source of concern that feeds into the view of nuclear reactors as geopolitical assets. Russia has cut off gas supplies to Ukraine on several occasions, in 2006, 2008–2009 and 2014. This has raised concerns that in countries where the electricity sector depends, or will depend, to a large extent on Russian nuclear fuel imports, Russia might exert its power in a similar fashion. There are factors inherent to the case of nuclear energy that make it less likely that NPPs could be used as political or economic leverage in the same way as gas. In terms of nuclear fuel, one-third of an NPP's fuel assemblies are replaced every 18–24 months.[64] This means that Russia would not be able to cut off supplies from one day to the next in the same way as it can with the gas pipeline infrastructure.

At a time of heightened tensions between Russia and Ukraine in 2014, a senior Russian official threatened to cut off nuclear fuel supplies to Ukraine.[65] All 15 operational nuclear reactors in Ukraine are Soviet/Russian-made. They generate 55 per cent of Ukraine's electricity. It is notable, however, that the threat was never carried out. For countries that have signed fuel supply contracts with a single supplier for the entire lifespan of their NPPs, diversification of the nuclear fuel market now offers alternative solutions. Rosatom's TVEL and Westinghouse have both invested in the manufacture of fuel for each other's reactors. TVEL signed a contract with Sweden's Vattenfall in 2016.[66] Westinghouse has been working on alternatives to TVEL-made fuel for VVER-type reactors. In Ukraine, Westinghouse has been working since 2001 to develop fuel assemblies for the country's VVER-1000 reactors. Ukraine has not fully replaced Russian-made fuel but a VVER-1000 unit was loaded with fuel entirely produced by Westinghouse for the first time in 2018.[67]

V. CONSOLIDATING NUCLEAR GOVERNANCE: EU INSTRUMENTS

In response to Russia's increasing dominance of the nuclear export market, US commentators have highlighted actions the USA should take to energize its own nuclear industry both at home and abroad. They see these steps as key to ensuring US leadership in setting norms on and standards for nuclear governance as well as an opportunity to compete on the international market again.[68] Experts have variously recommended investing in nuclear innovation, streamlining the administrative process for negotiating nuclear cooperation agreements and providing new funding opportunities through the US Export-Import Bank.[69] These recommendations see a strong nuclear industry as necessary to ensure high standards of governance. There are, however, opportunities for actors other than major suppliers to consolidate

[61] Bin Mushtaq, S., 'Bangladesh's ambitious military modernization drive', *The Diplomat*, 9 Jan. 2018.

[62] 'Russia grants Bangladesh $1 billion loan for weapons: Putin', Reuters, 15 Jan. 2013; and Bin Mushtaq (note 61).

[63] Gallucci, N. and Shellenberger, M., 'Will the west let Russia dominate the nuclear market?', *Foreign Affairs*, 3 Aug. 2017.

[64] Nuclear Energy Institute, 'Nuclear Fuel'.

[65] 'South Ukraine 3 fully loaded with Westinghouse fuel', World Nuclear News, 20 July 2018.

[66] 'Russia enters Sweden's nuclear fuel market', Nuclear Engineering International, 20 Dec. 2016.

[67] World Nuclear News (note 65).

[68] Centre for Strategic and International Studies (note 38).

[69] Holgate, L. S. H. and Saha, S., 'America must lead on nuclear energy to maintain national security', *Washington Quarterly* (Summer 2018), pp. 18–19.

existing nuclear governance norms and ensure the safe, secure and proliferation-resistant use of nuclear energy for peaceful purposes.

The EU is one such actor. In the past two decades, the EU has sought increasingly to address issues of non-proliferation through its institutional structures and budget instruments, and has developed a reputation as a global non-proliferation actor.[70] Energy choices, nuclear or otherwise, remain within the purview of individual member states. In the field of nuclear governance, however, the EU has developed a set of instruments for improving nuclear safety and security, and strengthening non-proliferation standards. These instruments can serve to address the risks associated with civil nuclear energy projects and the channels through which they are implemented can be used to improve cooperation on these issues with Russia, especially in the absence of a political basis for enhanced collaboration. This section outlines some of the tools used by the EU to address the inherent problems posed by an increase in the number of nuclear newcomers, most of which are recipients of Russian technology, and, to a lesser extent, issues related to energy security. The objectives of these instruments are to improve nuclear governance norms, serve as a facilitator for dialogue on issues related to non-proliferation and promote energy security objectives.

Initiatives to improve nuclear governance

The 2003 EU Strategy against Proliferation of Weapons of Mass Destruction (WMD) still defines the core tenets of EU policymaking in the field of non-proliferation. In its 'living action plan', it details several measures directly and indirectly related to improving nuclear governance.[71] Action number four highlights the need to strengthen export control policies and practices, and supplier regimes by, among other things, 'setting up a programme of assistance to States in need of technical knowledge in the field of export control' and 'working to ensure that the Nuclear Suppliers Group make the export of controlled nuclear and nuclear related items and technology conditional on ratifying and implementing the Additional Protocol'. EU member states make up more than half the 48-member NSG and the European Commission also participates as a permanent observer. Given their diverging positions on nuclear energy and trade, however, finding consensus among the EU member states can be difficult. As the NSG continues to discuss the prospects for India's membership, the EU and its member states have a role to play in ensuring that strict non-proliferation goals are upheld, especially with regard to ENR technologies, and in working to maintain the legitimacy of the export control regime. This is also in the interests of other suppliers, including Russia, with which the EU should seek to cooperate in order to bridge capacity gaps particularly in terms of strategic trade controls relating to dual-use technologies. Within the NSG, the EU should also continue to highlight the importance of the international legal non-proliferation regime, which includes IAEA safeguards and conventions with the NPT at its core.

While its member states retain sovereignty over their choice of energy sources, the EU has worked to establish common approaches to non-proliferation, nuclear safety and nuclear security, the latter to a lesser extent as it remains a national competence. The EU has called for the promotion of common approaches in the various communications that frame its external energy policies, such as the 2007 'An Energy Policy for Europe' and the 2010 'EU Energy Policy 2020'.[72] The latter calls on the EU to continue to be a world leader in developing systems for safe nuclear power by 'promoting legally binding nuclear-safety, security and non-proliferation standards worldwide' through European Commission initiatives aimed at 'encouraging partner states to make international nuclear safety, security and non-proliferation standards and procedures legally binding and effectively implemented around the globe'.

Nuclear security and non-proliferation

The EU WMD strategy highlights similar initiatives in the field of nuclear security by supporting international initiatives that aim to identify, control and intercept illegally trafficked WMD as well as related technologies and materials. In 2010, the EU launched its Chemical, Biological, Radiological and Nuclear Centres of Excellence (CBRN COE) to engage

[70] For an in-depth review of the implementation of non-proliferation objectives by EU actors see Grip, L., 'Mapping the European Union's institutional actors related to WMD non-proliferation', *EU Non-Proliferation Papers* no. 1 (May 2011).

[71] Council of the European Union, 'EU strategy against proliferation of weapons of mass destruction', 15708/03, Brussels, 10 Dec. 2003, p. 11.

[72] European Commission, 'An energy policy for Europe', 10 Jan. 2007; and European Commission, 'Energy 2020: A strategy for competitive, sustainable and secure energy', 2010, COM/2010/0639final.

partner countries in mitigating the risks related to CBRN materials.[73] The CBRN COE have worked with 59 partner countries on 65 different projects to provide training and technical support in CBRN threat response and strengthen export controls, among other things. The EU P2P Export Control Programme is one of the largest projects in the CBRN COE programme. It oversees a capacity-building programme on control of the export of dual-use goods.[74] The programme benefits from a network of experts across the EU that provides technical expertise on activities that support the drafting of export control legislation, the training of customs and licensing officials and the exchange of good practices. Such projects address some of the common governance issues found in certain countries noted in section II. Some CBRN COE projects, such as projects 28 and 60, have had a nuclear security focus while others have included nuclear security capacity-building skills among their objectives. Project 60, which supports the strengthening of nuclear security in East and Central African countries, is particularly notable as it involves countries actively engaged in talks with Russia, such as Ghana, Zambia and Uganda, and seeks to provide support with implementing international safeguards and conventions.[75] This project would benefit from direct cooperation with Russia and Rosatom, which is not currently envisaged. Furthermore, the European Nuclear Security Training Centre (EUSECTRA), which aims to improve EU member states' nuclear security capabilities, occasionally provides training for non-member states.[76]

The EU also supports nuclear security and other non-proliferation projects through the IAEA, separate from individual member state contributions. Between 2007 and 2013, the EU provided €34.5 million ($39.1 million) to the IAEA for nuclear security and €24.3 million ($27.6 million) for technical cooperation, which was mainly to repatriate spent fuel from Vinca in Serbia to Russia and for the subsequent decommissioning of the facility. This was an important example of successful collaboration between Russia, the USA and the IAEA on reducing radioactive and proliferation risks.[77] By providing funding to the IAEA, the EU could target specific programmes aimed at newcomer countries. Compared to direct cooperation, the IAEA can provide a more neutral framework in which the EU and Russia could work together.

Nuclear safety

The EU is also continually striving to promote high nuclear safety standards both internally and abroad. The European Atomic Energy Community (Euratom) has led and funded initiatives to improve nuclear safety overseas, notably through the Instrument for Nuclear Safety Cooperation (INSC) which was created in 2007. The INSC expanded the geographical scope of previous instruments used for nuclear safety cooperation, which was limited to countries in the EU's immediate neighbourhood. It was created to address the likely emergence of newcomer countries that lack adequate nuclear infrastructure and nuclear safety cultures.[78] In 2007–2013, the first iteration of INSC, INSC I, had a budget of €524 million ($594.5 million) to support activities that sought to improve nuclear safety, radiation protection, radioactive waste management, nuclear safeguards and emergency preparedness.[79] Under INSC I, the EU led projects in Eastern Europe, Central Asia, South America, and East and South East Asia. More than half the budget was spent on projects in Ukraine, however, since proximity to the EU remained an important criterion.[80] INSC II, the new iteration of the programme for the period 2014 to 2020, has a budget of €225.32 million ($255.67 million) and similar aims. These projects ensure that countries that wish to embark on the path to nuclear energy can do so safely.

Recent projects have supported nuclear regulators and capacity building through training in Egypt, Jordan and Morocco, all of which are countries that have expressed varying levels of interest in moving forward with nuclear energy plans with Russian assistance.[81] While INSC projects can only play a

[73] EU P2P export control programmes, CBRN Centres of Excellence.

[74] EU P2P Export Control Programme for Dual Use Goods [n.d.].

[75] EU CBRN Center of Excellence of Eastern and Central Africa (EU CBRN ECA), 'The Project 60' [n.d.].

[76] 'The European Nuclear Security Training Centre (EUSECTRA),' EU Science Hub, Updated 25 Jan. 2019.

[77] 'Overview of EU support to the International Atomic Energy Agency (IAEA) in the field of nuclear safety, safeguards, security and Technical cooperation financed during the current Multiannual Financial Framework 2007–2013', Fact sheet, 25 Jan. 2013.

[78] Parry, M., 'Instrument for nuclear safety cooperation', European Parliamentary Research Service, July 2017.

[79] European Commission, Joint Research Centre, 'INSC', Updated 12 Dec. 2018.

[80] Vrijen, J. et al. 'Accompanying document to the report from the Commission to the European Parliament and the Council on the evaluation of the implementation of the Council Regulation (Euratom) n°300/2007 (Instrument for Nuclear Safety Cooperation) in the period 2007–2013', Italtrend, Mar. 2014, p. 12.

[81] European Commission, *Building Nuclear Safety Together: The Instrument for Nuclear Safety Cooperation (INSC)* (European

small part in developing and improving nuclear safety, safeguards, waste management and the capacity of independent regulatory bodies, they should continue to evolve based on states' expressed interest in nuclear energy. African states in particular, such as Sudan, Nigeria, Kenya and Ghana, which are all investigating developing a nuclear power programme with support from Rosatom, could benefit from further support. The EU could do more to tailor assistance to these countries to enhance existing norms and standards while also coordinating with Russia on the provision of technical and legal training and avoiding overlap.

Beyond the INSC, nuclear safety is an area where the EU can work jointly with the IAEA and Rosatom to address the specific needs of countries with little experience of nuclear power. Further dialogue on nuclear safety between the EU and Russia has taken place under a 2001 agreement signed between Euratom and Russia.[82] The EU–Russia energy dialogue was initiated in 2001 but indefinitely paused in 2014 following events in Ukraine. It provided another platform for discussions on safety issues and, more importantly, on energy security issues.

Energy security

The EU's main concern with regard to Russian nuclear exports has been the issue of dependence on Russian nuclear fuel supplies. In the EU's 2014 Energy Security Strategy, the European Commission stressed the importance of fuel supply diversification and the need for new NPPs not to depend solely on Russian fuel.[83] A key European initiative in this regard is the European Supply of Safe Nuclear Fuel (ESSANUF) project.[84] This is an important EU initiative that seeks to promote the diversification of fuel sources and reduce reliance on Russian nuclear fuel. There are 18 Russian-designed reactors in the EU: 14 VVER-440 and 4 VVER-1000.[85] All 18 rely on Russia for their supply of nuclear fuel, which has to be reloaded approximately every two years. In 2015, Euratom provided €2 million ($2.2 million) to a consortium of European industries, consultancies and research institutes under the ESSANUF project. Coordinated by Westinghouse Sweden, the project developed an alternative source of nuclear fuel for Russian-designed VVER-440 reactors and aims to make the licensing process for this alternative fuel cheaper and easier than it is currently.

VI. CONCLUSIONS

Rosatom's global rise in the nuclear technology and energy market has been based on a concerted export strategy reinforced by past projects and a tailored approach that is particularly inviting to nuclear newcomers. While Russia's nuclear energy relationships can, to a certain extent, be used to make political gains or as economic leverage, Rosatom—and by extension Russia—have strong incentives not to use the nuclear trade for such purposes. There is currently little evidence that Russia has used nuclear energy for geopolitical purposes in the same concerted way as it has used gas supplies. While there are some concerns about the nature of BOO contracts, the prospects for an increase in the number of new nuclear builds, nearly all with Russian support, pose more immediate risks in terms of nuclear governance as these are taking place in countries that are new to nuclear energy. Some of these countries do not have an Additional Protocol in place, are not adhering to international conventions on nuclear safety or security and have important knowledge and capability gaps in terms of the nuclear infrastructure or regulatory oversight needed to manage a nuclear power programme. All suppliers have a vested interest in ensuring that NPP projects are implemented in a safe, secure and proliferation risk-free manner.

While the EU cannot and should not replace the role of a nuclear supplier or that of the IAEA, it has proved itself adept at using soft power to address the proliferation, safety and security risks posed by nuclear energy in its immediate neighbourhood and beyond. Non-proliferation objectives are emphasized throughout the EU's external communications. Projects funded through the INSC and the CBRN COE have targeted potential nuclear newcomers to help them improve their nuclear safeguards, regulatory infrastructure and export control legislation. Through the IAEA, the EU supports projects with similar aims, to enhance safeguards, safety and security, as well

Commission: Brussels, Dec. 2013).

[82] Agreement for cooperation between the European Atomic Energy Community and the Government of the Russian Federation in the field of nuclear safety, signed on 3 Oct. 2001, *Official Journal of the European Communities*, L287, 31 Oct. 2001.

[83] Communication from the Commission to the European Parliament and the Council, 'European Energy Security Strategy', 28 May 2014.

[84] ESSANUF, Project page, [n.d.].

[85] Westinghouse, 'Westinghouse-led group wins EU backing to diversify nuclear fuel supply to VVER reactors', 29 June 2015.

as technical cooperation. The IAEA also provides many existing platforms aimed at helping nuclear newcomers, which the EU could target through funding contributions. Projects developed by the IAEA, but also through EU-specific instruments such as the INSC and the CBRN COE, provide possible avenues for cooperation with Russia on non-proliferation and nuclear governance, partly free from the political constraints that have otherwise made EU–Russia interactions difficult.

In international non-proliferation forums, particularly the NSG and the IAEA, the EU should pursue a concerted dialogue with Russia on coordinating the promotion and implementation of effective nuclear governance and adherence to international conventions—especially in times of political tension or heightened competition. Given the increasing pace of the signing of new agreements and contracts with Rosatom, the EU should provide similar continuous and direct engagement on issues linked to nuclear governance for countries that opt for nuclear energy.

ABBREVIATIONS

BOO	Build-Own-Operate
CBRN	Chemical Biological Radiological and Nuclear
CBRN COE	Chemical, Biological, Radiological and Nuclear Centres of Excellence
CNS	Convention on Nuclear Safety
CPPNM	Convention on the Physical Protection of Nuclear Material
ENR	Nuclear Enrichment and Reprocessing
ESSANUF	European Supply of Safe Nuclear Fuel
Euratom	European Atomic Energy Community
EUSECTRA	European Nuclear Security Training Centre
IAEA	International Atomic Energy Agency
ICSANT	International Convention on the Suppression of Acts of Nuclear Terrorism
INSC	Instrument for Nuclear Safety Cooperation
JCPOA	Joint Comprehensive Plan of Action
NPP	Nuclear power plant
NPT	Non-Proliferation Treaty
NSG	Nuclear Suppliers Group
TENEX	Techsnabexport
UAE	United Arab Emirates
WMD	Weapons of Mass Destruction

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A EUROPEAN NETWORK

In July 2010 the Council of the European Union decided to support the creation of a network bringing together foreign policy institutions and research centers from across the EU to encourage political and security-related dialogue and the long-term discussion of measures to combat the proliferation of weapons of mass destruction (WMD) and their delivery systems. The Council of the European Union entrusted the technical implementation of this Decision to the EU Non-Proliferation Consortium. In 2018, in line with the recommendations formulated by the European Parliament the names and the mandate of the network and the Consortium have been adjusted to include the word 'disarmament'.

STRUCTURE

The EU Non-Proliferation and Disarmament Consortium is managed jointly by six institutes: La Fondation pour la recherche stratégique (FRS), the Peace Research Institute Frankfurt (HSFK/ PRIF), the International Affairs Institute in Rome (IAI), the International Institute for Strategic Studies (IISS), the Stockholm International Peace Research Institute (SIPRI) and the Vienna Center for Disarmament and Non-Proliferation (VCDNP). The Consortium, originally comprised of four institutes, began its work in January 2011 and forms the core of a wider network of European non-proliferation and disarmament think tanks and research centers which are closely associated with the activities of the Consortium.

MISSION

The main aim of the network of independent non-proliferation and disarmament think tanks is to encourage discussion of measures to combat the proliferation of weapons of mass destruction and their delivery systems within civil society, particularly among experts, researchers and academics in the EU and third countries. The scope of activities shall also cover issues related to conventional weapons, including small arms and light weapons (SALW).

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