REPORT

Developing Nuclear Energy in Estonia

An Amplifier of Strategic Partnership with the United States?

Tomas Jermalavičius | Max Bergmann | Peter Crail | Thomas O'Donnell | Tomas Janeliūnas | Tõnis Idarand |

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List of Abbreviations, Acronyms and Units of Measurement

3SI – Three Seas Initiative
BOO – build-own-operate
BRELL – Belarus-Russia-Estonia-Latvia-Lithuania
BWR – boiling water reactor
CCDCOE – Cooperative Cyber Defence Centre of Excellence
CEE – Central and Eastern Europe
CFSP – Common Foreign and Security Policy
CGN – China General Nuclear Power Group
CO2 – carbon dioxide
COP26 – conference of the parties
DFC – Development Finance Corporation
DOE – Department of Energy
EBRD – European Bank of Reconstruction and Development
ECIP – Estonian Citizens' Initiative Portal
EdF – Électricité de France
EDF – Environmental Defense Fund
EIA – environmental impact assessment
EPR – European Pressurised Reactor
EU – European Union
FBI – Federal Bureau of Investigations
FEED – front-end engineering and design
FIRST – Foundational Infrastructure for Responsible Use of Small Modular Reactor Technology
FMF – Foreign Military Financing
FOAK – first-of-a-kind
FSRU – floating storage and regasification unit
GICNT – Global Initiative to Combat Nuclear Terrorism
GIPL – Gas Interconnector Poland-Lithuania
GW – gigawatt
IAE – International Energy Agency
IAEA – International Atomic Energy Agency
IMET – International Military Education and Training
IPS/UPS – Integrated Power System / United Power System
IRDP – International Regulatory Development Partnership
ISN – International Security and Non-Proliferation [Bureau]
JRC – Joint Research Centre
KEPCO – Korea Electric Power Corporation
LNG – liquified natural gas
MENA – Middle East and North Africa
MOU – memorandum of understanding
MW – megawatt
NATO – North Atlantic Treaty Organisation
NCA – Nuclear Cooperation Agreement

NEPIO – Nuclear Energy Program Implementing Organization
NIMBY – not-in-my-backyard
NPP – nuclear power plant
NPT – Nuclear Non-proliferation Treaty
NRC – Nuclear Regulatory Commission
NS – Nord Stream
NSDC – National Security and Defence Committee
NSG – Nuclear Suppliers Group
NSSS – nuclear steam supply system
O&G – oil and gas
OECD – Organisation for Economic Cooperation and Development
OPEC – Organisation of the Petroleum Exporting Countries
OPG – Ontario Power Generation
PEJ – Polskie Elektrownie Jadrowe
PEP2040 – Polish Energy Policy 2040
PiS – Prawo i Sprawiedliwość [Law and Justice]
PO – Platforma Obywatelska [Citizen Platform]
P-TECC – Partnership of Transatlantic Energy and Climate Cooperation
PWR – pressurised water reactor
R&D – research and development
RR – Rolls Royce
RSRP – Radiation Sources Regulatory Partnership
SMR – small modular reactor
TWh – terawatt-hour
UC – universal canister
UK – United Kingdom
US – United States
USTDA – United States Trade and Development Agency
VSD – Valstybės saugumo departamentas [State Security Department]
WMD – weapons of mass destruction

Executive Summary

Estonia's climate neutrality commitments and its simultaneous pursuit of national security mean that it will need to develop and cultivate new zero- or low-carbon, affordable, secure and safe domestic sources of energy. Nuclear energy is increasingly regarded as one of the critical ingredients of successful transition to climate-neutral energy system and as a viable part of the future decarbonised mix of energy supply. Therefore, Estonia is officially considering the possibility to adopt nuclear energy generated by new-design Small Modular Reactors (SMR).

This choice, however, is not purely environmental, economic or technical, but also has geopolitical implications. It would create new long-term inter-dependencies with foreign partners which could represent fresh opportunities for closer cooperation in security and foreign policy domain, but also could create some new political, reputational and national security risks. This geopolitical dimension is of particular importance to countries such as Estonia that seek greater involvement of key allies such as the United States, United Kingdom, France, and Germany in the Nordic-Baltic area to counter the geopolitical pressure from Russia and, increasingly, China.

The report assumes that Estonia might eventually opt for nuclear energy and would choose the US as its SMR technology supplier. It explores how Estonia's foreign and security policy interests would benefit from a potential adoption of nuclear energy and development of technological and commercial relations in this field with the US. The report's main findings regarding the opportunities in relation to the US are the following:

- This would resonate with the bipartisan political consensus in the US over nuclear energy in climate and energy policy and align with the US push for export-oriented SMR technology development that underpins its efforts to regain the eroded competitive edge in civilian nuclear energy technology over China and Russia.

- This would represent a chance for Estonia to position itself at the forefront of the US nuclear technology ambitions and help create a new Estonian (or Estonia-centred) industrial and innovation ecosystem integrated with the US and transatlantic supply chains.

- There would be possibilities for Estonia to draw upon robust and accessible federal funding mechanisms for nuclear technology development and export support, partner capacity-building, and nuclear safety and security.

- This decision would provide substance and focus to cooperation on energy security that would go beyond the current (temporary) emphasis on LNG supply and would align with the geopolitical and geo-economic goals of the Three Seas Initiative (3SI).

- The decision would give an additional impetus for bilateral cooperation in countering hybrid threats: in intelligence sharing, counter-espionage, counter-terrorism, cybersecurity, non-proliferation, countering disinformation, and even military planning and preparedness.

- There could also be overall higher political attention from key US policymakers to Estonia's and Baltic regional security needs, somewhat mitigating the impact of the long-term gradual US pivot to Asia-Pacific.

The report also maps various potential risks in relations with several key fellow member states of the European Union that may arise from Estonia turning to nuclear power as a major source of energy and to the US for a technological solution. It considers how certain structural issues in national energy policies and divergent geopolitical perspectives of Germany, France and Poland—as well as some persistent characteristics of intra-European relations manifest through the EU's common policies—may impair or facilitate Estonian nuclear aspirations. While the report finds that France's pro-nuclear stance, Poland's own nuclear aspirations, and emerging pragmatism of the EU Commission on nuclear energy are favourable factors, it also identifies several risks among which are:

- Germany's anti-nuclear stance based on "renewables-only" ideology and related geo-economic interests built on the tenets of Energiewende (i.e. maximising the renewable technology exports), as well as a lingering instinct to countervail the US security role in Europe through parochial energy and economic policies.

- French geopolitical perspective sceptical of the US role in Europe, and the ensuing push for greater European technological and energy sovereignty, with the French-led European SMR cooperation efforts and French SMR models as one of its strands.

- Poland's potential to dominate the US nuclear energy interests and political attention due to the scale of its envisioned national nuclear energy programme and due to Poland's central role in the 3SI.

- The EU's continuing ambivalence regarding the role of nuclear energy in the future carbon neutral energy mix and vulnerability of its inter-governmental and inter-institutional consensus to anti-nuclear / "renewables-only" ideologically motivated lobbying.

The study also highlights that Estonia's affirmative decision concerning nuclear energy is likely to draw the attention and actions of malignant actors such as Russia aiming to discredit nuclear energy in general (as a viable pathway to energy security and climate neutrality) and US SMR technology in particular; undermine trust – domestically and internationally – in the ability of the Estonian government and enterprises to ensure competent and responsible stewardship of nuclear energy, and pit Estonia against some key regional and European allies.

The report articulates some recommendations on how to better exploit the opportunities related to the US involvement in the development of Estonia's nuclear energy programme and mitigate the identified risks. Some of the key recommendations are as follows:

- Fully exploit the opportunities provided by the US-Euratom NCA to develop bilateral nuclear energy partnership and also the FIRST programme to build and stand up credible capacity for competent nuclear energy governance.

- In the next iteration of the bilateral Estonia-US Security Cooperation Roadmap (for 2024-29), include items of cooperation that address the identified security risks to the nuclear energy programme in the areas such as counter-espionage, counter-terrorism, cybersecurity, and counter-proliferation.

- In cooperation with the US, develop a strategic communication plan aimed at various target audiences in Estonia, Baltic region and wider EU in order to explain the Estonian decision and characteristics of its nuclear energy programme and counter the disinformation campaigns.

- Work to institutionalise and advance multilateral nuclear energy cooperation within the framework of the 3SI and through the P-TECC, especially focusing on establishing and facilitating knowledge, learning and innovation networks in the region and on attracting the investments into the cross-border nuclear industry ecosystems.

- Engage in a continuous dialogue with Germany (and other nuclear sceptics) over the role of nuclear energy in future energy mix dominated by the renewables, while maintaining vigilance over and being prepared to counter the anti-nuclear lobbying within the EU structures that may gradually erode the consensus over the inclusion of nuclear energy in "green finance taxonomy."

- Develop a clear strategy to address both the geopolitical and commercial underpinnings of the French agenda, should Paris raise objections to the expansive US involvement in the Estonian nuclear energy programme.

- Strengthen energy and climate diplomacy capacity in key embassies and representations within the countries and international organisations of interest and relevance to the Estonian nuclear energy aspirations and programme as well as to Estonia's general energy and climate security interests.

INTRODUCTION

Europe is confronting twin energy crises resulting from the impact of climate change and its energy dependence on Russian fossil fuels. Addressing these crises will require the European Union (EU) and its member states to engage in nothing short of an energy revolution that will decarbonise Europe's energy usage and end dependence on Russian fossil fuels. Russia's invasion of Ukraine has focused transatlantic attention on the importance of energy security and reducing energy reliance on Russia. While the EU and US are now both taking immediate steps to reduce consumption and reliance on Russian supplies, some of these steps may result in increased emissions or will lead to greater reliance on other autocratic suppliers. To address the twin challenges of climate and Russia, significant action will be needed on the energy transition front in the short, medium and long term.

Estonia, like other EU (and NATO) members is therefore at an energy crossroads. Unlike many of its eastern EU neighbours, Estonia has not been highly dependent on Russian energy supply and is relatively energy secure. Domestically produced oil shale accounts for

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55% of Estonia's domestic energy supply (as of 2020).[1] While, prior to the Russia-Ukraine war, Estonia received roughly 93 percent of its natural gas from Russia, natural gas accounts for less than 8% of Estonia's overall energy consumption.[2] Furthermore, the imports of the Russian gas comes to an end as a result of steps taken by the Estonian government, in response to Russia's aggression, and will be replaced by liquified natural gas (LNG).[3] However, oil shale is very carbon-intensive, while increasing reliance on natural gas will do little to decarbonise energy system in the long-term. In order to meet Estonia's climate commitments, embedded in the EU's Green Deal and "Fit for 55" goals, Estonia will need to develop alternative sources of energy but will encounter manifold challenges in this transition.[4] As the climate crisis deepens, the failure to meet climate targets could also have significant reputational costs internationally.

Moreover, the effort to "electrify everything" from cars to heating will likely lead to increased demand for electricity. This will require not simply swapping out energy sources but producing more with the goal of having an abundance of energy. Additionally, an abundance of cheap and clean energy will be necessary to support carbon removal projects, such as through direct carbon capture and storage technology. Thus, no matter the technological developments in other energy types, there will be demand for an abundance of clean energy. Furthermore, while there have been significant advances in renewables, there are also concerns about intermittency – when the sun is not shining, or wind is not blowing – as well as space needed for deployment. One potential zero carbon technology for Estonia to consider is new advanced nuclear technology in the form of small modular nuclear reactors (SMR). Developing a small modular reactor could contribute to enhancing regional energy security within the EU and to achieving the EU's climate objectives.

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A decision to adopt nuclear energy, however, has implications not only for the national energy system or broader climate objectives. It is a sensitive area that intersects with geopolitical

1 "Estonia – 2020 – Total – main fuel families," Complete Energy Balances, Eurostat, last accessed 19 May 2022.

2 Ibid., also "Imports of Natural Gas – Estonia 2020," Energy Trade, Eurostat, last accessed 19 May 2022.

3 "Estonia to stop importing Russian gas by end of 2022," *ERR*, 7 April 2022.

4 "Fit for 55," Policies, European Green Deal, Council of the European Union, last updated 25 March 2022; "Riigikogu approval for 'Fit For 55' package expected by January's end," *ERR*, 11 January 2022.

and national security considerations. Its pursuit means new opportunities for deepening strategic partnerships, and cooperation in nuclear energy technology is often an effective vehicle to enhance not only commercial and technological interactions but also security and foreign policy ties between countries. This is of particular importance to countries such as Estonia that seek the greater involvement of main allies such as the US, UK, France, and Germany in the Nordic-Baltic area to counter geopolitical pressure from Russia and China. The United States stands out as a pivotal ally, but the US "footprint" in Estonia remains small compared to what it could be. Also, Estonia's foreign and security policy is currently heavily tilted towards diplomatic, military and cyber aspects when it comes to engaging the US, while energy security and energy technology receive far less attention. Nuclear energy cooperation would create new opportunities for enhancing US-Estonia ties.

Cooperation in nuclear energy technology is often an effective vehicle to enhance not only commercial and technological interactions but also security and foreign policy ties

At the same time, any efforts of Estonia to have "more US" in the region – particularly in such sensitive sector as nuclear energy, but also across the board – may encounter resistance. Some of it would inevitably arise from Russia and its geopolitical confrontation with the West, but it would also stem from the notions of "European sovereignty" as well as some persistent characteristics of intra-European relations, structural issues in national energy policies, and diverging geopolitical perspectives of some key countries in the EU. These aspects must be factored in when considering the geopolitical prospects of nuclear energy in Estonia and the highly appealing transatlantic dimension of these aspirations.

The report aims to explore how Estonia's foreign and security policy interests would benefit from a potential adoption of nuclear energy and development of technological and commercial relations in this field with the US. It also seeks to map various potential risks to advancing these interests – including in relations with various EU actors – through nuclear energy cooperation and identify actions and instruments necessary to mitigate them as well as to enhance potential benefits.

In Chapter 1, the report discusses the emerging policy debate in Estonia concerning nuclear energy and the contours of a potential programme that might be based on SMR technology developed by the US. It draws on a series of interviews with the Estonian energy and foreign policymakers and energy sector executives. Chapter 2 focuses on the US perspective concerning nuclear energy and explores how potential civil nuclear cooperation with Estonia could interlink with various security concerns which might require the US involvement and support to address, thus, in turn, deepening the security partnership between the two countries. It also discusses which policy instruments developed by the US government (USG) could be leveraged to advance Estonia's nuclear energy programme. Chapter 3 considers how the perspectives of three key EU countries – Germany, France, and Poland – as well as the overall trajectory of the EU's policy could affect Estonia's pursuit of nuclear energy. Background information on bilateral US-Estonian relations, Lithuanian experience with Russian malignant influence operations against its energy sector, and contours as well as context of Poland's emerging nuclear energy programme is provided in the report's annexes.

1. ESTONIA AND NUCLEAR ENERGY

Estonia's future energy needs have come into sharp focus at the time of multiple overlapping and often mutually reinforcing security crises afflicting Europe and the entire world. Particularly, Russia's war against Ukraine

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and the extensive use of energy supply as a geopolitical leverage by Moscow turned energy security into an emergency matter for Europe and the Baltic states, causing them to re-arrange their energy supply chains. At the same time, the accelerating climate crisis demands swift actions on decarbonisation commitments, but an ill-conceived transition to carbon neutrality may cause volatility in the markets, severe misalignments between demand and supply, as well as socio-economic and political tensions. As signs of a nuclear energy renaissance emerge – especially outside of Europe – investors are seriously considering a new generation of nuclear energy technology as important to transitioning to a low- or zero-carbon future.[5]

Estonia, by some accounts, has a strong anti-nuclear undercurrent in society, stemming from the negative experiences of Soviet-era environmental mismanagement and the civil nuclear disasters of Chernobyl in 1986 and Fukushima in 2011

The Estonian government is yet to make its decision regarding the adoption of nuclear energy for electricity generation. There is an inter-agency nuclear energy working group established to analyse the problem and issue recommendations by 2024.[6] The electricity prices crisis of late 2021-early 2022 drew attention and elicited many favourable assessments from various public figures.[7] The government even decided to expedite decision-making on the matter.[8] Prime Minister Kaja Kallas and the then Minister of Economic Affairs and Infrastructure Taavi Aas indicated their support to possible adoption of nuclear energy.[9] Political leadership of major parliamentary political parties both in the governing coalition and opposition are mostly in favour, while only the Greens, who do not hold any seats in the parliament, are opposed.[10] Public opinion polls conducted in early 2022 also showed high public support to nuclear energy, with 59% of the respondents being in favour.[11]

At the same time, some interviewed officials emphasized that Estonia need to carefully follow the International Atomic Energy Agency (IAEA) guidelines on national nuclear energy programme deliberations, limiting how much decision timelines could be compressed.[12] The political decision-makers might also decide to put the option for a vote in a referendum. Estonia, by some accounts, has a strong anti-nuclear undercurrent in society, stemming from the negative experiences of Soviet-era environmental mismanagement and the civil nuclear disasters of Chernobyl in 1986 and Fukushima in 2011. If Estonia is to adopt nuclear energy, this sentiment would have to be engaged and mitigated well before any further practical steps are made, which opens opportunities for hostile disinformation operations by malignant actors (see Section 2.3.1.3. and Annex B for more).

Currently, there is only one clear proposal on the table – by Fermi Energia which also has Swedish Vatenfall as a minority shareholder and expects more investors to join soon.[13] According to an interviewed executive of this company, Fermi Energia assesses that it can ensure, within a framework of a long-term contract, supply of electricity at the price of

5 International Atomic Energy Agency, Climate Change and Nuclear Power 2020 (Vienna: International Atomic Energy Agency, 2020).

6 "Tuumaenergia töörühm [Nuclear energy working group]," Ministry of the Environment, last updated 11 April 2022; BNS, "Tuumaenergia töörühma lõpparuanne võib saada avalikuks 2024. aastal [The final report of the Nuclear Energy Working Group may be made public in 2024]," *Postimees,* 8 February 2022.

7 Jüri Toomepuu, "Tuumaenergia on ohutu, puhas ja Eesti jaoks imperatiivne [Nuclear energy is safe, clean and an imperative for Estonia]," *ERR,* 14 December 2021.

8 "Valitsus kiirendab tuumaenergia kasutuselevõtmise otsustamist [The government is speeding up the decisions on the introduction of nuclear energy]," *Äripäev*, 8 April 2022.

9 Andrus Karnau, "Estonia could get a nuclear power plant," *Postimees*, 19 January 2022, https://news.postimees.ee/7433537/estonia-could-get-a-nuclear-power-plant.

10 Lemmit Kaplinski, "Hirm tuumajaama ees on põhjendamatu: selle kõrval elades on aastadoos võrdne ühe banaani söömisega [The fear of a nuclear power plant is unfounded: living next to it is equivalent to eating one banana]," *Eesti Päevaleht / Delfi.ee*, 18 September 2020; "EKRE volikogu toetab Eestisse tuumajaama rajamist [EKRE's council supports construction of a nuclear power plant in Estonia]," *ERR,* 6 February 2022; "Rohelised: tuumaenergeetika on tõsine oht julgeolekule [The Greens: nuclear energy is a serious danger to national security]," *ERR*, 19 April 2022.

11 Kantar-Emor, "Tuumaenergia valdkonna teadlikkus ning valmisolek selle kasutuselevõtuks Eestis [Awareness of the field of nuclear energy and readiness for its introduction in Estonia]," Opinion Poll Report, Ministry of the Environment of Estonia, February-March 2022.

12 International Atomic Energy Agency, *Milestones in the Development of a National Infrastructure for Nuclear Power* (IAEA Nuclear Energy Series, No. NG-G-3.1 (Rev. 1)) (Vienna: IAEA, 2015).

13 David Dalton, "Fermi Energia 'Raising Capital' To Begin SMR Licensing Process," *Nucnet,* 10 February 2021.

€55 per MWh for 15 years, which is about half or even one third of the current market prices in NordPool spot market over the last months. Given that price volatility is likely to continue and even worsen, while pressure to accelerate decarbonisation will only increase, as Estonian electricity production is the most greenhouse gas-intensive in Europe, this could be seen as an economically attractive and competitive proposition. [14] In addition, there would be heating supply available to nearby municipalities at a very competitive price compared to natural gas option.

Theoretically, Estonia could, instead of developing own nuclear power, join as an investor and participant in a larger project (e.g. in Poland). However, the lead times of such projects are often too long and compound various risks, as illustrated by the recently cancelled Hanhikivi-1 project in Finland.[15] Estonia also has a very negative experience

2030 is a crucial milestone for Estonia due to the plans to close oil shale-based power generation plants and the need to make further and faster progress towards fulfilling Estonia's climate neutrality commitments

from the Lithuanian Visaginas NPP debacle that led to failure of Lithuania to launch a regional NPP project agreed with the other Baltic states and Japan's Hitachi in 2011-12, while the option of buying into one of the upcoming Polish projects (see Annex C) might not be very appealing to Estonia.[16] In the view of some interviewed Estonian energy executives and policymakers, Polish energy needs would likely supersede those of any other participating country's when allocating the output, and many small investors are not of high interest to nor needed by the Polish companies behind Poland's nuclear projects. There is, however, room for cooperation in training, regulatory capacity building, R&D and similar aspects, much of which could be undertaken in the framework of the Three Seas Initiative (3SI), where the US has a leading role (see Section 2.2.). Even in construction, if it takes place in parallel, some common pooled purchases could be undertaken.

Thus, should there be an affirmative decision by the government, Estonian developers are leaning towards having a national solution, even though remaining open and even actively courting participants from neighbouring countries as investors, thus in reality turning it into a regional project. Latvia is among the priorities and shows a clear interest, as demonstrated by discussions between Fermi Energia and state-owned energy corporation, Latvenergo (in this case, if Latvenergo joined the project, Estonia would deploy four SMR units instead of two).[17] There are also ongoing talks with Finnish Fortum as a potential investor into the Estonian project, as the Russian electricity trade embargo enacted by the Kremlin – possibly in response to Finland's application to join NATO – and the failure of the Hanhikivi-1 venture prompted Finland to seek new sources of supply in the region to satisfy future electricity demand.[18] Thus, the company leading the Estonian project sees it as a regional one, just without the governments being in the lead. On the other hand, some interviewed officials insisted that governments would inevitably come to play an essential role in such a project of strategic importance not only to Estonia, but also to the wider region.

The Estonian project developers are strongly considering BWRX-300 by GE Hitachi, a joint US-Japanese venture, as the first choice and even signed a cooperation agreement to that effect.[19] So far, it appears that BWRX-300 will be the only reactor type that might be fully licensed – by Canada – and could obtain license in Estonia by 2030. This date is a crucial milestone for Estonia due to the plans to close oil shale-based power generation plants and the need to make further and faster progress towards fulfilling Estonia's climate neutrality commitments – the pace of which is strongly criticised by the civil society – without losing domestic generation capacity

14 "Greenhouse gas emission intensity of electricity generation by country," Data Visualization, European Environment Agency, last updated 25 October 2021.

15 Fennovoima, "Fennovoima has terminated the contract for the delivery of the Hanhikivi 1 nuclear power plant with Rosatom," Press Release, 2 May 2022.

16 "Lithuanian PM: Visaginas NPP project cannot be implemented," *The Baltic Times,* 23 April 2013.

17 LETA, "Latvia should build nuclear power plant together with Estonia – Pabriks," *The Baltic Times,* 8 March 2022; "Fermi ei saa veel avaldada detaile Latvenergoga seoses. Ees on ootamas veel teisigi koostöid [Fermi has not yet been able to disclose details regarding Latvenergo. Other collaborations are pending]," *Delfi Ärileht,* 7 April 2022.

18 "Russia cuts off electricity to Finland; industry group sees Nato link," *Yle News*, 14 May 2022.

19 Kamen Kraev, "GEH to Collaborate with Estonian Company on BWRX-300 Deployment," *Nucnet,* 3 October 2019.

necessary to provide stable baseload which the rapidly growing but intermittently performing renewables would not be able to ensure.[20] At the same time, some of Estonia's energy policy stakeholders interviewed for this report insist that, come 2030-40, the renewable sector will possibly have addressed, through technological innovation in grid storage and other areas, the intermittency problem and, given especially the offshore wind potential in the Baltic Sea, might make introduction of nuclear energy with all the attendant complexities and societal stigma unnecessary altogether. Indeed, the government's decision in August 2022 to accelerate the energy transition to 100% renewable electricity consumption in Estonia as early as 2030 indicates the abundance of optimism about such innovation.[21] Others, however, believe that renewables and nuclear energy can successfully co-exist and point to Finland as an example, but there are views that an Estonian SMR could be ready by 2040 at the earliest.[22]

However, the next generation SMR technology (generation IV) that makes international media headlines and excites venture capital investors is still not technologically mature enough.[23] Its licensing is not realistic until 2030 (standard design approval does not mean licensing), while some of the more mature SMR designs based on the existing technology, generation III and III+, are regarded as either too expensive or inflexible for Estonia's needs. For example, NuScale's SMR that is considered by Poland and Romania comes in 6 modular packs per reactor unit that would generate 500 MW of power; Estonian TSOs requirements are for a single unit not to exceed 400 MW. Even those more mature options will be built as test reactors first, so the timelines for commercial deployment are much longer than for the GE Hitachi option. However, the Estonian project developers remain uncommitted or "technology neutral," and the final choice would be made in 2023. They continue exploring other possibilities – particularly a UK Rolls-Royce (RR) designed SMR – in case the GE Hitachi SMR's licensing process in Canada, where the first deployment is planned, experiences major delays or other difficulties. However, alternative options such as RR's SMR could be deployed starting from 2035 at the earliest.

If Estonia decides to adopt nuclear energy, and the company leading the project selects GE Hitachi SMR, its deployment can be expected to be a high priority in US-Estonia and Canada-Estonia cooperation and possibly the highest value business engagement for the period of 2024-35 until the reactors have been deployed and operate routinely. The US would be the main partner on maintenance services, training and education. According to the interviewed Fermi Energia executive, GE Hitachi would be the design supplier, which includes all technical drawings, equipment specifications, safety studies, and personnel training, as well as the supplier of final fuel elements, fuel assembly services, instrumentation equipment and software, turbines, generators and more. Canada, as the first-of-a-kind (FOAK) deployment nation for this type of SMR, would be important in personnel training and supply chain management, with very significant supplies such as reactor pressure vessel (RPV), primary steam piping, RPV internals, valves, pumps, and uranium being provided by the Canadian suppliers. French Orano, 51% owned by the French government, could have a significant role in fuel cycle by providing the uranium enrichment and spent fuel recycling services, thus mitigating potential French objections to more US tech in Europe as contravening European "tech sovereignty" notions (see Chapter 3). It is likely that companies and export credit agencies from Sweden, Finland, France, US, Canada could be important investors and creditors. The envisaged capital expenditures (CAPEX) breakdown would be roughly as follows: in the US – 30%; in Canada – 30%, other countries – 10%; in Estonia – 30% (local suppliers of construction materials, services during the construction, etc). In addition, given its nuclear competence, very close economic ties with Estonia, and Vattenfall's investments, Sweden would also be an important partner, especially in personnel training.

A particular concern raised by some interviewed officials involved in the decision-making on the adoption of nuclear energy in Estoniais related to concerns nuclear waste management. In the vision of the company promoting the project, permanent nuclear waste storage could be done in Estonia. Some studies show that it has similar geological conditions as those in which

20 "Eesti Energia to drop oil shale electricity production by 2030," *ERR,* 2 June 2021; "Kallas at COP26: Estonia has a lot to offer in terms of climate neutrality," *ERR*, 1 November 2021; Estonian Fund for Nature, "Citizens' initiative: Climate Neutral Estonia by 2035," Press Release, last accessed 6 May 2022; Zsombor Garzo, "Intermittency issues power uncertainty ahead of COP26," CRU, 1 November 2021.

21 "Estonia sets 2030 target for renewable-only electricity," *ERR,* 25 August 2022.

22 See for instance, "Sutter: tuumajaam saaks Eestis tööle hakata alles 2040. aasta paiku [Sutter: The nuclear power plant would not be operational in Estonia until around 2040]," *ERR,* 9 February 2022.

23 Jason Deign, "Nuclear: These countries are investing in small modular reactors," World Economic Forum, 13 January 2021.

Finland is building the world's first permanent nuclear waste storage facility.[24] Spent fuel would be processed abroad to extract reusable nuclear fuel and placed into universal canisters (UC) before being sent back to Estonia, where the UCs will be lowered into a 2000-meter-deep borehole and sealed off. According to Fermi Energia executives, one SMR would generate about 172 TWh, or 172 UCs of nuclear waste over its 60-year lifetime, which amounts to about 223m of vertically stored UC for one reactor. By using a so-called PUREX process, the radioactivity of waste would be reduced five times, while the advanced designs of UCs would make them non-corrosive and safe against leakage, further minimising any potential risks in permanent storage.[25]

Estonia's success could also provide know-how and a point of reference to countries such as Lithuania, where there are already some voices calling for deploying SMRs as a solution to achieving energy independence

This approach, of course, is contingent on securing all the necessary permits and the Estonian government's approval, but it is obvious that some permanent storage solution must be part of the decision from the outset when committing Estonia to nuclear energy development. Sweden is the second nation in the world after Finland that approved permanent deep isolation solution just this this year, after decades of nuclear industry in operation.[26] Nuclear proliferation concerns typically associated with the nuclear waste storage issue, however, are not very high on the list of concerns in this vision, even though there is a clear understanding that there could be security vulnerabilities in the logistical chain of nuclear fuel cycle management that spans two continents (North America and Europe) and that Estonia must demonstrate to the international non-proliferation policy community that it takes the proliferation risks seriously.

Estonia's success could also provide know-how and a point of reference to countries such as Lithuania, where there are already some voices calling for deploying SMRs as a solution to achieving energy independence, a goal of its national strategy.[27] The fact that Estonia is "nuclear naïve" at the moment does not seem to put off potential investors; quite to the contrary, it makes Estonia's lack of legacy baggage more interesting to partners from Sweden, Finland or Canada. However, it is the political sentiment and geostrategic considerations in the US and EU – both in the EU institutions and among key member states – that will be of paramount importance if Estonia goes forward with nuclear energy and selects an SMR solution of US origin. The next chapter of this report considers how such a decision would align with US trends and interests and which national and international security aspects Estonia would need to address – with US assistance whenever necessary – in becoming a nuclear state.

2. THE UNITED STATES

The United States, like other major nuclear suppliers, views nuclear cooperation with other countries as major bilateral initiatives providing for a century-long commercial and security cooperation. Nuclear energy's traditionally high capital costs, lengthy financing mechanisms, long-term supply needs for fuel and parts, requirements for spent fuel disposal, and the need for eventual reactor decommissioning after decades of operations, all necessitate intensive long-term commercial and technical cooperation between the importer and supplier states. Moreover, the priority that the United States places on nuclear non-proliferation, safety, and security, means that elements of security cooperation are tied to civil nuclear cooperation, as Washington seeks to ensure that its nuclear cooperation partners adhere to international standards as a baseline. The time, cost, complexity, and risks of nuclear energy cooperation has severely curtailed US nuclear

24 Posiva, "Finland's path to final disposal of nuclear waste," *Nuclear Engineering International,* 31 March 2022; Deep Isolation, *Deep Isolation in Estonia: Qualitative Geological Readiness Assessment of Deep Isolation's borehole solution in Estonia* (London: Deep Isolation EMEA Ltd, February 2021).

25 "Processing of Used Nuclear Fuel," Information Library, Nuclear Fuel Cycle, World Nuclear Association, last updated December 2020.

26 Charlie Duxbury, "Sweden approves nuclear waste storage site," *Politico,* 27 January 2022.

27 BNS, "Lithuania may consider small nuclear power plants – president," *LRT,* 5 January 2022;

cooperation. Yet new technological advances in nuclear energy, such as through SMRs, opens the door for a potential new era of US nuclear energy cooperation with foreign partners and allies.

The United States, like other major nuclear suppliers, views nuclear cooperation with other countries as major bilateral initiatives providing for a century-long commercial and security cooperation

The prospect for US nuclear cooperation with Estonia would similarly entail extensive long-term commercial, technical, regulatory, and non-proliferation cooperation. Such cooperation would also build upon the existing strong bilateral ties between the two countries (see Annex A for more detailed background). This part of the report will analyse the potential for small modular reactors to address Estonia's strategic need to remain visible in Washington and relevant to various US policies. It will analyse how pursuing SMR could impact the bilateral relationship with the United States, assessing the impact on US perceptions of Estonia, diplomatic engagement, and potential enhanced security cooperation. It will also analyse the security considerations Estonia must assess when pursuing such a path and how those considerations might form a basis for the US support and involvement.

2.1. US Commitment to Nuclear Power

Pursuing American SMR technology will not only require a long-term commitment by Estonia but from the United States as well. Therefore, an important consideration for Estonia is the US commitment to nuclear energy and technology. In general, societal attitudes in the US toward nuclear energy vary from supportive to ambivalent, but there is an emerging strong bipartisan political consensus to support its continued development.

The robust opposition to nuclear power, which developed after the Three Mile Island and Chernobyl accidents, has faded. During the period between 1979 and 1988, 67 nuclear power plants were cancelled.[28] Since 2013, the US has closed another 12 nuclear reactors and another 7 have been scheduled for retirement by 2025, while the dramatic increase in natural gas extraction in the US has threatened the economic viability of nuclear power.[29] Furthermore, safety regulations added after Fukushima have also led to additional costs. The United States has several aging nuclear power plants that are at risk of closing due to operating losses, lack of investment, and environmental concerns. Additionally, the regulatory burdens on nuclear power are incredibly extensive and a huge barrier to the development of new nuclear technology.[30] The decline of the nuclear industry in the United States has also led to a decline in its political influence, which is far less influential than the much larger fossil fuel lobby.

However, the zero-carbon nature of nuclear power and its reliability has led to some growing support for nuclear energy. Within the Democratic party, there has been a renewed embrace of nuclear energy. In 2020, the Democratic party changed its stance on nuclear energy for the first time since 1972 to effectively endorse existing and advanced nuclear energy.[31] During the 2020 Presidential campaign, then-candidate Biden selected Former Secretary of State John Kerry and Congresswoman Alexandria Ocasio-Cortez, one of the leaders of the left wing of the Democratic party, to help draft the climate platform, which included language calling for creating "cost-effective pathways" to develop innovative nuclear reactors. The Biden administration

The prospect for US nuclear cooperation with Estonia would similarly entail extensive long-term commercial, technical, regulatory, and non-proliferation cooperation

28 Rebecca Tuhus-Dubrow, "The Activists Who Embrace Nuclear Power", *The New Yorker,* 19 February 2021.

29 Mark Holt and Philip Brown, "U.S. Nuclear Plant Shutdowns, State Interventions, and Policy Concerns," Congressional Research Service, updated 7 February 2022); Michael Levi, "Splitting rock vs. splitting atoms: What shale gas means for nuclear power," *Bulletin of the Atomic Scientists*, Vol. 68, Issue 4 (2015): 52-60.

30 Matthew Yglesias, "Can America get to yes on a new reactor design?," *Slow Boring,* 18 January 2022.

31 Robert Bryce, "After 48 Years, Democrats Endorse Nuclear Energy in Platform," *Forbes,* 23 April 2020.

has strongly supported nuclear energy. Energy Secretary Granholm has vocally supported nuclear energy, even recently tweeting that "Nuclear Energy is clean energy and it's vital to creating good-paying jobs, supporting our energy transition, and saving our planet."[32]

Societal attitudes in the US toward nuclear energy vary from supportive to ambivalent, but there is an emerging strong bipartisan political consensus to support its continued development

This has led to a renewed focus on developing small modular nuclear reactors. In November 2021, on the sidelines of COP26 in Glasgow, Secretary Granholm (along with the Romanian Energy Minister) highlighted a new commercial partnership that had been signed earlier in the week between NuScale Power and Nuclearelectrica. The agreement "has the potential to advance deployment of Europe's first SMR in Romania by the end of the decade that could position Romania as a potential hub for SMR production in the region."[33] At the event highlighting the new agreement, Granholm stated, "The United States views nuclear energy as a pivotal technology in the global effort to lower emissions, expand economic opportunity, and ultimately combat climate change. We have been supporting the development of SMRs for decades, and it is extremely gratifying to celebrate this important milestone for Romania to help them achieve their climate goals."

The Republican party and the Trump administration were also vocal proponents of nuclear energy. In 2019, President Trump tasked Energy Secretary Dan Brouillette to create a nuclear energy working group to focus on bringing advanced nuclear reactors to the international market.[34] In April 2020, the Trump Administration released a blueprint for "Restoring America's Competitive Nuclear Energy Advantage."[35] Department of Energy (DOE) blueprint advised the US Development Finance Corporation (DFC) to invest in nuclear power projects abroad and to drop its internal policies that in the past prevented such investments. DFC agreed and said it would "prioritise support of advanced nuclear technology in emerging and frontier markets that adheres to the highest safety standards."[36] However, while the Trump administration was a supporter of nuclear power, there were few major breakthroughs but more steady incremental progress and advances in a number of areas, such as research and reactor design.[37]

There is thus bipartisan support for new nuclear technology, including potential exports. As *The New Yorker*'s Rebecca Tuhus-Dubrow assessed, "Nuclear energy scrambles our usual tribal allegiances."[38] For example, Democratic Senators Cory Booker and Sheldon Whitehouse have co-sponsored a bill with Republican Senators John Barrasso and Mike Crapo to invest in advanced nuclear technology and help prevent the closure of existing nuclear plants.[39]

The environmental activist community, which holds particular sway within the Democratic party, has shifted from stalwart opposition to nuclear power to general ambivalence, as its focus has shifted to the problem of climate change

In general, the environmental activist community, which holds particular sway

32 Jennifer Granholm (@SecGranholm), "Nuclear energy is clean energy and it's vital to creating good-paying jobs, supporting our energy transition, and saving our planet," Twitter, 26 January 2022.

33 US Department of Energy, "U.S. Secretary of Energy Jennifer Granholm and Romanian Minister of Energy Virgil Popescu Highlight New Partnership on SMRs," News, Office of Nuclear Energy, 4 November 2021.

34 Dipka Bhambhani, "Trump Administration Pivots to Nuclear Energy, Finds Lever Against China, Russia," *Forbes*, 7 August 2020.

35 US Department of Energy, Restoring America's Competitive Nuclear Energy Advantage: A strategy to *assure U.S. national security* (Washington, DC: Department of Energy, 2020).

36 Dipka Bhambhani, "Trump Administration Pivots to Nuclear Energy."

37 US Department of Energy, "11 Accomplishments by the Trump Administration in Advanced Nuclear Energy," Office of Nuclear Energy, n.d..

38 Rebecca Tuhus-Dubrow, "The Activists Who Embrace Nuclear Power".

39 Ibid.

within the Democratic party, has shifted from stalwart opposition to nuclear power to general ambivalence, as its focus has shifted to the problem of climate change. There are now pro-nuclear environmentalists who are fighting to prevent the closure of nuclear power plants. Pro-nuclear think tanks include the Breakthrough Institute, an "ecomodernist" think tank in the San Francisco Bay area, Third Way – a centre-left think tank in Washington, and the Good Energy Collective.

There has been a strong backlash against Germany's decision to phase out nuclear power, which is leading to a continued reliance on coal

Nevertheless, the progressive climate movement in the United States has not embraced nuclear energy. Nuclear technology is seen as incredibly expensive, dangerous, and taking too long to construct. Thus, in general on the left side of the political spectrum there is support for maintaining nuclear power plants in existence as a bridge to the development of renewable energy. But there is deep scepticism about making additional investments in nuclear energy technology. For instance, the only new nuclear reactors set to come online are in Georgia, but the project's cost has more than doubled to $30bn and are at least six years overdue.[40] The high cost and the difficulty of construction has prompted the climate community to focus on renewables and generally look sceptically toward nuclear power.

The Environmental Defense Fund (EDF) provides an example of the ambivalence toward nuclear. In 2017, the EDF argued that nuclear power was still necessary for now.[41] In assessing whether to close a nuclear power plant in California the following year, the EDF took a somewhat ambivalent position that came down on the side of closure. "At the Environmental Defense Fund (EDF), we recognise nuclear energy can provide greenhouse-gas free electricity. However, we also agree that under these circumstances, continuing to operate an aging and increasingly unnecessary source of baseload power – or power that cannot ramp up and down quickly – doesn't make sense."[42] Similarly, the National Resources Defense Council, one of the most influential environmental organisations, is also ambivalent toward nuclear power, noting the zero-carbon nature of the power, but also highlighting the environmental dangers and significant costs.[43] The left-leaning Center for American Progress also supports maintaining existing nuclear power plants but is sceptical about the cost effectiveness of building additional nuclear power plants.

Many older, more established environmental groups, as well as non-proliferation focused organisations, remain wary of nuclear power. Greenpeace, for instance, opposes nuclear power, as both unsafe and expensive. Likewise, the Sierra Club remains "unequivocally opposed to nuclear energy."[44] As does the relatively new progressive Climate Justice Alliance. The Union of Concerned Scientists remains nervous of nuclear risks. As Ed Lyman, its director of nuclear-power safety, told the *New Yorker* because "there are so many uncertainties associated with nuclear safety analysis," it's "very hard to make a conclusion about whether it's safe or not."

Yet there is also a growing interest in potential new nuclear technology amongst a number of influential political and policy commentators. Influential centre-left writer Matt Yglesias has argued for a more-pro nuclear policy and for dramatic regulatory changes to enable the faster development of small modular reactors.[45] Additionally, there has been a strong backlash against Germany's decision to phase out nuclear power, which is leading to a continued reliance on coal. As ProPublica's Alec MacGillis examined, "The exit from nuclear power was leaving the country much less space to manoeuvre as it tried to move away from coal."[46] This is a view also shared on the right, as the Wall Street Journal's conservative editorial board described Germany's closure of nuclear power plants as amounting to an "energy surrender."[47] Thus, abandoning nuclear is seen as a mistake environmentally and geopolitically.

40 John Bazemore, "$30B Georgia Power nuclear plant delayed up to 6 more months," *Wabe / Associated Press*, 17 February 2022.

41 John Finnigan, "Why We Still Need America's Nuclear Power Plants — At Least for Now," Environmental Defense Fund Blog, 17 April 2017.

42 Larissa Koehler, "California says goodbye to its last nuclear power plant. What will replace it?," Environmental Defense Fund Blog, 23 January 2018.

43 "Minimize Harm and Security Risks of Nuclear Energy," Our Work, Natural Resources Defense Council, last accessed 20 March 2022; Padmaparna Ghosh, "Nuclear Power 101," Natural Resources Defense Council, 5 January 2022.

44 "Nuclear Free Future," Sierra Club, last accessed 21 March 2022.

45 Matthew Yglesias, "The nuclear policy America needs," *Slow Boring,* 12 October 2021.

46 Alec MacGillis, "What Germany's Effort to Leave Coal Behind Can Teach the U.S.," *ProPublica,* 31 January 2022.

47 "Germany's Energy Surrender," *The Wall Street Journal*, 22 December 2021.

2.2. US ROLE IN BALTIC ENERGY SECURITY

The United States has a strategic interest in increasing European energy security, particularly in the Baltic region. The United States has long been concerned about European dependence and reliance on Russia for its domestic energy. Throughout the last decade, multiple US administrations have opposed the Nord Stream 2 (NS2) pipeline and have pressed Europe to diversify its energy supply away from Russia. In the aftermath of Russia's invasion, the US and Europe will both look to apply added pressure on the Russian economy. By halting fossil fuel imports from Russia, the US and Europe could expand their sanctions efforts to target Russia's energy sector, which accounts for about 45% of Russia's total exports. The US therefore has a strategic interest in assisting Europe transition away from Russian energy.

The United States has a strategic interest in increasing European energy security, particularly in the Baltic region

But the United States also has its own parochial reasons to push Europe away from Russian gas. Over the last decade, the United States has undergone its own energy revolution, becoming a major producer of natural gas with fracking technology. The United States has become a major exporter of LNG and has encouraged Europeans to expand their LNG infrastructure to take advantage of American supplies. There are major US stakeholders that have an interest in expanding US LNG exports to Europe and see an opportunity in the current crisis to increase market access for US exports, which would justify increasing investment to expand domestic production. These stakeholders are particularly influential in Congress.

However, the drive for greater US energy exports, while a factor in US policy making, vary in their significance depending on the administration and political party in power. For instance, the Center for American Progress opposes constructing additional liquifying natural gas LNG terminals to expand exports, given the negative environmental impacts of LNG, the carbon footprint of natural gas, and a general desire to see additional investment in clean energy.

Nevertheless, the twin geopolitical and economic interests have seen the United States become a major proponent of the 3SI. This initiative was launched by the Presidents of Poland and Croatia in 2015 with the goal to develop north-south infrastructure, particularly relating to energy infrastructure. The United States views the 3SI as a way to expand LNG imports to reduce dependence on Russian natural gas, as well as provide a potential counter-balance to China's Belt and Road Initiative and its 16+1 format.

There is strong US support for the 3SI.[48] For instance, President Trump attended the 2017 Three Seas Annual summit. In November 2020, the House of Representatives passed a bipartisan resolution "expressing support of the Three Seas Initiative in its efforts to increase energy independence and infrastructure connectivity thereby strengthening the United States and European national security" (H.Res. 672, 116th Congress). In December 2020 the US DFC approved a $300 million investment in the 3SI Investment Fund, "primarily for projects focused on energy security." This investment was enabled by the European Energy Security and Diversification Act of 2019, which eased restrictions on investing resources for energy infrastructure projects in higher-income countries, such as the European Union. In February 2021, a bipartisan group of members of congress urged the new Biden Administration to continue the previous Administration's pledged financial support for the 3SI and called on DFC to finalise its approved $300 million investment.

Thus far, despite bold pledges, the United States has struggled to mobilise much investment in European infrastructure. There is some concern and frustration about the lack of action thus far from the DFC on the 3SI, as few of the pledged $300m have yet to be committed.[49] Much of this may be because the DFC, until recently, has

The twin geopolitical and economic interests have seen the United States become a major proponent of the 3SI

48 In the 116th Congress, related bills include the European Energy Security and Diversification Act of 2019 (House-passed H.R. 1616 and S. 704), the Protect European Energy Security Act (H.R. 2023), and the Energy Security Cooperation with Allied Partners in Europe Act of 2019 (S. 1830).

49 Interview with the US embassy officials, 4 April 2022, Tallinn.

until February 2022 lacked a Chief Executive Officer. But there may also be a broader concern about making investments in the European Union countries, due to their high income. The DFC has a global portfolio and finite resources and there is likely some resistance to investing in wealthier European countries, rather than in more developing regions.

While the 3SI has drawn significant attention, its projects are largely supported by European, not US, investments and several pre-existing projects were simply rebranded as part of the 3SI. Nevertheless, 3SI has focused attention on the need for north-south infrastructure within Europe. For instance, 3SI is supporting a gas interconnection between Poland and Lithuania, and connecting the three Baltic states and Finland to the European gas network. The pipeline has been completed ahead of schedule and came online in May 2022. Estonian transmission system operator (TSO) Elering told ERR that, "This is a critical event for Estonia, as the new connection with Europe should reduce the country's natural gas dependence on Russia, increase competition on the Estonian gas market as well as mean greater security of natural gas supply."[50] This will enable access to Poland's LNG terminal and allow Poland to access to Lithuania's floating storage and regassification unit (FSRU) in the port of Klaipėda. Of note, however, is that this project was funded through EU and member state contributions. The United States is a secondary player when compared to the EU in terms of infrastructure investment. For instance, three-fourths of the funding to desynchronise Baltic states from the Russian grid and synchronise them with the continental comes from the EU, with the US playing a much smaller financial role.

Thus far, despite bold pledges, the United States has struggled to mobilise much investment in European infrastructure

Nevertheless, the pressure from Congress on the Biden administration to make investments in European energy security will likely increase due to Russia's aggression. Congress will be especially focused on expanding LNG infrastructure. The Ukraine supplemental funding bill, which passed congress in March 2022, urged the administration to create a "Baltic Security and Economic Enhancement Initiative." The purpose of such an initiative is to provide the Baltic states with security assistance, bolster "physical and energy security needs," look for opportunities for US foreign direct investment, and improve "high-level security and economic cooperation." Congress has also called on the administration to send high-level representatives to the Baltics at least twice a year and attend trade, energy, and business fora.[51] How and whether this initiative will be implemented by the Biden administration remains to be seen. But there is now significant funding being made available to the administration for security assistance and energy financing.

Pressure will therefore increase on US agencies to show support for the Baltics and Eastern Europe, leading US agencies to scramble to identify sensible projects and investments. Should Estonia pursue American SMR technology, there will be immense US support for the project from the US congress and the Biden administration. It is increasingly visible that the USG has already identified the Trimarium region as one of the priority directions for advancing nuclear energy through the so-called Partnership for Trans-Atlantic Energy and Climate Cooperation (P-TECC) – an international platform initiated by the DOE (see Section A.3. in Annex A).

There is little doubt that proceeding with a climate-friendly energy project that has geopolitical ramifications and is based on cutting-edge US technology would help to deepen diplomatic relations with the United States

This nuclear energy strand of a broader effort to improve energy security and resilience across the region clearly checks a lot of boxes for USG agencies: It serves a strategic purpose of expanding European energy supply, it promotes American businesses, and develops new zero carbon technology. Thus, there would be strong support from the DFC, DOE

50 "Poland-Lithuania gas pipeline to go online May 1, ahead of schedule," *ERR,* 28 February 2022.

51 US Congress, "Defending Sovereignty of Ukraine Act of 2022 (S.3488)," Calendar No. 251, 18 January 2022.

and Department of State for stronger bilateral engagement in this area. This is illustrated by a recent P-TECC meeting that focused on nuclear energy in the CEE.[52]

The Estonian SMR project, if pursued, would likely become a show-piece project for the USG. US officials would take great interest in its success. US officials from the Department of Energy, State, and Commerce are becoming increasingly frequent visitors. For instance, new Assistant Secretary of State for Non-proliferation, Elliot Kang, has recently visited Estonia, where one major topic was SMR technology.[53] On official visits to the Baltics, which are sure to increase after Russia's invasion, the SMR project site will be an attractive stop for US officials. As such, when choosing which of the three Baltic states to visit, US officials, who rarely have time to visit all three, would likely see Estonia as an attractive stop to visit military and energy installations. There is little doubt that proceeding with a climate-friendly energy project that has geopolitical ramifications and is based on cutting-edge US technology would help to deepen diplomatic relations with the United States. It would also further bolster Estonia's image in the United States as an incredibly capable and cutting-edge ally that punches above its weight within the transatlantic alliance.

2.3. US-Estonia Security Cooperation

The security relationship between the United States and Estonia is incredibly robust and cemented within the NATO alliance. There is also great respect in Washington for what Estonia has achieved post-independence, and there is also an appreciation for Estonia's participation in operations in Afghanistan, Iraq, and the Counter-ISIS coalition. The sense of obligation to defend Estonian democracy therefore goes deeper than a mere sense of obligation to uphold the Article 5 treaty commitment. US security assistance to the Baltics was viewed as a long-term strategic priority. In 2019, the United States signed Security Cooperation Roadmaps with Estonia, Latvia, and Lithuania. These agreements identify agreed-upon security cooperation priorities for 2019-24.

52 See DOE International Affairs (@DoeIntlAffairs), "Nuclear energy is clean energy. Today, Dep. Sec. David Turk led our P-TECC initiative's latest working group to discuss how European nations and the U.S. can collaborate on advancing this power throughout Eastern and Central Europe," Twitter, 23 May 2022.

53 Ministry of Environment of Estonia (@MOEestonia) "Meeting with Dr. Eliot Kang, Acting Assistant Secretary of the U.S Department of State's Bureau of International Security and Nonproliferation," Twitter, 23 March 2022.

Russia's invasion of Ukraine will lead to significantly expanded interest in supporting Baltic security. There will likely be a significantly expanded NATO presence in the Baltic states in the years ahead. Moreover, US security assistance efforts will almost assuredly grow in response to the war. Additional funding will likely be prioritised for the Baltic states, either through congressional appropriations or by the administration reallocating funding from other parts of the world to the Baltics.

> *One geopolitical advantage of an American SMR project from an Estonian security perspective is that it will bring additional attention and focus of the USG to the Baltic region*

The war in Ukraine has focused US attention on European security. But the centre of gravity for US foreign policy has shifted, and will continue to shift, toward Asia. The focus on China will not go away. The US military remains overstretched, having to face peer or near-peer rivals in China and Russia. There will be a competition between the Asian and European theatre for US military assets for the indefinite future.

It is also possible that the focus could accelerate the pivot to Asia, not in the immediate term, but in the medium term. Russia's bungled invasion of Ukraine may prompt US defence planners to believe they can reduce their force posture in Europe and still cope with Russia militarily. Moreover, the strangling economic sanctions and technological degradation caused by export restrictions will further weaken Russia's defence industry and its overall economy, possibly leading US policy makers to see Russia as a hollow threat that is easily contained.

Therefore, one geopolitical advantage of an American SMR project from an Estonian security perspective is that it will bring additional attention and focus of the USG to the Baltic region. The United States will want the project to succeed and will be quite focused on tracking its development and championing its success. While the US recognises the strategic importance of energy security for the Baltics, it has struggled to find tangible ways to provide support beyond pledging LNG supplies and vague assurances of cybersecurity cooperation.

A US SMR project would transform US-Baltic energy cooperation and would mean continuous flow of US officials and delegations to Estonia, enabling Estonia to broaden and deepen its relationship with the United States.

2.3.1. SMR and Implications for US Security Assistance

The evolution of the bilateral security cooperation agenda that is likely to take place as a result of Estonia's choice to pursue nuclear energy based on the US SMR technology largely depends on what security risks result from this choice and how the USG could assist in addressing those risks.

Traditionally, US security assistance to help protect and secure nuclear facilities has been largely focused on countering the threats posed by terrorism – whether preventing terrorist attacks against the plant itself or addressing the proliferation threats to ensure nuclear materials do not fall into the wrong hands. However, the war in the Ukraine has made clear that nuclear power plants are also national strategic assets and therefore potential military targets. Moreover, the hybrid threat environment in which Estonia finds itself means that its SMR project could be exposed to the use of various vectors of attack (e.g. cyber, disinformation, etc) applied by hostile state powers seeking to advance their interests through the medium of so-called "grey zone" conflict.[54] Interaction between the USG and Estonian authorities in monitoring and countering such risks would form an important strand of bilateral security cooperation.

2.3.1.1. Conventional Military Threat

Russia's invasion of Ukraine provides important lessons for Estonia to consider when assessing whether to proceed with an SMR. This war has created an unprecedented situation in which nuclear power plants have been in the crossfire of war. The war in Ukraine demonstrates that an SMR would be a potential target for Russia, whether in a conventional military operation against Estonia or in conducting asymmetric or grey-zone operations to weaken or undermine the government in power. For instance, Russia in 2015 targeted Ukraine's power sector through a cyberattack, successfully shutting off the power for 200 000 Ukrainians before Christmas.[55] Similarly, during the war in Ukraine, Russia has also launched cyberattacks against Ukraine's power grid.[56]

Russian forces sought to capture and seize power plants – nuclear and non-nuclear – in the early days of the war and have treated them as strategic targets. The efforts to control power plants and nuclear sites are likely to ensure Russia is able to apply additional pressure on Ukraine and to demonstrate Russian control of the country. Russian airborne forces captured the Kakhovka hydroelectric power plant in the initial assault on Ukraine.[57] Russia also immediately captured and took control of the Chernobyl Nuclear Power Plant (NPP) exclusion zone, seizing likely because it was a strategic location between Belarus and Kyiv, and endangering nuclear safety of the conserved nuclear facility in the process.[58]

Russia has been willing to engage in incredibly dangerous assaults on or near operational nuclear power plants. Most notably, Europe's largest nuclear power plant became a battleground, as Russian forces sought to gain control of the nuclear complex. The Russian attack on the Zaporizhzhia Nuclear Power Plant (ZNPP) brought concern of a massive nuclear catastrophe, as the site contains six nuclear reactors, providing Ukraine with half of its electrical power, and drew widespread condemnation.[59] The willingness to engage in a military assault on a nuclear power plant – and to subsequently use the plant as a staging area for offensive strikes and as a shield for its units against the Ukrainian counter-attacks – reveals a shocking willingness by Russia to accept the risk of a nuclear accident for military ends.[60]

Russia's targeting of civilian infrastructure demonstrates that Russia will adopt an expansive view over what is permissible in a conflict. According to Brent W. Stricker, "Given that ZNPP appears to have dual value, principally as a facility that benefits civilians but also some utility for the Ukrainian military forces, ZNPP qualifies as a military objective…Both rules [Articles 55 and 56 of Geneva Treaty] suggest that attacking ZNPP and risking a nuclear meltdown or wide-spread release of radioactive material are prohibited. However, neither rule

54 Danny Pronk, "Fifty Shades of Grey: 21st century strategic competition with Russian and China," Strategic Alert, Clingendael, December 2021.

55 Kim Zetter, "Inside the Cunning, Unprecedented Hack of Ukraine's Power Grid," *Wired,* 3 March 2016.

56 Patrick Howell O'Neill, "Russian hackers tried to bring down Ukraine's power grid to help the invasion," *MIT Technology Review,* 12 April 2022.

57 "Images show Russian forces near Ukrainian hydroelectric power plant -Maxar," *Reuters*, 26 February 2022.

58 William Potter, "The fallout from Russia's attack on Ukrainian nuclear facilities," *War on the Rocks*, 10 March 2022.

59 Lamiat Sabin, "World leaders condemn Russia's 'despicable attack' on Zaporizhzhia nuclear plant in Ukraine," *The Independent,* 7 March 2022.

60 David Gormezano, "Should the war in Ukraine spur a nuclear security rethink?," *France24,* 26 May 2022.

expressly prohibits an attack on a nuclear power plant." Thus, according to Stricker, the law of armed conflict "only prohibits attacks that may release the dangerous forces and 'consequent severe losses among the civilian population'."[61]

The targeting and seizing of power plants in Ukraine means that Estonia must consider the likelihood that Russia will target an SMR in a potential conflict

Russia has kept the plant operating and has also sent some Rosatom personnel to the power plant.[62] As Stricker concludes, "Russian forces are guarding ZNPP and it remains operational with work shift changes implying the attack was designed to capture the plant rather than damage or destroy it. Consequently, the attack appears to have been consistent with customary international law." However, according to the head of the IAEA, the risk of a nuclear safety incident under these conditions remained high, including to the potential violation of safety protocols that may occur due to the unclear role of Rosatom's personnel at ZNPP.[63]

The targeting and seizing of power plants in Ukraine means that Estonia must consider the likelihood that Russia will target an SMR in a potential conflict. In a conflict with Estonia, Russia's military objectives may also differ significantly than its objectives with Ukraine. Russia has appeared intent on changing the regime in Kyiv and occupying the country and has therefore allowed plants to continue operating. But in an attack against Estonia, Russia may have more destructive ends. A conflict with Estonia may focus less on the political aspects of changing a government in Tallinn but in simply damaging Estonian and NATO forces and asserting Russia's military domination over the country to deny territory for follow-on NATO forces. Hence, instead of seizing and operating power plants, Russia may simply seek to destroy the SMR and deprive the country of significant source of electrical power. Thus, the construction of an SMR, which if built, would likely provide Estonia with an important portion of its power supply and potentially provide power to Latvia as well, would be a prime target for Russia in the event of a military conflict. Thus, US security cooperation with Estonia related to an SMR would be much broader than provided to other nuclear facilities, which do not anticipate the threat of an attack by a conventional military power.

Estonia would likely need to take measures to prevent the destruction or capture of the plant. Construction of an SMR would likely prompt discussions with the US and NATO about enhancing air defence. An SMR might need a layered air defence, or if in a coastal area, anti-ship missiles and coastal defence protection. This could involve the acquisition or provision of long-range systems to protect against cruise missile strikes, as well as the acquisition of close-range air defence systems to protect against air assaults and helicopter attacks. Or, alternatively, NATO would need to prioritise the SMR's protection and deploy the necessary assets. Estonian or NATO military forces would likely need to be stationed close enough to the SMR to respond to a potential airborne or ground assault on the plant. Auto-shutdown is a feature of modern reactors, and Estonia would likely want to create some power redundancies to ensure a single strike or assault would not leave Estonia without sufficient power supply.

From a nuclear safety standpoint, SMRs do not pose the same risks from being in a warzone as the larger, older reactors threatened in Ukraine

From a nuclear safety standpoint, SMRs do not pose the same risks from being in a warzone as the larger, older reactors threatened in Ukraine. A central feature of SMR technology is their reliance on passive rather than active safety systems to keep the reactor core cooled and prevent a meltdown causing a dangerous release of radiation.[64] One of the primary risks to Ukraine's nuclear power stations from Russia's attack is the loss of power to the plant cooling systems. Ukraine's older nuclear plants

61 Brent W. Stricker, "Legal Aspects of Russia's Attack on the Zaporizhzhya Nuclear Power Plant," *Small Wars Journal,* 8 March 2022.

62 Katie Balevic, "Russian energy officials traveled to Ukraine and seized control of largest nuclear power plant, Ukrainian officials say," *Business Insider,* 12 March 2022.

63 Louise Guillot, "Atomic energy chief: Ukraine's nuclear safety situation 'far from being resolved'," *Politico*, 10 May 2022.

64 Miklos Gaspar, "Technology Neutral: Safety and Licensing of SMRs," International Atomic Energy Agency, 17 August 2020.

require active steps by plant staff to ensure reactor cooling operations continue, and those cooling operations require power. The loss of power to the cooling system is what ultimately led to the meltdown of three units of the Fukushima-Daiichi nuclear power plant in 2011, when a tsunami flooded the plant's emergency generators. Instead, light-water SMRs, the first type to reach the market, use feedback loops

An SMR, especially one tied to the United States, would also be a prime target for Russian cyber and espionage campaigns

to discharge, recirculate, and condense steam automatically in emergency situations to keep the reactor cooled without the need for power. While the specifics of each SMR's passive safety system depends on their design, SMRs also include inherent safety features such as low power and operating pressure that reduce the need for active safety measures. In addition, depending on the chosen design, SMRs can be built underground. An underground SMR would help protect the reactor vessel from being compromised by military ordnance causing a release of radiation. However, any spent fuel assemblies stored in cooling ponds on site could potentially be at risk from military action, and may need special safety and security consideration.

2.3.1.2. Cyber, Espionage, and Terrorist Target

An SMR, especially one tied to the United States, would also be a prime target for Russian cyber and espionage campaigns. Developing robust cyber security standards would be a must, as would maintaining extremely careful security protocols for staff.

It is unlikely that global efforts to establish norms in cyberspace will have much of an impact on Kremlin thinking. In 2021 every member state of the UN, including Russia endorsed the "Open-Ended Working Group on responsible state behaviour in cyberspace" language that states should not take action that "intentionally damages critical infrastructure or otherwise impairs the use and operation of critical infrastructure to provide services to the public."[65] Nevertheless, Russia has clearly seen public utility infrastructure as a potential target for offensive operations against the West. In the event of another conflict or in response to crushing sanctions, Russia may seek to respond in an asymmetric manner.

Power plants and power grids have been major targets for Russian cyber operators in the past. For instance, Ukraine's electrical grid was taken offline in December 2015, with the attack impacting more than 225 000 Ukrainian customers.[66] In 2016, Russia inserted malware into Ukraine's electrical grid, called Industroyer, designed to cause a blackout.[67] The attack caused a blackout in Kyiv for an hour. US counter-intelligence also has observed Russian hacking US nuclear power plants.[68] The United States has also been concerned about Russia targeting fibre-optic cables, as well as potentially undersea cables.[69] Therefore, a high-profile, cutting edge power plant, that supplies a large percentage of Estonia's would indeed be a target for a hostile Russia – in peacetime or in conflict.

Russian intelligence and cyber hackers would likely see the plant as a key target both to disrupt operations at the plant, as well as to conduct industrial espionage to improve Russia's nuclear industry. However, such cyber and espionage efforts are not dependent on proximity to Russia and likely make any SMR a target for Russian operations. Protecting the SMR from cyber attacks and espionage penetration will have to be a major priority. An SMR would undoubtedly need to be treated like other sensitive military facilities, with similar security procedures to vet staff and to protect networks. The technology behind the SMR will likely be innovative and very commercially sensitive. China, for instance, is known for their robust industrial espionage efforts and may seek to grow their own development of new nuclear technology by gaining access to US and European SMR designs and technology.

Estonia, however, is better prepared than most to ensure the cyber security of an SMR. It is

65 Open-Ended Working Group on Developments in the Field of Information and Telecommunications in the Context of International Security, "Final Substantive Report," United Nations General Assembly, A/AC.290/2021/CRP.2, 12 March 2021.

66 Roman Marshanski, "The world-changing 2015 cyberattack on Ukraine's power grid," ITProPortal, 22 February 2021.

67 ESET, "Industroyer: Biggest malware threat to critical infrastructure since Stuxnet," 12 June 2017.

68 Ellen Nakashima, "U.S. officials say Russian government hackers have penetrated energy and nuclear company business networks," *The Washington Post,* 8 July 2017.

69 Max Bergmann and Carolyn Kenney, "Acts of an Adversary: Russia's Ongoing Hostilities Toward the United States and Its Allies," Center for American Progress, 5 December 2017.

among top nations in the world in cybersecurity, coming first among the EU members in the Global Cybersecurity Index 2020 due to its highest scores in terms of legal, organisational, technical, and cooperative cybersecurity measures in place.[70] Since 2008, it has also hosted a NATO Cooperative Cyber Defence Centre of Excellence (CCDCOE), which helps advance cybersecurity cooperation between NATO members, engages in cyberwarfare research and training, and arranges exercises to detect and fight cyberattacks. However, while there is a lot of vague pronouncements regarding cyber security cooperation, tangible cooperation between the US and partner countries can be difficult. The US, due to intelligence classification standards, often finds it difficult to share information in the cyber domain with partners. This can lead to some frustration amongst US partners that feel the cooperative exchanges go one-way, with information being provided to the US, while little specific information is relayed back.

The technology behind the SMR will likely be innovative and very commercially sensitive. China may seek to grow its own development of new nuclear technology by gaining access to US and European SMR designs and technology

Lastly, an SMR or any high-profile critical infrastructure must be seen as a potential target for terrorist networks. Over the last twenty years, the US has taken considerable steps to strengthen its critical infrastructure protection, improving safety standards and regulations, and focusing significant domestic and international intelligence assets to identifying, monitoring, and disrupting potential threats. The US for decades has had robust counter-terrorism cooperation with European countries and the construction of an SMR would likely see enhanced engagement and cooperation from the FBI, Department of Homeland Security, and other US intelligence agencies involved in monitoring terrorist threats.

70 International Telecommunication Union, *Global Cybersecurity Index 2020* (Geneva: ITU, 2021).

2.3.1.3. Disinformation Target

Given the societal sensitivities about nuclear energy, disinformation is one of the most serious challenges that an SMR project would face in Estonia, especially during the public debate on adopting nuclear energy and then during the project's implementation. Capitalising on the deep-seated fears fostered by the Chernobyl and Fukushima disasters, persistent disinformation would seek to undermine trust in new technology and its safety, reputation of the companies involved in the project, and credibility of the Estonian state as a competent, effective, and responsible guardian of nuclear energy. Indeed, some of the threats discussed above could be employed in a disinformation campaign and might even be followed through on to substantiate the messages of that campaign and to maximise the psychological and political impact.

The impact of malignant disinformation campaigns on political processes and national security is well understood by the US and Baltic governments, as is the role of hostile state powers in orchestrating such campaigns. Over the last two decades, the Russian threats to energy security of the Baltic states were analysed in depth by academics and periodically highlighted by intelligence services. "Russia continued its attempts to dominate the energy market of the Baltic region and obstruct its integration into the Western Europe energy system," stated the Lithuanian State Security Department in 2018.[71] The same assessment was made by the Estonian Foreign Intelligence Service in 2019: "Russia makes particular use of international energy supplies to create energy dependence that would allow it to pursue its economic and political interests".[72]

Given the societal sensitivities about nuclear energy, disinformation is one of the most serious challenges that an SMR project would face in Estonia

71 State Security Department and Second Investigation Department, *National Threat Assessment 2018* (Vilnius: Ministry of National Defence, 2018), 5.

72 Estonian Foreign Intelligence Service, *International Security and Estonia 2019* (Tallinn: Estonian Foreign Intelligence Service, 2020).

Dependence on Russian energy resources, lack of supply alternatives, and remaining a part of the post-soviet electricity system IPS/UPS through the so-called BRELL – which includes Belarus, Russia, Estonia, Latvia, and Lithuania – set of agreements formed a dense network of Russian influence on the Baltic energy sector supported by technical, economic, and political means. Almost every attempt of the Baltic states to break away from the Russian energy sphere of influence was met with harsh opposition from Russian energy companies as well as the domestic lobby, connected to Russian interests. Implementing the EU's Third Energy Package directives while reforming gas and electricity sectors according EU energy market liberalisation aims, investing in LNG facilities as alternative to Gazprom monopoly of supply, or seeking to synchronise to Continental electricity grid instead of BRELL, just to mention a few – every move by Baltic states was thwarted by Russian and local lobbyists through legal, diplomatic, economic, disinformation and outright corruption methods.[73] Disinformation, alongside invisible or illegal political influence through corrupt politicians and other decision-makers, has become one of the most important methods that Russia has used actively over the past decade. By initiating controversial discussions over the economic feasibility or safety of new energy projects, Russian lobbyists thwarted a number of initiatives to reduce energy dependence on Russia. Former Lithuanian Prime Minister Andrius Kubilius admitted that Lithuania had lost several important "battles" (see Annex B for more details of the Lithuanian experience):

> The 2012 referendum "against the Visaginas Nuclear Power Plant (VAE)", which ended in a complete victory for the Kremlin and Rosatom. So now we have the Astravyets problem. That victory of the Kremlin was realised in Lithuania by well-known parties and well-known business figures, who in 2013 were able to enjoy very successful deals with businesses close to the Kremlin. I also named Lithuania's defeat in 2013-2014 over the Chevron's investment in shale gas exploration in Lithuania. This defeat in Lithuania was again caused by specific parties, communities, politicians or otherwise "public figures".[74]

In 2006-12, Lithuania's intentions to build an NPP together with Latvia and Estonia would have significantly changed the current picture of electricity generation in the Baltic region. However, Russia's actions contributed to the suspension of this project (see below for expanded case study on this example). Consequently, there was no potential competitor in the region for the future Astravyets NPP, which was commissioned in 2020 ignoring numerous construction incidents and Lithuania's protests.

For many years Russia's main energy interests in the Baltics have been:

- to hinder the liberalisation and integration of the Lithuanian, Latvian and Estonian energy markets into the EU;
- to maintain a monopoly on gas supply and hamper the development of alternative gas supply routes;
- to prevent the development of new electricity generation capacity in the Baltic states in order to maintain dependence on electricity imports from Russia (and Belarus);
- to maintain the possibility for electricity trade with the Baltic states – primarily from Kaliningrad to Lithuania, but also from Russia to Latvia – even after the synchronisation of Baltic's electricity networks with the EU continental system.

All of these objectives were based not only on financial interests, which are of importance, but also on political reasons as well. In 2020, before the Astravyets NPP started operations, commercial imports of electricity to the Baltic states from the Kaliningrad exclave, continental Russia, and Belarus was 3.7 TWh, and the potential import for 2021 could reach 9.4 TWh if Astravyets NPP surplus production was allowed into the Baltic markets.[75] Russian energy companies exploited dominance in the Baltic energy markets by creating bogus trade companies, which acted as intermediaries of Russian energy exporters, functioned as instruments of the Russian lobby, manipulated of public opinion and bribed local politicians.[76]

73 See Margarita Balmaceda, *The Politics of Energy Dependency: Ukraine, Belarus, and Lithuania between domestic oligarchs and Russian pressure* (Toronto: University of Toronto Press, 2013); Vija Pakalkaite, "Lithuania's Strategic Use of EU Energy Policy Tools: A Transformation of Gas Dynamics," The Oxford Institute for Energy Studies, OIES Paper NG 111, 2016.

74 Andrius Kubilius, "Kremliaus hibridiniai karai prieš Lietuvą. [Kremlin's hybrid wars against Lithuania]," *15min.lt*, 8 February 2018.

75 Giedrius Radvila, "Operation of Belarus NPP and energy flows: data analysis", Litgrid, 10 February 2021.

76 Margarita Balmaceda, *The Politics of Energy Dependency*; Agnia Grigas, "Energy Policy: The Achilles Heel of the Baltic States," in *The Baltic States in the EU: Yesterday, today and tomorrow* (Studies & Reports, No 98), eds. Agnia Grigas et al (Paris: Notre Europe – Jacques Delors Institute, July 2013); National Security and Defence Committee of the Seimas of Lithuania, "Conclusion of the Parliamentary investigation into possible undue impact of persons, business entities and other interest groups on state authorities in decision making and possible unlawful influence on policy processes," No XIII-1228, 5 June 2018.

In other words, dependency on Russian energy imports allowed Putin's regime to keep its influence in a much broader way by providing some of the needed material and financial foundations for the so called "Russia's sphere of influence". It may be that true independence from the Russian energy networks of influence. can occur only after synchronisation with the continental grid in 2025 and the subsequent severing of physical connections with Kaliningrad, Belarus, and Russia.

Nuclear power projects are particularly affected by misinformation because they are surrounded by a variety of myths and fears

Given the historical precedents (see Annex B) and Russia's still-relevant interests in the Baltics, some assumptions can be made with regards to future energy projects in the Baltic region. Nuclear power projects are particularly affected by misinformation because they are surrounded by a variety of myths and fears. Some public opinion studies and academic research point to construction costs and safety concerns, such as waste storage, as drivers of scepticism.[77] Others highlight the influence of environmentalist movements on public opinion and institutional decision-making.[78] Inevitably, major nuclear incidents, such as the Chernobyl and Fukushima cases, are also having a negative impact on public opinion regarding nuclear energy.[79] On the other hand, some studies found that familiarity to nuclear facilities, increased awareness of climate change, and demands for low-carbon electricity increases public support for nuclear energyIn general, attitudes of people who live near nuclear power plants are more favourable than of general public.[80]

77 Jonathon Baron, «Mass Attitudes and the Relationship Between Nuclear Power and Nuclear Weapons,» *SSRN Electronic Journal*, 2020; Younghwan Kim, Minki Kim, and Wonjoon Kim, "Effect of the Fukushima Nuclear Disaster on Global Public Acceptance of Nuclear Energy," *Energy Policy* 61 (October 2013): 822–28; M.V. Ramana, «Nuclear Power and the Public," *Bulletin of the Atomic Scientists* 67, no. 4 (July 2011): 43–51.

78 Christian Joppke, *Mobilizing Against Nuclear Energy: A Comparison of Germany and the United States* (Berkeley, CA: University of California Press, 1993).

79 Kim, Kim, and Kim, "Effect of the Fukushima Nuclear Disaster."

80 Ann S. Bisconti, "Public Opinion on Nuclear Energy: What Influences It," *Bulletin of the Atomic Scientists* (blog), 27 April 2016.

The Baltics have done a lot to distance themselves from Russia's electricity system and even decided to reduce commercial flows from Russian networks to 300 MW in March 2022 due to Russia's invasion of Ukraine.[81] However, the Kremlin will still retain an interest in preventing the Baltics from securing local generation capacity, perhaps hoping that electricity trade with the Baltics could be an option in the future. History shows that the Kremlin's regime interferes at any possible opportunity and that tendency will not change soon. Some specific factors related to the features of a SMR project in Estonia could be exploited in creative ways:

- **The novelty of a project** can be used as an additional source of mistrust and fear of modern technologies. People tend to fear something that is unknown to them, or as N.R. Carleton summarises, "fear of the unknown may be a, or possibly the, fundamental fear."[82] Practically untested technologies or the first nuclear reactor of its kind can be easily linked to various fears and uncertainties, and some conspiracy theories can gain momentum.

The Kremlin will still retain an interest in preventing the Baltics from securing local generation capacity, perhaps hoping that electricity trade with the Baltics could be an option in the future

- **US involvement** in the construction of the nuclear reactor could further facilitate Russian-sponsored conspiracy theories. Recently, the topic of "nuclear weapons" or "radiological laboratories" in Ukraine has been widely used in Russia's disinformation narratives.[83] These allegations could also be directed at the US-Estonia nuclear

81 Ministry of Energy of Lithuania, "The Baltic electricity transmission system operators are reducing the commercial capacity of system connections with Russia," News, 2 March 2022.

82 R. N Carleton, "Into the Unknown: a review and synthesis of contemporary models involving uncertainty," *Journal of Anxiety Disorders*, 39 (2016): 30-43.

83 Matthew Goldenberg and William C. Potter, "Russian Misinformation About Ukrainian Radiological Weapons Capabilities and Intentions," James Martin Center for Nonproliferation Studies, 10 March 2022.

reactor project, to instil suspicion that the project has some "secret" part and that a nuclear or radioactive weapon may be being developed or deployed in Estonia.

The fact of the US involvement itself would also make Russia's disinformation efforts against the project more likely, as the United States has long been regarded as the main strategic adversary of Russia by Putin's regime.

Possible Russian efforts to interfere in the deployment of a small modular reactor in Estonia could be as follows:

- **Disseminating disinformation on social networks**, especially in closed groups. In this case, people who easily succumb to various conspiracy theories are often exploited. These groups of people easily accept and naturally disseminate any information that allegedly reveals a government conspiracy, whether it's about vaccines, 5G technology or genetically modified food, etc.
- **Creating platforms – forums, conferences and other types of events – for supposedly objective discussions** and questioning the meaning or economic feasibility of the project. In the public information space, it may be encouraged to doubt official information and assessments. Particularly common topics for disinformation are the interpretation of economic costs, issues of nuclear fuel utilisation, and environmental risks. The initiators or participants of such discussions may or may not be directly related to Russian organisations, and there may be a natural involvement of civil society in the discussions. However, increased attention should be paid if discussions are initiated by previously inactive or completely new non-governmental organisations or by hitherto unknown experts.
- **Igniting protests, especially by exploiting local communities** which would actively oppose the implementation of the project. People are reluctant to support the construction of potentially dangerous facilities near their living environment, so taking advantage of their anxiety can be easy.
- **Political lobbying** and attempts to disrupt the process by delaying procedures, raising inquiries about additional assessments, and other bureaucratic mechanisms. If there is a possibility that Russia may have "agents of influence" in national or local political structures, it is possible that it will try to exploit them on this issue as well.
- **Actions to collect signatures and sign petitions against the project.** Referendums have become a common tool used by pro-Russian political or social groups in various countries in recent decades. Unlike in some other European countries, where referenda can be initiated by citizens, only the Parliament can announce a referendum in Estonia. Estonian citizens do not have the direct right of referendum initiative. However, although Estonians cannot directly initiate a referendum, they can petition the Parliament through, for example, the Estonian Citizens' Initiative portal (ECIP), an institutionalised online instrument to sign a petition, and such actions can also politicise the issue.

Persistent toxic narratives targeting nuclear energy development in Estonia, or psychological operations aimed to scare the public into believing that the SMR-hosting power plant – still planned, under construction or in operation – is unsafe, would greatly complicate the project or might even put an end to it. Such operations could include data leaks to damage the reputation of the project team or the government regulator, drone appearances in the plant's vicinity, attacks on power grids, attempted terrorist attacks at the plant, and even threats of or actual physical attacks on the project's key executives and their family members to intimidate them. Other vectors of disinformation campaigns would include suasion in the direction of regional neighbours that Estonia is acting irresponsibly in pursuing its nuclear project.

The fact of the US involvement itself would also make Russia's disinformation efforts against the project more likely

Most of the aspects of malignant disinformation will have to be addressed by the Estonian government and the SMR project company itself. However, the USG would have a very strong interest in protecting the reputation of the US technology and supporting Estonia in countering Russia's malignant interference. Clear strategic communication from Washington about the benefits of nuclear

energy, trustworthiness of SMR technology, and its role in enhancing climate security and energy independence of its allies would be the bare minimum required in response. It would also require sharing intelligence about

Persistent toxic narratives targeting nuclear energy development in Estonia, or psychological operations aimed to scare the public into believing that the SMR-hosting power plant is unsafe would greatly complicate the project or might even put an end to it

the organisations and networks of individuals involved in anti-nuclear disinformation efforts and providing early warning about the activities or security incidents planned by them that are exploitable in the information domain to cause confusion, distrust, and fear.

The essential matter, however, will be the credibility of US nuclear energy technology, including SMRs, and the mechanisms to ensure its effective and safe application in international markets, including in Estonia. The USG has a long-standing and robust policy and legal framework serving this purpose.

2.4. Framework for US Civil Nuclear Cooperation

The legal and policy basis for US civil nuclear cooperation with other countries is codified in the Nuclear Cooperation Agreements (NCAs) the United States concludes with foreign governments and entities. The conclusion of such agreements is required under US law before the United States can engage in "significant transfers" of nuclear material and equipment, namely the transfer of nuclear reactors, major reactor components, or nuclear material for fuel.

These agreements, known also as 123 Agreements after Section 123 of the US Atomic Energy Act (AEA), must meet nine non-proliferation criteria specified in the Act. The nine criteria include: IAEA safeguards on nuclear facilities and material, physical protection requirements, and US consent rights for retransferring, enriching, or reprocessing nuclear material from the United States or produced with US equipment, as well as the storage of enriched uranium or plutonium. The US Department of State provides the President and Congress with both classified and unclassified assessments of the agreement's compliance with those criteria.[84] Once concluded, NCAs are subject to Congressional review in which the agreement enters into force automatically after a period of time unless both chambers of Congress adopt a joint resolution of disapproval, a fairly high bar to block an agreement. The President can waive any of the nine non-proliferation criteria if such waiver is determined to be in the US national security interest, but an NCA using such a waiver must go through a more rigorous review process and receive a positive vote from Congress to be adopted.

2.4.1. Enrichment, Reprocessing, and the Gold Standard

While US nuclear cooperation agreements must generally conform to the AEA's nine non-proliferation criteria, over the last decade, the United States has also sought to include additional provisions to seek political or legal commitments from partners that they will not pursue domestic uranium enrichment and/or spent fuel reprocessing capabilities. This effort was part of a broader strategy beginning in the early 2000s in which the United States placed an emphasis on preventing more countries from constructing enrichment or reprocessing facilities, based on the role such facilities played in Iraq's nuclear weapons programme prior to 1991, and more recently, Iran and North Korea.

Enrichment and reprocessing represent the two technical pathways to produce material for nuclear weapons. Uranium enrichment involves increasing the concentration of the uranium isotope U-235, which facilitates the nuclear fission process. The most common nuclear reactor designs, and most nuclear power reactors in operation today, use low-enriched uranium consisting of about 4% U-235. However, enrichment facilities can be used to enrich uranium to weapons-grade levels of 90% or more, making them particularly proliferation sensitive.

Reprocessing involves the chemical separation of highly radioactive by-products of nuclear

84 For a complete list see Paul K. Kerr and Mary Beth D. Nikitin, "Nuclear Cooperation with Other Countries: A Primer," Congressional Research Service, updated 28 December 2021.

fission from spent nuclear fuel unloaded from a reactor. Reprocessing is used in civil nuclear energy to reduce the heat and volume of waste from spent nuclear fuel to facilitate spent fuel management and ultimate disposal. However, the process of stripping radioactive by-products from spent nuclear fuel also separates plutonium. Plutonium separated from nuclear fuel offers another route to acquire material for nuclear weapons.

Enrichment and reprocessing are both expensive, technically sophisticated processes that are not domestically required for civil nuclear energy. While non-nuclear weapon states parties to the Nuclear Non-Proliferation Treaty (NPT) are prohibited from developing or pursuing nuclear weapons, there are no restrictions on pursuing these technical pathways to producing material for weapons. Yet for most countries, relying on the international market for fuel services is far more economical than building domestic enrichment or reprocessing facilities. Moreover, Iraq, Iran, Libya, and North Korea all sought to build enrichment or reprocessing facilities in secret as part of the nuclear weapons programmes. The United States, as well as its non-proliferation partners, have therefore questioned the peaceful intentions of states that have elected to pursue such capabilities, while China has questioned the intention behind Japan's significant reprocessing capacity.

By including clauses related to enrichment and reprocessing in its NCA's, the United States sought to use its role in civil nuclear trade to pursue its non-proliferation objectives. However, with the significant decline of US global market share of nuclear energy since the 1990s, the United States has had to balance those non-proliferation objectives with commercial realities. As a result of this balancing act, the extent to which such provisions have been included in NCAs has been the primary source of US political contention over US civil nuclear cooperation.

In 2009, the United States concluded an NCA with the United Arab Emirates in which the UAE made a legal commitment not to pursue enrichment or reprocessing on its territory.[85] US officials at the time cited this commitment as the "Gold Standard" for bilateral nuclear cooperation, creating an expectation that subsequent agreements would seek, if not contain, similar legally binding commitments. However, as the United States engaged in nuclear cooperation negotiations with countries such as Vietnam, which were willing to make political, but not legal commitments on enrichment and reprocessing, the Obama administration reviewed its policy on enrichment and reprocessing and clarified its position in 2014. Under the revised policy, the United States indicated that it would seek commitments on enrichment and reprocessing on a "case-by-case basis," informed by the context of the partner country's bilateral and multilateral non-proliferation commitments.[86] US officials also dropped use of the term gold standard in reference to the non-proliferation policy. Both the 2014 US-Vietnam NCA, and the 2018 US-Mexico NCA included expressions of political intent to rely on the international market for nuclear fuel services rather than domestic enrichment or reprocessing.

In addition to the political divisions over legal requirements prohibiting new enrichment and reprocessing capabilities, the US Congress has also sought greater say over the terms of US nuclear cooperation. Since NCAs that meet the AEA's nine non-proliferation criteria automatically enter into force unless the House and Senate vote to block it, some members of Congress from both parties have felt the Congressional oversight role to be far too limited. Bills have been proposed in the past requiring Congressional approval for an NCA to enter into force, but those bills have faced opposition from the executive branch and haven't received enough support for Congress to adopt them.

2.4.2. US-Euratom Nuclear Cooperation Agreement

US civil nuclear cooperation with Estonia would be governed by the existing US NCA with Euratom. While that agreement was concluded in 1996, prior to Estonia's accession to the EU, its terms remain valid for all Euratom members. Operating under the umbrella of the US-Euratom NCA gives Estonia a significant head-start, compared with other countries without an NCA in place seeking to develop civil nuclear power. Issues that have led to extended negotiations and delays in nuclear cooperation with other potential US partners are already in place via the US-Euratom NCA.

85 This provision was conditioned by an Agreed Minute to the 123 Agreement where the United States expressed willingness to consult the UAE on amending the terms of the 123 Agreement if the United States concluded such an agreement with another state in the region offering more favorable terms.

86 One of the authors of this report was involved in the policy review and public roll-out of the policy clarification.

In particular, the US-Euratom NCA provides advance US consent for civil nuclear partners to retransfer and reprocess nuclear material processed in US-origin nuclear equipment. The requirement to seek consent to retransfer or reprocess US-origin nuclear material, or nuclear material processed using US-origin

The US-Euratom NCA provides advance US consent for civil nuclear partners to retransfer and reprocess nuclear material processed in US-origin nuclear equipment

equipment, is one of the nine non-proliferation criteria for NCAs. While the NCA itself does not explicitly use the terms consent or approval, Article 8 of the US-Euratom NCA stipulates that such retransfers and reprocessing are possible, and the agreed minute to the NCA clarifies the process through which retransfers and reprocessing can occur. In effect, Euratom members have US advance consent to reprocess nuclear material processed in US-origin equipment if the material is sent to a facility in Euratom's jurisdiction, namely, Orano's La Hague and Marcoule facilities in France. Euratom members can also retransfer material to most major trading partners of the United States and EU. This means that the bilateral legal framework for Estonia to ship spent fuel to France for reprocessing to reduce waste is already in place. Moreover, French involvement in the reprocessing of spent fuel from a US-built reactor in Estonia could mollify pressure from France for Estonia to pursue one of its designs as an EU partner.

In addition, the United States has concluded an administrative arrangement to the US-Euratom NCA which clarifies how parties to the agreement will track and account nuclear material covered by the agreement. In addition to nuclear material accountancy for IAEA safeguards and nuclear security purposes, tracking imported nuclear material is important to assure suppliers that their peaceful use obligations are being met. To ensure that states parties to the NPT adhere to their commitments not to contribute to the development of nuclear weapons, exports of nuclear material are subject to peaceful use obligations. Such material is therefore "flagged" as originating from the supplier state, and material accountancy processes track the flagged material as it makes its way through the nuclear fuel cycle. Because material flagged from one supplier may be mixed with material from another supplier during nuclear facility operations, material accountancy processes may involve complex mechanisms such as flag swaps to ensure that the amount of material provided by any given supplier is accounted for and subject to the conditions of supply. Under the US-Euratom NCA, Euratom is the party responsible for providing information to the United States regarding any US-flagged material. However, Estonia will need to develop a system of accounting and reporting possession and transfer of foreign-flagged nuclear material according to Euratom regulations.

Euratom has also concluded an Additional Protocol with the IAEA providing enhanced monitoring for international inspectors. Upon joining Euratom, Estonia's safeguards agreement with the IAEA was suspended and replaced by Euratom's safeguards agreements, including the Additional Protocol. The United

The United States has concluded an administrative arrangement to the US-Euratom NCA which clarifies how parties to the agreement will track and account nuclear material covered by the agreement

States, EU, and other like-minded states have pushed for the Additional Protocol to be recognised as the international safeguards standard, and to be a condition for nuclear supply. The reluctance of states such as Saudi Arabia to adopt an Additional Protocol has been a point of contention regarding potential nuclear cooperation with the United States.[87]

Lastly, by means of the US-Euratom NCA, Estonia is also already a "generally authorised" destination for the transfer of US civil nuclear technology and information.[88] This general

87 US Government Accountability Office, "U.S.-Saudi Nuclear Cooperation: Progress is Stalled Over Nonproliferation Conditions and Agency Management of Negotiations is Unclear," Report to Congressional Requesters, April 2020, 5.

88 This Department of Energy authorization is commonly referred to as a Part 810 authorization, after Part 810 of Title 10 of the U.S. Code of Federal Regulations. See Paul K. Kerr and Mary Beth D. Nikitin, Congressional Research Service, "Nuclear Cooperation: Part 810 Authorizations," In Focus, Congressional Research Service, April 18, 2019.

authorisation provides for the transfer of technology for the design, construction, operation and maintenance of commercial nuclear reactors and key equipment and components for these reactors. That allows US nuclear reactor vendors to share proprietary technical information regarding their products and services, providing the Estonian energy sector with important information to consider as it decides whether to pursue nuclear cooperation with the United States. This general authorisation covers the majority of activities entailed in civil nuclear trade. The US DOE does require specific authorisations, in effect

SMRs and their potential market are viewed as an important aspect of US efforts to regain a share of the global nuclear reactor market and are a feature of both US commercial marketing and diplomatic outreach

an agency review, for transfers of goods or information involving nuclear activities that are proliferation sensitive, such activities include uranium enrichment, heavy water production, or spent fuel reprocessing.[89] Estonia does not appear to have plans to develop the types of capabilities subject to specific authorisations for sensitive transfers.

The US-Euratom NCA expires in April 2026, but includes provisions for rolling 5-year extensions if the parties do not desire to make changes. US State Department officials interviewed for this study believed the NCA would likely be extended automatically and did not see a need for renegotiation. Given the complexities of reopening such an umbrella agreement, it is likely that the NCA would be similarly extended again in 2031.

2.4.3. US Civil Nuclear Technology and Its Governance

The United States is the world's largest producer of nuclear energy. With 93 operating reactors, it maintains the largest nuclear reactor fleet in the world, produces 30% of the world's nuclear-generated electricity, and maintains a domestic workforce of approximately 100 000.[90] No other country in the world has as much experience with civil nuclear energy operations. The United States is also a standard-setter for the safe and secure use of nuclear energy. US licensing processes are incredibly stringent, at times to the point of challenging the competitiveness of the US nuclear industry due to lengthy licensing procedures. But the reliability, safety, and security aspects of US nuclear technology has been one of its most important features.

However, much of the US civil nuclear experience was concentrated on domestic and exported reactors constructed between the 1960s and 1990. Domestic nuclear reactor construction has slowed considerably in the past 30 years, due to competition from cheap natural gas and construction delays and cost overruns. Challenges faced by Westinghouse, one of the premier US reactor vendors, with the construction of 4 new reactors in South Carolina and Georgia led Westinghouse to file for bankruptcy in 2017 and the cancellation of the two South Carolina reactors. US reactor exports have also slowed in recent decades owing considerably to competition from state-owned nuclear enterprises, particularly Russia's Rosatom.

SMRs and their potential market are viewed as an important aspect of US efforts to regain a share of the global nuclear reactor market and are a feature of both US commercial marketing and diplomatic outreach. The establishment of the Foundational Infrastructure for Responsible Use of Small Modular Reactor Technology (FIRST) programme in April 2021, which Estonia joined in January 2022, is indicative of the USG's focus on SMRs in its near-term nuclear export strategy. Market research organisations estimate the SMR market to grow by 15% and reach roughly $19 billion by 2030.[91] The United States began considerable investment in SMR development in 2012 with the US Department of Energy's establishment of the SMR Licensing Technical Support Program. Since that time, a wide variety of SMR designs have been under development and are in various stages of licensing.

The most important difference between the types of SMRs being developed is whether

89 "§ 810.7 Activities requiring specific authorization," US Code of Federal Regulations, National Archives, last updated 18 August 2022.

90 "Nuclear Power in the USA," World Nuclear Association, last updated 22 August 2022.

91 GlobeNewsWire, "Small Modular Reactor Market To Reach $18.8 Billion by 2030: Allied Market Research," News Release, 21 December 2021.

they are light water-cooled designs, like the vast majority of nuclear reactors in operation today, or more advanced designs using fuel and cooling processes quite different from reactors currently in use (generally referred to as Generation IV nuclear reactors). Light water cooled SMRs, which are either pressurised water reactors (PWR) or boiling water reactors (BWR), are in more advanced stages of development, validation, licensing, and commercial marketing and deployment. Generation IV SMR designs remain in various stages of development and technology validation and are likely to face challenging and lengthy licensing processes given their new designs. While Generation IV reactors may ultimately provide more efficient and safe operations, they are unlikely to reach the market in the timeframe Estonia is considering for deployment. Moreover, selecting a reactor design that has not yet been built elsewhere and being FOAK to build it tends to lead to much lengthier and costly construction.

If the market for SMRs grows as expected over the next 25 years to help countries meet their de-carbonisation goals, Estonia could benefit by becoming an early adopter of the technology

Given the timeframe being considered for Estonia's potential deployment of nuclear reactors, including to meet the country's climate change commitments, light water-cooled SMRs are likely the only ones to complete the licensing process and become ready for construction. US light water-cooled SMR vendors include: GE-Hitachi, which pioneered BWRs and is now marketing SMRs based on the same technology, Holtec International, a long-time provider of nuclear reactor components and supplies for spent fuel management, and NuScale, a relatively new company focused on the development and deployment of SMRs. The reactors these companies have developed differ in terms of their electricity generation, pricing, and number of modules, but all share the general design performance characteristics of SMRs.

In recent months, both GE-Hitachi and NuScale have inked agreements with non-US utilities and energy firms to facilitate deploying their designs. In December 2021, the Canadian utility Ontario Power Generation (OPG) selected GE-Hitachi as the technology partner to provide its BWRX-300 SMR design, providing 300 MWe with an intended completion date by 2028.[92] If Estonia decides on the BWRX-300 design, Fermi Energia's cooperation agreement with OPG subsidiary Laurentis Energy Partners would provide Estonia with a head start for understanding and tapping into Ontario's role in the BWRX-300 supply chain as the first site to host the design, and aid in the development of a licensing process for the reactor. In November 2021, NuScale signed a teaming agreement with Romania's nuclear energy producer Nuclearelectrica to advance the potential deployment of a 6-module NuScale plant producing 462 MWe as early as 2027. Both GE-Hitachi and NuScale have signed agreements with Polish energy firms to explore SMRs as replacement for coal power plants.

While there has been considerable focus on SMRs in the nuclear energy industry and by those considering civil nuclear energy, these types of reactors are still new to the market. Moreover, there are about 70 different SMR designs being developed by a wide variety of companies around the world. Regulatory bodies in the home countries of these companies have been examining the promises for improved safety features for SMRs for many years, but other intended benefits from SMRs, in particular the savings in cost and time from modular-serial production and design simplicity can only be evaluated if and when more SMRs are constructed and enter operations. At present, the only SMR in operation designed to provide power – as opposed to serving as a demonstration project – is Russia's floating OKBM Afrikantov reactor, and no SMR has yet to be built for export. The extent to which costs for Estonian SMRs can be brought down by taking advantage of economies of scale will depend on the export experience of the SMR vendor over the next decade, as well as the number of reactors Estonia decides to purchase. However, if the market for SMRs grows as expected over the next 25 years to help countries meet their de-carbonisation goals, Estonia could benefit by becoming an early adopter of the technology. Estonia would grow a base of expertise and experience in the construction and operation of such reactors that would be in demand by other countries

92 Tim Kelly, "GE Hitachi Nuclear to Build Small Modular Reactor in Canada," *Reuters*, 3 December 2021.

pursuing their first SMR. Estonia might also become part of the supply chain for SMR components of the reactor design it chooses, especially for other countries in the region.

2.4.4. Scope of Civil Nuclear Trade

Engaging in civil nuclear trade establishes long term cooperation between countries because, even after the construction of nuclear power plants, the supplier and host countries continue cooperation over the decades that a reactor is expected to be in service. For the nuclear industry, the primary profits come from the delivery of services, including fuel, once reactors have begun operations. US companies engaged in civil nuclear trade are generally involved in one or more of the following sub-sectors:

- **Design, Construction and Operation.** Companies involved in this subsector address the activities involved in the design and engineering, procurement, and construction phase of a nuclear power plant project. This includes site preparation ahead of construction, plant operation and maintenance after completion.
- **Components.** Nuclear power plants are typically described as being composed of two "islands": a nuclear island containing the reactor, cooling system, and steam generator—generally referred to as the nuclear steam supply system (NSSS) — and a non-nuclear island containing turbines and other components that produce electricity from the steam generated by the NSSS. Companies in this sub-sector provide components for the non-nuclear island section of nuclear power plants.
- **Fuels.** Companies involved in the fuel sector represent most aspects of the nuclear fuel cycle. That includes uranium mining and milling, conversion, fuel fabrication, refuelling, and fuel transportation. The United States has one operating civil uranium enrichment facility owned by Urenco, but it is dedicated to enriching uranium for domestic US nuclear power reactors.
- **Back-End Services.** Companies in this sub-sector provide services related to nuclear power plant decommissioning and used fuel management, including waste management and removal, remediation, used fuel management, interim storage and transportation, geologic disposal and reprocessing, and recycling of plant by-products. Importantly, while US companies assist with spent fuel management, the United States does not have spent fuel reprocessing capabilities and therefore does not take back spent fuel from US nuclear power reactors.
- **Advisory and Legal Support Services.** This sub-sector includes companies that provide advisory and consulting services that address the development of legal and regulatory regimes, licensing support, siting, environmental impact analyses, legal advice, and tender writing and development. It also includes standards development and trade association activities.

Engaging in civil nuclear trade establishes long term cooperation between countries

The purchase of nuclear reactors from a US vendor will naturally entail trade in the design, construction, and operation sub-sector. The extent of US trade in other areas will depend on the arrangements that Estonia's energy sector makes for the supply of fuel, the construction of the non-nuclear island, and spent fuel management processes. USG programmes could potentially provide initial funding for some of these sub-sector services, especially functions related to safety and security issues such as facility siting, spent fuel management, and regulatory development. For example, last year the US Trade and Development Agency (USTDA) provided a $1.3 million grant to Romania's Nuclearelectrica to help fund the cost of site assessment services for new nuclear facilities and the development of a licensing roadmap for SMRs.[93] The United States is likely to deliver any such assistance through the FIRST programme initiated in August 2021, which Estonia joined in January 2022.

2.4.5. The Financing Hurdle

One of the most significant challenges that partners for US nuclear cooperation face is receiving financial support to help fund the large upfront capital costs of constructing nuclear reactors. US nuclear vendors are private companies whose capital costs for reactor construction are generally financed from private capital in a mix of debt and equity. This

93 "US Grant Made for Romanian SMR Siting Assessment," *World Nuclear News*, 14 January 2021.

has not only been a challenge for US exports but domestic projects as well. Part of the US difficulties building new domestic reactors over the past 30 years has been the reluctance of regional utilities to bear much of the cost, especially during a time of cheap natural gas.

In contrast, most other nuclear reactor suppliers are semi-state owned, including Électricité de France (EdF) (85%) and South Korea's KEPCO (51%), or wholly state-owned, including Russia's Rosatom and the China General Nuclear Power Group (CGN). With the backing of their governments, these nuclear suppliers can offer more generous financing terms than their US competitors. Rosatom in particular has pursued a "Build-Own-Operate" (BOO) model for its nuclear exports in which

The United States views its ability to set strong standards for nuclear non-proliferation, safety, and security to be threatened by its declining share of the global nuclear market

Rosatom assumes all equity in the project and operates the plant once it is constructed, receiving payments for the provision of energy to host country consumers.

For clear geopolitical reasons, competition from Rosatom is not a factor in Estonia's decision-making regarding nuclear cooperation. Moreover, there are also Organisation for Economic Cooperation and Development (OECD) rules via the Arrangement on Officially Supported Export Credits that cap state financing for nuclear projects at 85% of the value of the contract and limits the pay-back period to 18 years maximum.[94] The OECD's rules, however, are not legally binding.

The lack of US financing is not limited to nuclear exports and reflects a US policy preference to limit government intervention in commercial activity. Moreover, the degree to which the United States supports its exports financially has often been a political matter as well, with the US Export-Import (Ex-Im) Bank serving as a political target for conservative politicians. Ex-Im Bank has required periodic reauthorisation over its 80-year history, but in 2015, the Republican-led US Congress allowed its authorisation to expire, ultimately leaving the Bank unable to approve transactions over $10 million until December 2019, when Congress agreed on reauthorisation.[95] Ex-Im Bank is currently authorised through December 2026. Since its reauthorisation, Ex-Im Bank officials have touted the role of the bank in helping to finance US nuclear exports.[96] While it is possible that Ex-Im Bank comes under political pressure again in the future, the Republican Party's traditional laissez-faire approach to free trade has been upended by former President Trump and his supporters, who promoted tariffs and other protectionist measures that had previously been anathema to Republican policy orthodoxy. This shift away from limiting government involvement in trade makes unified Republican opposition to reauthorisation less likely in 2026. Moreover, much of the US political and business establishments see competition with China as the most important issue for US foreign and economic policy, with Ex-Im Bank being a tool to compete with China's state-backed exports.

In recent years, concerns about Chinese efforts to acquire equity in infrastructure projects around the world through initiatives such as Belt and Road has prompted USG efforts to intervene with its close partners and develop Western alternatives. US officials, for example, spent many years lobbying the UK to abandon the 20% minority stake CGN acquired in the planned construction of a nuclear plant in Suffolk, and to block CGN's plans to build an additional plant in Essex.[97] At the time of this report, EdF, which is leading the UK reactor project, is in discussions with the British government on replacing CGN's stake.

Concerns about US commercial competitiveness with China's state-backed exports has also shifted US views regarding the need for USG support for certain industries. The nuclear industry is a particular focus for this competition as the United States views its ability to set strong standards for nuclear non-proliferation, safety,

94 Organisation for Economic Cooperation and Development, "Arrangement on Officially Supported Export Credits," TAD/PG(2021)6, Paris, July 2021.

95 Export-Import Bank of the United States, "President Donald J. Trump Signs Historic Seven-Year Long-Term Reauthorization of EXIM," News, 20 December 2019.

96 Export-Import Bank of the United States, "EXIM Chairman Reed Provides Keynote at New Nuclear Capital Conference 2020," News, 10 December 2020.

97 "UK looks at ways to remove China's CGN from nuclear project through stake sale- FT," *Reuters*, 29 September 2021.

and security to be threatened by its declining share of the global nuclear market. Both Congress and administrations of both parties have taken steps to improve USG financing of nuclear exports in recent years.

In 2019, the US Congress required Ex-Im Bank to develop the China and Transformational Exports Program to help US exporters face competition from China's state-subsidised exports in key technology areas, including supporting the US nuclear industry. As a result of these developments, Ex-Im Bank has become less of a political target than it had been in the past.

Similar to developments with the US Ex-Im Bank, in 2020, the US International Development Finance Corporation (DFC) changed its longstanding rules to remove a prohibition against financing the export of nuclear reactors, opening up an avenue in addition to the US Ex-Im Bank for USG financial support.[98] Acting on this change, in October of that year the DFC pledged to support NuScale Power's bid to provide 2 500 MW of nuclear energy to South Africa.

2.4.6. Cooperation on Capacity Building

While the US government's ability to support the financing of nuclear reactor construction is limited, the United States does maintain a series of capacity-building programmes to provide states with training and resources related to nuclear energy governance. Specifically, these capacity building programmes work with partner states across the fields of trade, customs, law enforcement, transportation, and environmental protection to meet international standards for nuclear non-proliferation, safety, and security. These capacity building efforts help to build relationships between the US interagency and their counterparts in partner countries, helping to foster deeper bilateral security ties.

The focus of much of this capacity building would come through the US Department of State's International Security and Non-proliferation (ISN) Bureau. ISN leads the US government's nuclear cooperation efforts through its Office of Nuclear Energy, Safety, and Security, and manages the FIRST programme, which provides assistance to states considering developing nuclear power using SMRs or advanced reactors. ISN also oversees the US Export Control and Related Border Security (EXBS) assistance programme. EXBS provides training and equipment to partner countries

While the US government's ability to support the financing of nuclear reactor construction is limited, the United States does maintain a series of capacity-building programmes to provide states with training and resources related to nuclear energy governance

to help prevent the spread of weapons of mass destruction, their means of delivery, and destabilizing accumulation of conventional weapons. Moreover, EXBS coordinates with several other USG agencies who participate in its capacity building efforts, including the Departments of Energy, Commerce, Justice, and Homeland Security, as well as the US national laboratories, and academic and private sector capacity building implementers.

2.4.6.1. Regulatory Support

Estonia has a strong regulatory environment and a significant technical base. However, as a small country without a history of nuclear energy use, US officials interviewed for this report indicate that the country will effectively need to establish its nuclear regulator from scratch.

The FIRST programme is intended to help partner countries build the institutional capacity to manage a civil nuclear power programme by implementing the IAEA's Milestones Approach. The Milestones Approach is a three-phased roadmap consisting of 19 nuclear infrastructure issues requiring specific steps at each phase to prepare the institutional groundwork for nuclear energy, a process that generally takes between 10-15 years.[99] Those

98 Organization for Economic Cooperation and Development, "OECD Financing Rules for Nuclear Power Projects," Presentation, n.d..

99 International Atomic Energy Agency, "Milestones in the Development of a National Infrastructure for Nuclear Power," Nuclear Energy Series, 2015.

19 issues include IAEA safeguards, funding and financing, emergency planning, human resource development, radiation protection, and radioactive waste management, among others. Estonia is currently in phase 1 of the IAEA Milestones as it considers nuclear energy as an option and examines the requirements to do so. The second phase would entail a decision to pursue nuclear power, the preparatory work for the construction of a nuclear plant, and the establishment of regulatory frameworks and organisations. Phase three involves all of the activities around the construction of the first nuclear plant.

While the FIRST programme is led by the US Department of State, it leverages expertise from other government agencies, including the Nuclear Regulatory Commission (NRC) and Department of Energy, to provide information, training, and best practices to carry out the steps in each phase of the IAEA's milestones. In particular, support from the FIRST programme entails assistance establishing or empowering the three main organisations involved in the governance of a nuclear energy programme: 1) a government body serving as a Nuclear Energy Program Implementing Organization (NEPIO) responsible for coordinating all of the organisations involved in the establishment of a nuclear energy sector; 2) an independent regulator responsible for overseeing safety and compliance with regulatory frameworks, which in Estonia's case includes Euratom regulations; and 3) an owner/operator capable of running the nuclear plant in a safe and secure manner.

The US NRC also maintains an assistance programme called the International Regulatory Development Partnership (IRDP) that helps partner states develop the organisation structures and processes for the regulatory oversight of new nuclear power programmes.[100] This assistance includes support to develop staffing and training processes for the new regulatory agency and the drafting of laws and regulatory guidance.

2.4.6.2. Export Controls and Border Security

While Estonia has not had a need to-date to establish a robust nuclear trade regulatory system managing the import and export of nuclear goods and material, since 2004 it has been a participant in the 48-member Nuclear Suppliers Group (NSG), a multilateral body that coordinates controls over the export of nuclear goods and technology. In particular, the NSG maintains and updates control lists for nuclear goods and technology of varying sensitivity, whose incorporation into national export control procedures is a crucial step in meeting international nuclear export control standards. As it explores engaging in civil nuclear energy and civil nuclear trade, Estonia will need to ensure it has not only adopted the NSG control in its domestic system – it will also need credible licensing and customs processes to regulate the transfer of listed items. Developing a nuclear power programme and the regulatory and export controls system will likely raise Estonia's profile in the NSG as it would develop a domestic technical base around nuclear technology and would have first-hand experience licensing and regulating nuclear trade.

US officials interviewed for this report indicated that the Export Control and Related Border Security (EXBS) programme would likely be leveraged to assist Estonia with several security aspects of a nuclear power programme. EXBS provides support for five general areas to prevent proliferation and protect WMD-related material: laws and regulations, licensing, enforcement, government-industry cooperation, and interagency and international cooperation and coordination. Specific areas of support would include US Department of Energy commodity identification training to help Estonian customs and licensing officials understand and identify nuclear related items on export control lists to regulate transfers of nuclear goods and technology. The US Department of Justice and US Customs and Border Protection also provide training as part of EXBS on the enforcement of export control

Developing a nuclear power programme and the regulatory and export controls system will likely raise Estonia's profile in the NSG as it would develop a domestic technical base around nuclear technology and would have first-hand experience licensing and regulating nuclear trade

100 US Nuclear Regulatory Commission, "International Regulatory Development Partnership," brochure, n.d..

laws, including investigating and prosecuting potential violations. Based on needs, EXBS can also provide detection equipment to help monitor and prevent any unauthorised movement of radioactive material.

2.4.6.3. Nuclear Safety and Security

Estonia is already party to several multilateral instruments that set global standards for aspects of nuclear safety and security. These instruments include the IAEA Convention on Nuclear Safety, the Convention on the Physical Protection of Nuclear Material and its 2005 Amendment, and the Convention for the Suppression of Acts of Nuclear Terrorism. Estonia also participates in the US-led Global Initiative to Combat Nuclear Terrorism (GICNT). This means Estonia is already committed to many international standards for the safe and secure use of nuclear energy. Working with US capacity building programmes would provide for Estonia's implementation of these standards domestically.

The FIRST programme includes training modules addressing nuclear safety and licensing for SMRs, nuclear security, and SMR siting and early preparation works which are related to safety, emergency planning, and environmental considerations. US interagency partners under FIRST, including the Department of Energy and NRC, would provide information and best practices for each of these modules.

The US NRC also manages an assistance programme called the Radiation Sources Regulatory Partnership (RSRP) which works with partner country regulators to develop the regulatory infrastructure to account for and safely use and dispose of radioactive sources.[101] This includes assistance with the development of laws and regulations over radioactive sources, guidance on licensing and inspection processes, and procedures to address occupational radiation exposure. While this assistance programme is not solely related to the development of nuclear energy, it addresses an aspect of nuclear regulatory oversight.

Estonia is already committed to many international standards for the safe and secure use of nuclear energy

2.5. Implications for Estonia

As the US is seeking to regain its nuclear energy market lead, through the design and export of new generation SMRs, it will become increasingly active in advancing this technology in those parts of Europe that are searching for pathways towards "zero carbon" future and greater energy security. Washington will leverage 3SI and P-TECC as frameworks, through which countries of the Trimarium will be continuously engaged to discuss the strategic benefits of nuclear energy and US technology. Estonia, as participant of these frameworks, will have access to and opportunities to cultivate networks coalescing around the particular geoeconomics interests of its key strategic ally. Moreover, given the envisaged timelines, Estonia could even be at the forefront of advancing this interest and thus become a vital partner to the US in what is likely to become one of the central strands of global competition for technological dominance in the post-hydrocarbons era.

Aligning with this interest poses little political risk when it comes to the US political scene, where strong bipartisan consensus has emerged over the future of nuclear energy. Exploiting the opportunity would also enable Estonia to draw upon robust nuclear energy and security cooperation as well as capacity-building mechanisms put in place by the USG to support US partners. Although the decision to build a nuclear power plant – even based on a safer SMR technology – creates its own set of security issues, attending to those issues presents new opportunities for the Estonian foreign and security policymakers and national security authorities to engage their US counterparts and develop closer ties with them. This would be a new area for government-to-government, government-to-business and business-to-business contacts and collaborations that would "bring more US" to Estonia and the region. As a multi-billion project, it could also significantly add to rather modest bilateral trade and investment dynamics between the two countries (see Annex A).

However, as Estonia is deeply integrated into European security and economic structures and the EU's knowledge and technology

101 US Nuclear Regulatory Commission, "Radiation Sources Regulatory Partnership," brochure, n.d..

networks, such strategic positioning might not be welcomed by some of the European partners, weakening their solidarity with Estonia's long-term security interests. Next chapter of the report considers the European dimension of the prospective Estonian nuclear energy aspirations.

3. EUROPE

In Estonia's security policy, the fundamental importance of the United States and the transatlantic relations is supplemented by equally pivotal importance of Estonia's membership in the EU. Although energy policy and planning remain a national responsibility within the EU, there is a growing degree of intergovernmental coordination and various commitments undertaken by the member states at the EU level, e.g. within the framework of the so-called Energy Union.[102] Member states are also expected to seek greater coherence and cooperation in various aspects of internal security in the framework of the Security Union, and coordinate their efforts and interests in ensuring external security through the Common Foreign and Security Policy (CFSP) instruments.[103]

The increasing interdependence of various member states in their energy security – as well as in ensuring overall national security against various internal and external threats – means that every country should consider the positions and interests of their fellow member states and common European interests when making some key decisions. Absent such consideration, they might run into difficulties when it comes to accruing political capital that they could deploy in advancing their interests within the EU as well as in ensuring solidarity and mutual support in security crises. Commitment to nuclear energy based on technology sourced from outside the EU is one of such decisions – especially at the time when the EU officials increasingly refer to such concepts as European "technological sovereignty," "energy sovereignty," and "strategic autonomy."[104]

This chapter aims to examine where some of the EU member states stand regarding the future of nuclear energy, why, and how this stance shapes the EU-level debate as well as affects Estonia's interests. In addition to discussing the compromises emerging within the EU, we have chosen to investigate two major EU states representing the opposite ends of the spectrum, pro-nuclear (France) and anti-nuclear (Germany). We also discuss an important member state that is moving towards adopting nuclear energy as part of its efforts to decarbonise the energy sector (Poland). This selection also represents countries of vital significance to Estonia's security and defence interests that, at the same time, have different or even divergent perspectives on the importance transatlantic relations and the prospects of the EU as a geostrategic actor. Issues that can be identified due to Estonia's decision to develop nuclear energy based on the US technology in conducting future relations with them would largely be applicable to relations with other fellow member states that exhibit similar perspectives as one of those three studied cases.

3.1. Germany

Due to Germany's political and economic weight in the EU, it is important to understand Germany's potential reaction and political stance concerning Estonia's decision. Germany also plays a significant role in the Baltic region, as it provides considerable contribution to NATO's deterrence and defence posture in the Baltic region, engages in defence technology and industrial partnerships with the Baltic states, and is one of the most active economic investors in the region.[105] It is also among the top five foreign trade partners of Estonia.[106] Therefore, it is necessary to assess the likely geostrategic response of Germany to an Estonian decision to adopt American SMR technology to decarbonise its electricity generation.

It is reasonable to expect Berlin's posture to be more muted for the immediate future towards such a policy than it would have been prior to 24 February 2022, when Russia invaded Ukraine and Germany's Federal Chancellor Olaf Scholz declared a *Zeitenwende,* an historical "turning point" for German domestic and foreign affairs, which is likely to

102 "Energy Union," Policies, Council of the European Union, last updated 27 November 2020.

103 "European Security Union," Strategy Priorities for 2019-2024, European Commission, last accessed 25 April 2022; "A stronger Europe in the world," Strategy Priorities for 2019-2024, European Commission, last accessed 25 April 2022,.

104 Thierry Breton, "Europe: The Keys to Sovereignty," European Commission, 11 November 2020.

105 See more on the Baltic security relations with, and expectations from, Germany in Tony Lawrence, "The Baltic States Would Wish Germany's New Government to Step Up in Defence and Step Back from Russia," ICDS Commentary, 18 February 2022.

106 "Destinations 2021" Statistics Estonia, last accessed 6 April 2022; "Consignment 2021", Statistics Estonia, last accessed 6 April 2022.

diminish the reliance of Germany on Russia in energy security.[107] However, the Estonian nuclear energy programme would be at odds with enduring core tenants of German energy orthodoxy and perceived national interests, so the potential for episodic and even systematic geostrategic opposition by Berlin in the mid-term is significant.

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Many German elites were quite aware of the menacing developments within the Russian leadership over the past 15 years or so. Naivety may have played some role; however, German policy repeatedly returned to protecting and reaffirming its partnership with Moscow, especially in energy matters, after each new affront committed by the Russian leadership. The reasons seem to be twofold:

- Objective structural difficulties in the economy and energy-resource deficits;
- An enduring urge to gain space for independent German geoeconomic and geostrategic policy, as German elites exhibit discomfort with American elites, while still enjoying the benefits of the US-enforced global security and liberal-trade order.[108]

Subsequently, there have long been two energy-focused pillars of German geostrategy: first, pursuit of ever closer energy partnership with Russia that not only ensured Germany's energy supply but also provided a means to balance Germany's security dependence on the US and second, the diplomatic and commercial effort to internationalise the German domestic energy-transition model, the *Energiewende,* into what is termed "the Global *Energiewende*."[109] A brief overview of these, and their underlying motivations, gives a sense of the impetus one will find from Berlin to object to any Estonian SMR project, and especially one associated with the US firms and government entities.

3.1.1. German-Russian Energy Partnership

As is well-known, German elites have partnered closely for four-to-five decades with successive Soviet Union and Russian Federation leaderships in the business of Russian oil and natural gas supplies for Europe. The resulting vertically integrated relationship brought with it, if the partners remained content, a rather autonomous and secure energy supply chain, enabling the forced suppression of competitive forces, monopolist pricing (whether especially low or high, as required by the circumstances), a taming of volatility for the consuming countries and guaranteeing long-term markets for the supplier. Put otherwise, Russian dependence of this sort, if it persisted, produced a significant degree of national energy independence for Berlin from other major powers, especially the US, in energy and economic matters. Throughout this history of the German-Russian gas and oil vertical integrations, elites in Germany were especially enamoured, both in the pre- and post-unification eras, with the degree of independence it offered them from American prerogatives within the global energy system such as to resort to war or not in the MENA region, to impose oil-export sanctions on "rogue" states or not, etc.

The end of the Cold War brought about certain challenges to this relationship and created new opportunities. After German reunification and the dissolution of the USSR, the relationship between Russia and the former-Soviet-dominated states, which the extensive German-Soviet legacy-pipeline system transited, was seen as becoming problematic in both Berlin and Moscow.[110] As Putin came to power in January 2000, a project emerged for a cooperative complete rerouting of all the old pipelines via new more geostrategically secure routes for both partners. NS2 was the latest-stage icon of the near-success of this re-invention of their energy alliance, and the full project included new Russian pipelines via Turkey into the Balkans and Central Europe,

107 Benedikt Becker, "Historische Rede: Scholz läutet mit seiner Regierungserklärung eine Zeitenwende ein [Historic speech: Scholz heralds a turning point with his government statement]," *Stern*, 27 February 2022.

108 Matthew Karnitschnig, "Analysis: Germany's pivot from America," *Politico,* 22 January 2022; Bruce Stokes, "All is not well in the transatlantic relationship," *Politico,* 10 January 2022.

109 239 references, search results for "Global Energiewende" on Boll Stiftung (institute) of the German Green party website.

110 Thomas O'Donnell, "Neue Ostpolitik [New eastern policy]," *Berlin Policy Journal*, German Council on Foreign Relations (DGAP), 21 July 2017.

and Nord Stream 1 (NS1), the 2011 completed twin sister of NS2.

On the German side, the goals were two-fold: preserve and update the relationship it had as the principal partner of Russian in its oil and gas (O&G) exports to Europe and to avoid what it saw as the "strategic risk" to its and its EU-export-market countries' energy security from subversion and wars in the former-Russia-dominated states.[111] For Berlin, and very broadly within German elites, maintaining these supplies via new, secure routes was of the highest geostrategic priority for the energy and economic security of Germany and its EU trade-zone partners.

The 20-years-long US-German struggle over NS1 and NS2 was, on the German side, a major element of its concerted efforts to *de facto* – in the sense of not openly showing this intent, but instead "leading from behind" and by establishing energy-infrastructural facts on the ground – decide transatlantic policy for dealing with Russia.[112] If it were not for Putin's new invasion of Ukraine coming when it did, the German-Russian infrastructural renewal of their Europe-encompassing O&G system was on the verge of full success.[113] Even without NS2 accomplished, sufficient new infrastructure was already in place in Europe and inside Russia such that continued transit capacity via the old routes across Ukraine, Belarus and Poland, etc., had become strategically unimportant to Moscow and Berlin.[114]

The 20-years-long US-German struggle over NS1 and NS2 was, on the German side, a major element of its concerted efforts to de facto decide transatlantic policy for dealing with Russia

What must be seen here is that both German liberal-left and conservative-right interests, across the German political spectrum, broadly resolved to pursue this partnership as a national priority. For most of its existence, this partnership opened a new vector for German capital, trade, and soft-power to penetrate those European states dependent on German-Russian gas and Russia itself.

In the end, however, the German-Russian partnership to reroute all Russian gas exports to the EU via "secure" routes has collapsed amid the Russian partners' war of choice against Ukraine. Germany persisted in its embarrassingly self-delusional conviction that its upstream partner was so appreciative of its years of investment and political support that it would never upend the relationship. For Berlin, this illusion was undermined on 24 February 2022. Nevertheless, the present coalition government has been a drag on Washington and Brussels, due to its initial reluctance to impose sanctions against Putin's aggression. Germany showed reticence to sanction Russian coal, oil, and gas, and it has been slow to supply Ukraine with heavy arms.[115] However, lost within the shadow of German hesitations, a number of other smaller CEE states are just as hesitant to sanction Russian oil or gas until clear alternative supplies are secured.

On the one hand, as various interviews conducted for this study in Berlin have revealed, the current ruling coalition has made a significant break with the doggedly Russian-partnering positions of the Merkel years. There is no illusion left of the possibility of Russia as a "reliable supplier." Even in the last year or so of the Merkel period, it was already admitted, albeit timidly, that there were significant geopolitical aims and costs associated with NS2 and the Russian O&G dependence enabled and promoted by Germany. Already before the war, opposition to NS2 as a singularly German geo-economic and geostrategic project with Moscow began to ruin Berlin's soft power throughout especially Baltic and Central and Eastern European members states of the EU, squandering investment and trade advantages.

Nevertheless, the German urge will live on for accomplishing, somehow, the same ends of carving out for itself a significant degree of freedom of action from US preponderance in global energy markets, transatlantic security, and the global liberal-trade ecosystem. Germany realises fully that it has now lost the ability to use its energy and other relationships

111 Personal communications; research discussions, Berlin.

112 See especially: Thomas O'Donnell, "Nord Stream 2: Berlin-Washington Mutual Intransigence Shows Transatlantic Divide on Russia," American Institute of Contemporary German Studies (AICGS), 8 October 2020.

113 Thomas O'Donnell, "Niemcy nie boją się Rosji. Boją się ryzyka płynącego z Ukrainy [Germany is not afraid of Russia. They are afraid of the risks coming from Ukraine]," *Dziennik Gazeta Pravwna*, No 149, 4 August 2021.

114 Thomas O'Donnell, "The growing EU v Russia asymmetry in energy trade. EU-USA nix oil/gas sanctions over Ukraine, fearing supply crisis," *The Global Barel*, 14 February 2022.

115 Henry Foy, Max Seddon, and Andres Schipani, "NATO states agree to supply heavy weapons to Ukraine," *The Financial Times*, 8 April 2022.

with Moscow to counterbalance the US in the transatlantic relations. The rupture in relations with Russia necessitates enhanced integration into and dependence on US-dominated global O&G markets. Moreover, its rupture will not only be with Russia but with large sections of official and civil societies of Europe's eastern states who deeply resent Berlin's recent history with Moscow.

The current ruling coalition has made a significant break with the doggedly Russian-partnering positions of the Merkel years. There is no illusion left of the possibility of Russia as a "reliable supplier"

Generally, a return to great power competition highlighted in the current US National Security Strategy has been, since its first articulation by the Obama administration, anathema to German geo-economic and geostrategic policy. Structural characteristics of the German economy mean that it will continue to have great difficulties living under this renewed US-mediated transatlantic alliance discipline. The key reason here is Germany's economic model relying on foreign trade as a high percentage of GDP, about 50%, and on maintaining what is now the world's largest trade surplus, surpassing even China's.[116] This policy is interwoven with its policies of low internal investments, and suppression of wages and consumption levels. This uniquely high overreliance on exports depends on the relatively low value of the Euro and on the guarantee of a global liberal-trade order under the protection of the US superpower.[117]

At the same time, a return to great power competition, as both Donald Trump and Joe Biden made clear vis-à-vis China and Russia, requires using the US and EU's capacity to exclude even the largest rogue states. However, German reliance on exports is so massive and connected to the domestic social contract of maintaining its highly valued social peace, that it simply cannot long tolerate these exclusions. Unlike China, where the leadership recognises its overdependence on exports must be rectified via building the internal market, there is no significant similar movement evident within Germany and certainly not on the radar of the present coalition government. All this means the frictions with the United States over its strategy of a return to great power competition, and with the increasingly US-aligned Trimarium (3SI countries) will continue to build.

Despite demanding US protection of global trade flows, significant sections of German elites feel that Washington, by pushing NATO frontiers East, constrained Germany's capacity to act independently of the US. Just as during the Mideast and Balkan wars, the resultant geostrategic disdain will be palpable. This sentiment among a sizeable section of elites does not bode well for the Estonian and other states in the Trimarium, who now pursue closer ties with the US on topics such as nuclear power.

Meanwhile, there are other sections of German elites moving closer, both happily and unhappily, into acceptance of the now-stricter disciplines imposed on commerce and politics by the strengthened US-led transatlantic alliance.

The frictions with the United States over its strategy of a return to great power competition, and with the increasingly US-aligned Trimarium will continue to build

However, it is not at all evident that these sentiments could predominate in any near-term German coalition government. In the end, the stubbornly unreformed structural imbalances of the German economy will continue to drive German geopolitical inclinations – particularly, in relation to the US involvement in shaping the energy policy landscape in Europe.

3.1.2. "Global Eneregievende" and Its Ideological Roots

The signature German model or pathway to the "energy transition" is based on strict adherence to "100% renewables" and "no fossil fuels or

116 Heribert Dieter, "Stubbornly Germany First: Options for Reducing the World's Largest Current Account Surplus," SWP Comment (2018/C 48), 19 November 2018.

117 Ben S. Bernanke, "Germany's trade surplus is a problem," Brookings Institution Blog, 3 April 2015; Heribert Dieter, "Stubbornly Germany First."

nuclear."[118] This is, *ipso facto*, not merely a climate change mitigation programme, as nuclear energy emits no greenhouse gasses in its operation, but has deep ideological roots. Germany's Green Party championed and spread internationally the view of "green" as only renewables that excludes nuclear energy. As a result, by the end of 2022, Germany would have eliminated the last three of its 17 nuclear reactors, prioritising this task over the elimination of Germany's polluting coal generation, which is now a task set by the Bundestag and governing coalition for 2038 at latest.[119]

In fact, the "100%-renewables-and-no-nuclear" demand of the Green Party's predecessor organisations raised this slogan before climate change was seen by the movement as a critical threat, and it was not originally emphasized as a rationale for the slogan. This transition to a new renewables-only energy system for heavily industrialised countries such as Germany was initially presented in the 1970's as the "Soft Energy Paths" model.[120] It placed a heavy emphasis on building a new energy system without fossil or nuclear, which would eliminate the need for big corporations, whose role was seen as unavoidable in any system including fossil-fuels or nuclear energy. Instead, it was promised that renewables would be locally controlled, via energy democracy, and the big energy corporations would be displaced.

Germany's Green Party championed and spread internationally the view of "green" as only renewables that excludes nuclear energy

The ideological and policy originator of "Soft Energy Paths" was Amory Lovins, the American environmentalist and founder of the Rocky Mountain Institute in the US.[121] In 2016, the Federal Ministry of Energy awarded Lovins the Federal Cross of Merit, in recognition of his services to the energy transition. He is credited with originating the very concept of "energy transition."[122] In this report, it is not possible to explore in detail the ideological, cultural, political, economic and even religious factors which gave rise to a mass, civil-society movement and the *Energiewende*, the widely-adopted German national "energy transition" plan.[123] However, it is instructive to point out that the aforementioned distortions within the German economy have facilitated the hegemony of this highly ideological, populist form of energy transition as one of German domestic and geostrategic policies and priorities.

Beyond opposing nuclear, renewables-only adherents militated to rapidly kill natural gas use. This illustrates a limitation of the *Energiewende* model, positing "the perfect as the enemy of the good." Absolute moral clarity has significant mobilizing effects; however, it often blocks the embrace of pragmatic measures that are effective in cutting carbon emissions. For example, there is evidence that natural gas ousts coal from the market when it is cheap and plentiful. In the US, 290 coal plants were shut between 2010 and May 2019, amounting to 40% of the country's coal-generating capacity. Of those shut between 2011 and 2019, 121 were repurposed, 103 of which were converted to or replaced by natural gas-fired plants.[124] This, of course, was all made possible by the "fracking revolution," a matter often addressed only in dismissive terms in much of Europe.

In contrast, however, Germany was forced to increase its coal use in 2021 by 35% due to an over-25% drop of wind early in the year versus 2020, such that coal became again the top source of its electricity, at 27%.[125] This also helped deplete gas storage, permitting Moscow to weaponise the EU's dependence on Gazprom in filling its gas storages before the 2021-22 winter. Even with the present gas crisis provoked by the Russian war, the German

118 Leonard Göke, Claudia Kemfert, Mario Kendziorski, and Christian von Hirschhausen, "100% Renewable Energy for Germany: Coordinated Expansion Planning Needed," Deutsches Institut für Wirtschaftsforschung e.V.(DIW), Weekly Report 29/30/2021,. 209-215.

119 "Kohleausstieg: Der Bundestag und der Bundesrat haben den Ausstieg aus der Kohleverstromung bis spätestens 2038 beschlossen [Coal exit. The Bundestag and the Bundesrat have decided to phase out coal-fired power generation by 2038 at the latest]," Bundesnetzagentur [Federal Network Agency], last accessed 26 April 2022.

120 Amory B. Lovins, *Soft Energy Paths: Toward a Durable Peace* (1st ed.) (San Francisco, CA: Friends of the Earth International: USA, 1977); Amory B. Lovins, "Soft Energy Technologies," *Annual Reviews of Energy*, Vol. 3 (1978): 477–517.

121 "Amory Lovins: Cofounder and Chairman Emeritus," People, Rocky Mountain Institute, last accessed 26 April 2022.

122 Claus Hecking and Petra Pinzler, "'Die Politik sollte steuern, die Wirtschaft rudern' [Politics should steer, the economy should row]," *Die Zeit,* 17 March 2016.

123 Though this programme is supported to a significantly lesser extent by the latter-founded far-right AfD.

124 Lindsay Aramayo, "More than 100 coal-fired plants have been replaced or converted to natural gas since 2011," US Energy Information Agency, 5 August 2020.

125 Michael Shellenberger, "German Emissions From Electricity Rose 25% in First Half of 2021 Due to the Lack of Wind Power, Not Willpower," 28 July 2021.

coalition, with its anti-nuclear agenda, has initially refused to keep its last three plants open. This means that there would be another 11% (2020) of electricity production that coal will have to make up, as gas will remain in short supply for some time.[126] The severity of the energy crisis prompted the German government to consider extending the lifespan of the last operational nuclear reactors, and 78% of citizens favour retaining them in operation for at least a while.[127] However, some key government officials continue insisting on irreversibility of nuclear closure.[128] Ideological resistance to any prospects of a nuclear renaissance will remain strong and is likely to outlive the present crisis.

Unbalanced overreliance on renewables in Germany is being now somewhat moderated in practice, due to Russia's war on Ukraine and its use of oil and gas supplies as a geopolitical lever

Third, big reductions in the installation costs of wind turbines and solar cells are often correctly cited to justify "renewables only" model of energy transition. However, the inescapable intermittency of wind velocity and sunshine intensity in an overly renewable dependent system requires a costly rebuilding of transmission and distribution grids, plus massive, generalisable "grid scale" storage – technology for which is not yet adequately developed.[129] Even in wealthy and engineering-capable Germany, annual reports repeatedly show progress on these grid-and-storage "reinvention" tasks to be very disappointing. In contrast, a new nuclear plant – or a gas-fired plant – can be inserted into the existing grid at the location of a shuttered coal-fired power plant.

126 "Gross electricity production in Germany," Production, Statistisches Bundesamt (Destatis), last updated 11 January 2022.

127 Melanie Amann et al, "Atomkraft? Ja bitte! [Nuclear energy? Yes, please!]," *Der Spiegel,* 5 August 2022; Bojan Pancevski, "Germany to Keep Last Three Nuclear-Power Plants Running in Policy U-Turn," *The Wall Street Journal*, 16 August 2022.

128 Markus Wacket and Andreas Rinke, "German economy minister rules out keeping nuclear plants running to save gas," *Reuters*, 21 August 2022.

129 Paul Hockenos, "Is Germany Making Too Much Renewable Energy?," *Foreign Policy,* 10 February 2021.

In Berlin, the energy transition orthodoxy has been that all the necessary technology already exists, that wind and solar installation prices are falling, and so all that is needed is political will or more ambition. In reality, there are difficult technical and economic problems with overdependence on intermittent renewables and complete rejection of nuclear energy. This unbalanced overreliance on renewables in Germany is being now somewhat moderated in practice, due to Russia's war on Ukraine and its use of oil and gas supplies as a geopolitical lever. The continued necessity of securing alternative long-term O&G supplies is pursued now even by a Green Party's energy and environment minister. However, the ideological foundations of the 100% renewables model still have strong popular and official appeal in Germany, and this will create frictions on the level of both elites and civil society with Estonia's likely adoption of nuclear energy.

3.2. France

France is an economic heavyweight of the EU and also, after the departure of the UK from the Union, its preeminent military power possessing an independent nuclear deterrent. More importantly, since Brexit, Paris has been less restrained in advocating various EU sovereignty concepts that are supposed to strengthen the Union's geopolitical credentials and ensure its "strategic autonomy" in action – in the event of the US disengagement and/or when facing opposition from key strategic adversaries such as China or Russia.[130] At the same time, like Germany, France has been an important contributor to NATO's defence and deterrence posture in the Baltic region and NATO's wider eastern flank and, through the European Intervention Initiative and due to military missions in Sahel, an important defence cooperation partner of Estonia.[131] Nuclear energy cooperation would naturally add another dimension to the existing security partnership between the two countries, but its breadth must be subjected to considerations that pertain both to energy policy and geopolitics.

3.2.1. Roots of French Nuclear Energy

France developed its nuclear energy sector extremely rapidly, in a scenario that has echoes

130 Charles Grant, "A very French Europe?," Insight, Center for European Reform, 26 April 2022.

131 Kalev Stoicescu and Maxime Lebrun, "Estonian-French Defence Cooperation – Where Estonian Pragmatism Meets French Vision," ICDS Analysis, August 2019.

of today's situation in Europe. The immediate impetus was the Arab-OPEC oil embargo of 1973, at a time when the country produced most of its electricity from oil.[132] However, the precursor was the Suez Canal Crisis of 1956, in which the attempt by France and the UK to retake the canal nationalised by Egypt ended in a failure and led to the blocking of the canal for oil transit from the Gulf to Europe. Rather than bail out these allies with the "oil lift" they were pleading for, the US administration, who had warned the allies not to attempt seizure of the canal, imposed an American oil embargo on them and threatened to blockade Israel. So, for Paris, the 1973 Arab-OPEC embargo was an energy-embargo déjà-vu, strengthening its resolve to develop nuclear energy.

France developed its nuclear energy sector extremely rapidly, in a scenario that has echoes of today's situation in Europe

With the high price of oil in the wake of oil sector nationalisations across major supplying countries that came on top of having suffered two oil embargoes in under 20 years, France moved to seek an exit from oil in electrical generation. In 1974, the government decreed the Messmer Plan, a blueprint for a massive nuclear-powered electricity transition. Just fifteen years later, France had rather astoundingly built 56 reactors. The original plan, never fully executed, had been to build 170 reactors, based on initial future-demand projections. As it turned out, the 56 units exceeded actual national electrical demand, allowing France to massively export electricity.[133]

Today France produces a higher percentage of its electricity from nuclear than any other county worldwide, 70.6% in 2020.[134] It clearly had the advantages of already being a nuclear-capable state, with all relevant technical and human capacities; it was also an industrialised state; and it could exploit its post-colonial African ties to directly secure uranium.[135]

The impetus for France moving so rapidly was not merely economic, but the security of the Republic and its energy supply. The point today is that, for France, nuclear power means energy security, and it comes with no grid, storage or major synchronisation cost and headaches, or with excessive dependence on unstable or adversarial regimes overseas. Therefore, it is highly unlikely France will ever abandon its core reliance on nuclear energy. It did flirt with a nuclear phase-out in the past decade, but both centrist President Emmanuel Macron and his failed far-right opponent in the presidential election of 2022, Marine Le Pen, made nuclear modernisation and expansion key campaign promises.[136] In France, renewables will have an important, but appropriate and moderate role.

There are two aspects of the French nuclear policy which show its deep integration into French economic and political/geopolitical realities that any other member state interested in expanding or initiating nuclear power should understand. First, it is the commercial role of the sector; second, it is the French-EU policy and broader geopolitical considerations.

3.2.2. Commercial Considerations

Nuclear energy has long made electricity cheap in France and sufficiently abundant to export,

For France, nuclear power means energy security, and it comes with no grid, storage or major synchronisation cost and headaches, or with excessive dependence on unstable or adversarial regimes overseas

enhancing French regional importance. In fact, France is normally the world's largest exporter electricity, earning some €3 billion annually.[137]

132 Timothy Mitchell, "Carbon democracy," *Economy and Society*, Vol. 38, No 3 (August 2009): 399-432; Daniel Yergin, *The Prize: The Epic Quest for Oil, Money & Power* (New York, NY: Free Press, 1992), 422-24.

133 Tina Grant, *International Directory of Company Histories* (Volume 41) (Chicago, IL: St. James Press, 2007).

134 "Nuclear share figures, 2010-2020," Facts & Figures, World Nuclear Association, June 2021.

135 Guy Martin, "Uranium: A Case-Study in Franco-African Relations," *The Journal of Modern African Studies*, 27(4) (1989): 625–640.

136 Angelique Chrisafis, "France to build up to 14 new nuclear reactors by 2050, says Macron," *The Guardian,* 10 February 2022.

137 "Nuclear Power in France," Information Library, Country Profiles, World Nuclear Association, last updated March 2022.

From around 2000 onwards, it also emphasized export of its nuclear technology. However, the expected international nuclear renaissance of those years was elusive. On the one hand, while it had looked as though natural gas was running low in North America, the prospects for nuclear energy would rise. A resurgence first in conventional gas and most especially, from 2005, the US fracking revolution, ushered in a period of abundant and cheap natural gas – the main obstacle of any nuclear revival.[138]

In addition, there have been technical problems with the two first projects of a new European Pressurised Reactor (EPR), the French Third-Generation nuclear model that it has now succeeded, after long delays, in Finland and China. Those problems were apparently caused by issues with the first iteration of the EPR design, and the EdF is now focusing on designing a second, and technically simpler version of the EPR, expected to become available from 2030.[139] In addition, it appears there were significant problems in cooperation with the state partner in Finland, with local quality control characteristics and constraints in the availability of sufficient skilled labour complicating matters and souring relations.[140]

In response to the climate challenge and Russian aggression, France is again pushing to grow its international business, using the latest reactors featuring improved passive safety designs

Delays in European advanced generation reactor projects and recent bankruptcies in the nuclear industry dimmed the prospects of nuclear revival in Europe. However, in response to the climate challenge and Russian aggression, France is again pushing to grow its international business, using the latest reactors featuring improved passive safety designs. It is also starting to develop new, versatile SMRs, based on the designs used in its nuclear-powered submarines.[141] Its expertise and established position in the EU's and world's nuclear power sectors are factors of significance to any new nuclear energy programme – including to Estonia's and even more so to Poland's which would be focused on building multiple, large-scale reactors – and also to the long-established programmes of other CEE states seeking to escape dependence on Russia.

At the same time, it has also become evident that the EdF has failed to adequately invest in the maintenance of its domestic legacy plants, such that, as of April 2022, including plants off for scheduled maintenance, half of the total fleet has shut down; many were taken offline due to corrosion of non-nuclear components.[142] Furthermore, due to severe drought conditions that reduced waterflows in the country's major rivers in 2022, the operator was forced to significantly curb the output of reactors cooled by those rivers.[143] This has slashed French exports at a time of crucial need in view of the energy crises associated with the Russian war on Ukraine. It is also an unfortunate hit to the reputation of the French national operator, which may affect the entire French nuclear industry. The French government, which is the main shareholder across many of the industry's enterprises, will have strong motivation to offset this impact and work to improve the industry's prospects in export markets – including in the EU, where France is spearheading the geopolitical agenda that revolves around the concept of European sovereignty in various domains, including energy and technology.

3.2.3. EU Policy and Geopolitical Considerations

Of crucial significance is that France will remain the main force pushing the EU to further aid the development and functioning of nuclear power. It will play a key role in counter-balancing the populist anti-nuclear and "renewables-only" camp led by Germany but having other significant supporters. This is of crucial interest to any nuclear programme decision in Estonia and nuclear-capable states throughout the Trimarium. The French recommitment to nuclear power means that nuclear energy and technology will not be merely a question of the

138 International Energy Agency, "The US shale revolution has reshaped the energy landscape at home and abroad, according to latest IEA policy review," Press Release,13 September 2019.

139 Heidi Vella, "Does the European Pressurised Reactor have a future?," *Power Technology,* 5 December 2019.

140 Mycle Schneider, *Nuclear France Abroad: History, Status and Prospects of French Nuclear Activities in Foreign Countries* (Paris: Mycle Schneider Consulting, 2009), 28.

141 Ania Nussbaum, "France to Build Small Nuclear Reactors by 2030 in Export Push," *Bloomberg News*, 21 October 2021.

142 Jesper Starn, "France's Nuclear Shutdown Hits 50% of Reactors, Squeezing Supply," *Bloomberg News,* 29 April 2022.

143 Lars Paulsson, "France to Curb Nuclear Output as Europe's Energy Crisis Worsens," *Bloomberg*, 3 August 2022.

CEE and Baltic states, and thus it will be harder to isolate and characterise or stigmatise by anti-nuclear forces in Brussels and elsewhere.

This makes commercial inclusion and political courting of France by Estonia and Three Seas regional states a necessary task. However, as to which state should be Estonia's and the region's key nuclear-technology and capacity supplier – highlighting the long-term relationship aspect of this choice – requires broader geostrategic consideration than just the intra-EU policymaking dynamics over the future

France will remain the main force pushing the EU to further aid the development and functioning of nuclear power. It will play a key role in counter-balancing the populist anti-nuclear and "renewables-only" camp led by Germany but having other significant supporters

energy mix.[144] In this relationship, trust in the past and current geopolitical judgement as well as perceived reliability and dependability of a country from which nuclear technology is sourced will be of paramount importance.

While being staunchly pro-nuclear, which implies a positive view towards Estonia's potential decision to develop nuclear energy, France has also historically oscillated between lukewarm encouragement of transatlantic partnership to outright hostility to the US role in security affairs of the European continent. French efforts to rally fellow EU member states to pursue the so-called European strategic autonomy – while occasionally seen as a potentially useful hedge against the consequences of renewed US isolationism and abandonment of Europe – often elicits suspicions in the Baltic states and CEE countries that Paris is just looking for another way to curtail the US involvement in Europe.[145] A recent spat between Paris and Washington over the latter's pact with Australia (AUKUS) that undercut an important element of French strategy in the Indo-Pacific also served as a fresh reminder of how the two allies of great importance to Estonian security might occasionally and abruptly collide and fall out on geopolitical matters.[146]

Also, long-standing French courting of Russia – a supposedly indispensable, in the view of Paris, partner of dialogue and cooperation in the broader European security architecture – has drawn much criticism from various capitals in the Trimarium, conscious of a severe threat posed by the Kremlin regime, and undermined their trust in French geopolitical judgement and leadership.[147] This is, however, compensated to some extent by French support to strengthening, in response to Russia's aggression against Ukraine, NATO's deterrence posture on the eastern flank as well as imposing stricter EU energy sanctions on Moscow.[148] The political support lent by Paris in countering China's coercion against such fellow member states like Lithuania is also noteworthy, given the salience of the unfolding geopolitical confrontation between the West and China.[149]

Thus, in relation to France, the Estonian case for its domestic nuclear power generation potentially based on the US technology will have to navigate between France's pro-nuclear energy policy stance, its instinctive opposition to the US influence in Europe, EU sovereignty visions emanating from Paris, and a deep-seated Russophile streak in its foreign and security policy establishment. There would undoubtedly be persistent frictions from the French side in reaction to a small fellow EU

144 It was argued, by a Westinghouse representative interviewed for this study, that the third-generation reactors which will be installed in Poland will likely have a 100-year lifetime. He said this means that Poland must consider what country they trust to have a 100-year relationship with which includes expertise, fuel supplies, maintenance, and similar, which the supplying firms in the nuclear industry are permanently involved with over their reactors' lifetimes. The strong implication is that for Poland this would be the US rather than France, for reasons of greater geostrategic reliability. See Atlantic Council, "Partnership for Transatlantic Energy and Climate Cooperation (P-TECC): Day 1," YouTube video, 22 September 2021, Warsaw, Poland, (Panel session VII: "Nuclear energy financing and technologies," comment by David Durham, President, Energy Systems, Westinghouse Electric Company).

145 "The Baltics fear European 'strategic autonomy'," *The Economist*, 4 October 2018.

146 Célia Belin, "AUKUS: A cautionary tale for French-American relations," War on the Rocks, 13 December 2021.

147 Romain Le Quiniou, "Mission Unaccomplished: France's Monsieur Macron Visits the Baltics," RUSI Commentary, 9 October 2020.

148 "France sending more forces to Estonia," *ERR,* 25 February 2022; NATO Allied Command Operations, "France sends troops and equipment to Romania," News, 8 March 2022; Camille Gijs and Giorgio Leali, "Macron calls for more energy sanctions as Ukraine accuses Russia of war crimes," *Politico,* 4 April 2022.

149 Jakob Hanke Vela, Giorgio Leali, and Stuart Lau, "France eyes quick anti-China action to bail out Lithuania in trade war," *Politico,* 6 January 2022.

member state choosing non-French nuclear technology, despite France championing nuclear energy in Brussels. To avoid them and to please Paris, Estonia could theoretically opt, if it goes ahead with nuclear energy programme, to partner with France rather than the US or UK on an SMR deployment, thus acting in the spirit of the EU's solidarity and sovereignty.

This partnership, however, would come with an attendant risk of a closer entanglement with and dependence on a power whose political instincts Estonia and many other transatlantic countries do not fully trust. President Macron's calls "not to humiliate" Russia that run counter the understanding in the Baltic region on the strategic imperative to thoroughly defeat Russia's aggression in Ukraine just add fresh doubts.[150] It would be perfectly rational for Estonia to follow its transatlantic security policy principles and turn to the US for their nuclear technology, especially considering the "100-year relationship" this implies. At the same time, Tallinn cannot afford to turn its back on an important European ally in such a sensitive domain. Poland, which will be rolling out a larger number of reactors, has the luxury of diversifying their fleet and investing both into the US and French technology (see Annex C); Estonia's sole nuclear power plant would not provide for such an approach. It appears that the involvement of the French nuclear industry in the nuclear fuel cycle for an SMR based on the US technology could be exactly such a geopolitically balanced "Macronesque" solution that a French centrist might appreciate.

The Estonian case for its domestic nuclear power generation potentially based on the US technology will have to navigate between France's pro-nuclear energy policy stance, its instinctive opposition to the US influence in Europe, EU sovereignty visions emanating from Paris, and a deep-seated Russophile streak in its foreign and security policy establishment

3.3. Poland

Poland is a pivotal strategic partner of the Baltic states in energy security, military defence, and other areas of security. It is a vital bridge for the energy and transport infrastructure linking the region to the rest of Europe as well as a NATO ally with a critical role in ensuring robust collective defence and deterrence posture in the Baltic area. Its assessment of the nature and severity of Russia's threat is identical to the Baltic perspectives, and its strong transatlantic orientation and the emphasis on bilateral ties with the US echo the security policy principles of Estonia and other Baltic neighbours.[151] As one of the countries most supportive of the 3SI, it also seeks a leadership role in various aspects of this initiative and often provides the necessary political and practical impetus for this framework of cooperation.[152]

However, Poland has also been wrestling with some major controversies in its relations with Brussels, caused by its domestic reforms that are viewed by the EU Commission and some key EU capitals as contravening the rule of law and other fundamental principles underpinning the EU's functioning.[153] This could occasionally complicate the calculus of the Baltic states when seeking closer alignment with Poland within the EU policymaking, since there has been a risk of being seen, in Brussels, Paris or Berlin, as mere adjuncts to the Eurosceptic and illiberal regime in Warsaw. On the other hand, Russia's war against Ukraine and a powerful response to this fundamental challenge from Poland that is more in synch with London, Washington and the Baltic capitals than with Paris and Berlin is shifting the perspectives to the point where such risks hardly matter any longer.[154]

Poland's views and actions in ensuring energy security are of particular interest to the Baltic and Estonian decision-makers. Severing as soon as possible the remaining dependence on energy supply from Russia is one of the key elements which align Polish and Baltic

150 Georgi Gotev, "Macron says EU is not at war with Russia, warns against 'humiliating' Putin," *Euractiv,* 9 May 2022.

151 See Tomas Jermalavičius et al, "NATO's Northeast Quartet: Prospects and Opportunities for Baltic-Polish Defence Co-operation," ICDS Policy Paper, November 2018.

152 Ryszard Zięba, *Poland's Foreign and Security Policy, Problems of Compatibility with the Changing International Order* (Cham, Switzerland: Springer Nature Switzerland, 2020), 201-215.

153 Andrzej Bobinski, "Poland's Frozen Conflict over Rule of Law," GMF Insights, 22 April 2022.

154 Andrew Higgins, "Long on Europe's Fringe, Poland Takes Center Stage as War Rages in Ukraine," *The New York Times,* 25 March 2022.

interests.[155] Poland is also among top emitters of CO_2 in the EU due to heavy reliance on the lignite-burning power plants for electricity production, which means it faces just as serious challenge of energy transition and decarbonisation as Estonia. Nuclear energy is emerging as a major building block in Poland's strategy to achieve greater energy independence as well as climate neutrality, which makes Poland's stance and initiatives as well as challenges in this area of major interest to Estonia.

Severing as soon as possible the remaining dependence on energy supply from Russia is one of the key elements which align Polish and Baltic interests

3.3.1. Energy Transition and National Security

On 2 February 2021, the Polish government announced its "Energy Policy of Poland Until 2040," (PEP2040) after approval by the Council of Ministers. According to the International Energy Agency (IEA), this is "the first strategic document regarding Polish energy approved in 12 years."[156] PEP2040 is based on three pillars:

- Just transition,
- Zero-emission energy system, and
- Good air quality

National security and energy sovereignty are not called out as a specific pillar, but nevertheless, national security has arguably played the strongest role in shaping PEP2040. Both official and expert sources on Poland's national security have given it greater weight in especially energy-transition issues than the other EU states we are considering here. In *The National Security Strategy of the Republic of Poland,* approved 12 May 2020, energy security tasks are delineated up front under "Security Environment," stating that "it is crucial for Poland to ensure energy security."[157]

In addition to lamenting Russian dominance in the O&G markets of the CEE and the Balkans and the attendant risk of geopolitical coercion – something that is rapidly changing as a result of Russia's aggression against Ukraine – the document also emphasizes a separate challenge of maintaining "the competitiveness of electricity production in Poland due to the climate and energy policy of the European Union, which aims to markedly reduce the use of coal in electricity production."[158] It also highlights that the condition of the Polish energy infrastructure, including power plans and underdeveloped transmission networks, also has national security implications.

The national security strategy underlines that Poland will not attempt to significantly move away from O&G dependence anytime soon. Upstream supply diversity and security and downstream infrastructure fortification are thus key to its national security. However, Poland recognises that EU climate policy – via price as well as political constraints – necessitates concerted efforts towards coal replacement, adding to this its own air-pollution reduction emphasis.

Taken together, these security assessments require significant efforts to secure O&G supplies and infrastructure – something that came into sharp and urgent focus as Russia's Gazprom halted gas supplies to Poland in April 2022. There are several high-priority projects to replace current Russian gas supplies and generate a modest increase in gas usage. This includes the Baltic Pipe which is now under construction from Norway via the North Sea, across Denmark and the Baltic Sea to Poland, with a capacity of 10 bcm, and is expected to be completed in late 2022. In addition, there are plans for expansion of the existing LNG import regasification terminal capacity at Swinoujscie, plus installation of an LNG floating storage and regasification unit (FSRU) in the Gulf of Gdansk by 2024-25. The Gas Interconnector Poland-Lithuania (GIPL), completed and inaugurated in May 2022, will further expand gas import possibilities from non-Russia sources through the FSRU in Lithuania.[159]

Polish energy policy and its national security perspective also underscore that the country can embrace only a limited deployment of

155 Gabriella Gricius, "Poland And Baltic States Reduce Reliance On Russian Energy," *Global Security Review,* 10 June 2019.

156 Ministerstwo Klimatu i Środowiska [Ministry of Climate and Environment of Poland], "Polityka energetyczna Polski do 2040 r. [Energy policy of Poland until 2040]," *Monitor Polski,* 264 (2021).

157 President of the Republic of Poland, *The National Security Strategy of the Republic of Poland* (Warsaw: National Security Bureau, 2020), 8.

158 Ibid.

159 "About the Baltic Pipe Project," Baltic Pipe Project, last accessed 26 April 2022; "Swinoujscie LNG Gas Terminal, Baltic Coast, Poland," Hydrocarbons Technology, last accessed 26 April 2022; Stuart Elliot and Adam Easton, "Poland sets plan to install new LNG import terminal in 2024-25," S&P Global, 24 April 2019; BNS, "In move away from Russian gas, Lithuanian-Polish gas pipeline comes into operation," *LRT*, 2 May 2022.

intermittent renewables in tandem with a significant nuclear base-load capacity, while advancing the Polish energy transition, escaping coal dependence, and protecting energy security. This is in line with the view that the existing weakness of the Polish transmission system and the high costs and technical requirements for the system's full modernisation to permit very high percentages of intermittent wind and solar energy (as has been evidenced in Germany) is too high a barrier to overcome in the medium- or even long-term.[160] PEP2040 envisages two priority technological solutions to meet the EU's climate and energy goals: first, installing the country's first offshore wind farms, and, second, building the first of several large-scale nuclear power plants by 2033.[161]

Polish energy policy and its national security perspective also underscore that the country can embrace only a limited deployment of intermittent renewables in tandem with a significant nuclear base-load capacity

3.3.2. Polish-US Energy Alliance

A further geostrategic signal within Poland's national security policy, one highly relevant for its posture to Estonia's nuclear considerations, is the active inclusion of energy as a part Warsaw's national security partnership with the US. When asserting the importance of Poland's NATO and EU memberships and its strategic partnership with the US in the National Security Strategy, energy cooperation with the US is specifically mentioned but nowhere else with any other partner: "Poland's security is also shored up through the development of cooperation with the United States of America in the fields of security and defence, energy, trade, investment as well as [R&D]."[162] So too, in a section on bilateral, regional and global cooperation, listing all partners, there are multiple mentions of Three-Seas projects and EU Ten-T transport projects; but, again, it is only with the US, in the first of some 13 points, where energy cooperation is made specific. [163]

In fact, such efforts at energy partnership with the US, in LNG, but most relevantly here, in nuclear energy have been actively pursued through a series of agreements negotiated and signed and already being implemented together with US business and government entities. For instance, in October 2020, on the margins of the Three Seas summit in Tallinn, the US and Polish officials signed an agreement to cooperate in selecting partners and exploring funding options for the development of Poland's first nuclear power plants that may entail up to $18bn worth of purchases from US suppliers.[164] In June 2021, the US Trade and Development Agency announced a grant for an industry-led "front-end engineering and design (FEED) study that will help develop Poland's first two nuclear power plants, facilitate the country's transition away from coal-fired power, and strengthen the country's efforts to ensure its long-term energy security."[165] The study is focusing on

A further geostrategic signal within Poland's national security policy, one highly relevant for its posture to Estonia's nuclear considerations, is the active inclusion of energy as a part Warsaw's national security partnership with the US

160 As an example, during a talk by the Polish then-finance-and-energy minister in Berlin for a small group of German business representatives (at the BID) in 2015, where one of the authors of this study was present, the minister diverted from his prepared remarks to comment that he should tell the German side frankly, there was "no way" Poland would exit coal dependence until non-Russian alternatives (i.e., gas and nuclear) are available, as a matter of national security. He explained he understood that was not the German approach, but it is the Polish approach.

161 Ministerstwo Klimatu i Środowiska, "Polityka energetyczna Polski do 2040 r."

162 President of the Republic of Poland, *The National Security Strategy*, 10.

163 Ibid., 26.

164 Marek Strzelecki, "Poland, U.S. to Sign Nuclear Cooperation Agreement Monday," *BNN Bloomberg News,* 19 October 2020; Timothy Gardner, "U.S. sees $18 billion from purchases in nuclear power agreement with Poland," *Reuters*.

165 US Trade and Development Agency, "USTDA Advances Poland's Civil Nuclear Energy Program by Funding U.S. Industry-Led Study," Press Release, 30 June 2021.

the solution based on Westinghouse's AP1000 reactor, but there are also MOUs signed with the developers of SMRs, such as NuScale (see Annex C).[166]

3.3.3. Implications for Estonia

The main implication of Poland's energy transition and its geopolitical underpinnings is that the degree to which Estonia follows a similar trajectory – by embracing US nuclear training, technology, business, and government-agency partnerships – will further increase the level of Polish confidence, goodwill, and solidarity with Estonian energy policy and national security. The opposite could be the outcome of Estonia uncritically embracing key tenets of the "Global *Energiewende*" ideology advanced by Germany. This could have detrimental effects on some aspects of its relations with Poland – especially if political frictions and structural differences between Germany and Poland persist.

Differences between Poland and Germany on the nexus of energy policy and national security are just too large and cannot be resolved by a mere change in German or Polish leadership. In any case, there is no significant faction within the major German political parties prepared to spearhead energy transformations more in line with Poland's view of national and energy security and of relations with the US, and vice versa. Moreover, geopolitical manifestations of deeply entrenched foreign trade and energy-infrastructural characteristics on the German side (see the section on Germany) are setting Germany and Poland further apart, adding to the complexities that Estonia would have to navigate in its relations with Warsaw and Berlin while crafting its own energy security strategy.

As for the opportunities in energy security cooperation with Poland, both solutions to Poland's energy needs prioritised by its current strategy – offshore wind and nuclear energy – would be of interest to Estonia. Like Estonia, Poland has no prior experience with either of these two areas, although there is an established onshore wind sector with significant installed capacity. Crucially, both energy sources will require establishing new energy technology commercial and state governance sectors. Most difficult will be the nuclear sector, with its long-term training and education needs, high supply-sector standards, longer lead times, and governance requirements. It is reasonable to assume Estonian business ventures and government outreach for nuclear capacity development would be favourably received in Warsaw. However, one should expect Warsaw to be inclined to defend its leadership trajectory within the region on these matters and seek to be a hub for other Three Seas countries in developing their nuclear energy sector, which may not always align with the interest of Estonia to cultivate more diverse and flexible set of partnerships in developing its nuclear energy programme.

Poland's nuclear energy ambitions and plans (see Annex C for a detailed description) also mean that a nuclear technology and economic policy expertise is required within the established Polish energy-policy community, political parties and civil society generally. Academic and civil society capacity is required for the new sector to learn from experience, to correct and optimise policy in a timely manner and, independently of political polarisation, and sustain itself democratically in the face of inevitable intensified anti-nuclear populist campaigns – as distinct from data- and expertise-driven critiques – by domestic and foreign sources opposed to nuclear power. Estonian academic institutions and civil society could contribute to and benefit from building a vibrant and robust knowledge ecosystem on nuclear energy, based on bilateral, such as with Poland, trilateral, such as with the US and Poland, and minilateral, such as within the 3SI, ties.

Estonian academic institutions and civil society could contribute to and benefit from building a vibrant and robust knowledge ecosystem on nuclear energy, based on bilateral, such as with Poland, trilateral, such as with the US and Poland, and minilateral, such as within the 3SI, ties

3.4. The European Union

Adopting US technology implies long-term Estonian partnerships with related American businesses and government departments. In addition, Estonia would not be alone, as this would occur within the context of other American partnerships throughout the Three-

166 Rod Walton, "Bechtel, Westinghouse teaming up to pursue Polish nuclear energy projects," *Power Engineering,* 19 July 2021.

Seas region with considerable consequences for future energy and geo-strategic prerogatives of the European Union.

The EU has been playing a pivotal role in pushing for and coordinating common responses to the climate crisis and Russia's use of energy as a tool of geopolitical coercion. Policy instruments and strategies agreed by the member states, such as the EU Green Deal and RePowerEU, advance the diversification of energy sources, promote the energy transition to climate neutrality, and provides for greater coherence, solidarity, security, and closer integration of national energy systems.[167] Although choices concerning national energy mix remain the prerogative of the member states, the overall policy direction undertaken by the EU and the general sentiment in Brussels about the approaches of individual member states clearly matter in assessing the risks and opportunities for Estonia related to nuclear energy.

3.4.1. Green Finance Taxonomy

At the end of 2021, the Commission finally completed an extended process that culminated with a decision to include nuclear energy – and natural gas – in its Green Finance Taxonomy (often referred to as simply "green taxonomy" in most discussions), established under the Union's Green Deal.[168] Examining this decision provides insight as to the balance of forces among member states and within the Commission on these matters.

On the upside, the pro-nuclear decision can be considered a victory for science- and data-driven policy against green-populism, with crucial input made by various scientific studies on the climate impact of nuclear energy. In March of 2021, the Commission received a report solicited from the Joint Research Centre (JRC), its scientific expert arm, finding that nuclear waste is manageable, posing no significant harm to the environment, and that nuclear energy has been demonstrated to be safe.[169] Several EU member states, on France's initiative, petitioned the Commission to respect the judgements of its own scientific bodies and recognise nuclear as green.[170] Poland also insisted the Commission should support nuclear financially, as it would any other type of clean energy.[171]

The decision primarily represents an acknowledgement of the reality that nuclear energy is, de facto, the only scalable solution to reliable base-load carbon-free generation that can displace coal – and eventually natural gas – and does not require the installation of massive, generalizable grid-scale storage, as does an over-reliance on variable renewables. With such popular and ideological forces in favour of the 100%-renewables-and-no-nuclear-model, only the appearance of significant difficulties with this model motivated the Commission and ministerial actors to weather the formidable shaming of "green washing" to open new opportunities for nuclear energy.

The "green taxonomy" decision means that member states who chose to expand or employ nuclear technology will be saved from having to engage in sharp and potentially damaging confrontations with and in Brussels on this matter

There appears to have been a certain new awakening in the Commission and its circles on the need for pragmatic results. For instance, EU Commission President Ursula von der Leyen stated in late 2021:

> It is obvious that we need more renewable and clean energy. If you look at the production price of renewables, it has considerably decreased. For solar energy, it is ten times cheaper today than a decade ago. Wind energy is very volatile, but it is 50% cheaper than it was a decade ago. So that is the way to go. They are carbon-free and they are homegrown, so a lot of independence is in that. **Alongside this, we need a stable source, nuclear** [authors'

167 European Commission, "A Clean Planet for All: A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy," COM(2018) 773 final, 28 November 2018; European Commission, "REPowerEU: Joint European action for more affordable, secure and sustainable energy," Press Release, 8 March 2022.

168 European Commission, "Commission Delegated Regulation (EU) /... amending Delegated Regulation (EU) 2021/2139 and Delegated Regulation (EU) 2021/2178 as regards specific public disclosures for those economic activities," C/2022/0631 final, 9 March 2022.

169 EC Joint Research Centre, *Technical assessment of nuclear energy with respect to the 'do no significant harm' criteria of Regulation (EU) 2020/852* (Petten, Netherlands: European Atomic Energy Community, 2021).

170 Frédéric Simon, "Macron, Orban urge EU to 'actively support' nuclear power," *Euractiv,* 25 March 2021.

171 "Poland to seek EU approval for state aid to build nuclear plant," *Euractiv/Reuters,* 22 October 2020.

emphasis]; and during the transition, of course, natural gas.[172]

This results-driven policy tendency has been further encouraged by the European energy crises provoked by the February 2022 Russian invasion of Ukraine, although not always to the benefit of nuclear energy; the Commission's new plan to halt the dependency of the EU on Russia's energy supply and hydrocarbons mentions nuclear power only twice and in very fleeting terms – which serves as an indication of the political headwinds it will continue facing even in the midst of a major security crisis that requires bold decisions and actions.[173] This could also be explained by the fact that new nuclear generation capacity would take years to bring online, thus reducing its value in immediate response to Russia's aggression; however, the Commission's plan did not attempt recommending, for instance, the cancellation or at least delay in closing operational nuclear power plants at such a critical juncture.[174]

The "green taxonomy" decision means that member states who chose to expand or employ nuclear technology will be saved from having to engage in sharp and potentially damaging, especially for states which might build a nuclear sector from scratch, such as Estonia, confrontations with and in Brussels on this matter. It also opens wider opportunities for European cooperation on nuclear energy technology; although the EU has never funded nuclear power projects, it has already provided a platform for discussions on developing a European SMR and associated secure industrial supply chains that would give substance to the idea of the European tech sovereignty, as in line with the Commission's pragmatism.[175] It is also funding research that could develop instruments for member states to assess and validate safety of SMRs in a licensing process and also engages the US in a dialogue on the SMR technology.[176]

Arguably, the taxonomy decision was only possible due to a compromise reached by the two EU heavyweights: France, which demanded nuclear energy's inclusion, and Germany, which demanded natural gas inclusion. German pro-gas stance was necessary because its renewables-only project cannot conceivably deliver the desired outcomes, as its industrial and home-heating depends on natural gas, especially as it closes its last nuclear plants and accelerates its coal exit, both of which raise the need for gas-generated electricity as well. What is more, German natural gas generation capacity also needs to be expanded to back up its expanding installation of intermittent renewables, especially onshore wind.

3.4.2. A Temporary Reprieve?

However, Brussels' acceptance of nuclear energy is only partial. Expert observers in Brussels interviewed for this report feel that neither the Commission nor the EU Parliament will likely ever create a level-playing field for nuclear, whether it be by granting subsidies or carbon credits, as renewables enjoy.[177] The decision has indeed not created a level playing field for nuclear energy, which was put in the category of "transitional" source. No new projects should be added after 2045, and no current plant should have its lifetime extended after 2040. In addition, the allowed temporary and "transitional" expansion of zero-carbon-emitting nuclear generation will not be eligible for favourable financing nor carbon credits as are the policy-privileged renewable wind and solar.[178]

Restrictions won by the renewables-only and green-business lobbies are an indication of intentions to gradually pile crippling constraints on nuclear energy over time

These restrictions won by the renewables-only and green-business lobbies are an indication of intentions to gradually pile crippling constraints on nuclear energy over time. In fact, despite the German coalition government

172 European Commission, "Opening remarks by President von der Leyen at the joint press conference with President Michel following the meeting of the European Council of 21-22 October 2021," statement, 22 October 2021, Brussels.

173 European Commission, "REPowerEU Plan," COM(2022) 230 final, Brussels, 18 May 2022.

174 Liz Alderman and Stanley Reed, "Nuclear Power Could Help Europe Cut Its Russia Ties, but Not for Years," *The New York Times,* 26 April 2022.

175 "First EU Workshop on Small Modular Reactors," Events, European Commission, 29 June 2021;

176 "Towards European Licensing of Small Modular Reactors," CORDIS – EU Research Results, European Commission, last updated 10 May 2022; "EU-U.S. high-level forum on small modular reactors," Events, European Commission, 21 October 2019.

177 Interviews for this report conducted via telephone in February and March 2022 with a former Commission energy official, an energy diplomat from a member state from the CEE, and a journalist-expert.

178 European Commission, "Commission Delegated Regulation (EU) /... amending Delegated Regulation."

agreeing to this compromise brokered with France, its various officials publicly denounced the agreement as fundamentally dangerous to the environment, with the Green Party in particular resolving to fight against it.[179] The Commission faces strong ideological pushback from various other member states, including Spain, Austria, and Luxembourg, even though their combined voting weight is not sufficient to block the inclusion of nuclear energy in the "green taxonomy."[180] Germany itself, despite its compromise with France, has indicated it would vote against the inclusion nuclear energy in the taxonomy, although it would not launch a legal challenge to it.[181] The motion in the European Parliament to veto the Commission's decision and thus exclude nuclear energy from the taxonomy failed to obtain the necessary majority of 335 votes in July 2022. However, it was still supported by 278 MEPs out of total 705.[182] Vast, institutionalised, and often state-supported sections of civil society but also political and administrative establishments of various member states are engaged in a consciously ideological-cultural and political-policy struggle in defence of their favoured renewables-only model.

3.4.3. Implications for Estonia

The interviewed Estonian SMR project executive struck an optimistic note on the "sunset clause" of nuclear energy investments in the EU "green taxonomy." Despite the time horizon of 2045 for any new investments, it is seen as sending a signal to the investors and large financial institutions that such projects as SMR in Estonia will not encounter regulatory and political risks at the time when they are expected to come online and when capital expenditures will have been made. Subsequently, the European Bank of Reconstruction and Development (EBRD), Nordic Bank of Investments, and other large financial institutions have a clear mandate to support these investments.

However, given the human, technical, production, and commercial capacities required to be developed to establish a nuclear industrial sector, the "pushback" from the anti-nuclear member states might become problematic to Estonia even within the set timeframe. What is a clear signal at the moment could become a tainted and confused policy area in a few years, as the anti-nuclear forces continue campaigning against nuclear energy across various member states and in Brussels. Perceived future political, societal and regulatory risks, and informal barriers could discourage some private investors and partners, especially from the US. It also creates uncertainty for those talents choosing to apply themselves, in their professional careers, in the nuclear sector; loud anti-nuclear campaigning within the EU will maintain an atmosphere in which this career path, as opposed to renewables sector, might appear as less appealing – at least in countries without a traditionally established nuclear industry.

The renewables-only populism has, in general, already gained a significant degree of popular and intra-state dominance and cannot be ignored, thinking that the EU-level consensus is rock-solid and cannot be compromised or eroded

Just as pro-nuclear member states have already appreciated it, countries considering nuclear energy should recognise that the anti-nuclear camp views the debate as an ideological battle. The renewables-only populism has, in general, already gained a significant degree of popular and intra-state dominance and cannot be ignored, thinking that the EU-level consensus is rock-solid and cannot be compromised or eroded. Should Estonia opt for a nuclear energy, its officials and involved experts, just as those from other new pro-nuclear member states, will have to explain and defend their country's decision to adopt nuclear within the EU political and bureaucratic entities. Government will need to actively back the efforts of its own officials, civil society groups, and the expert, academic, and think-tank communities to engage nuclear sceptics of the society in critical, facts-based polemic and thus provide some balance against the renewables-only populism.

179 Jamie Gordon, "EU taxonomy faces legal dispute as member states oppose inclusion of gas and nuclear," *ETF Stream,* 10 February 2022.
180 Mehreen Khan, "EU faces down critics over green investment label for gas and nuclear power," *The Financial Times*, 2 February 2022.
181 Hans von der Burchard, "Germany to vote against EU plan to label nuclear as green but won't sue," *Politico*, 13 May 2022.
182 European Parliament, "Taxonomy: MEPs do not object to inclusion of gas and nuclear activities," Press Release, 6 July 2022.

CONCLUSIONS AND RECOMMENDATIONS

Estonia is in the process of considering nuclear energy as part of its future energy mix. It may well decide not to go ahead with it, but if it does, the implications will be far broader than just energy policy, economic development, or environmental safety. This report examined how such a decision – and a specific choice of an SMR technology sourced from the United States – could have manifold implications in security and foreign policy domain. It analysed how the decision could shape various aspects of Estonia's strategic partnership with the United States, relations with some of the key EU member states, and what risks and opportunities could arise as a result. The report is far from comprehensive, as developing a full picture would require some additional effort to understand, for instance, how the dynamic in the Nordic-Baltic region, or relations with the UK – another major contributor to Estonia's security – would be shaped by the Estonian nuclear decision and its specifics. However, the report provides sufficient ground to judge various implications of such a decision for the security and foreign policy Estonia.

Civil nuclear energy cooperation engagement is a unique opportunity, available both because of alignment with the bi-partisan pro-nuclear sentiment in energy policy of the United States and the need for the US companies to regain their competitive edge in the international nuclear energy market

The United States remains of pivotal importance to Europe's and Estonia's security, and this importance was further underlined by its role in countering Russia's aggression against Ukraine as well as strengthening NATO's deterrence posture on the eastern flank (or "eastern front," as it is increasingly referred to). Its continued bilateral and, through various cooperative formats such as 3SI, minilateral engagement in the Baltic region is vital foreign and security policy interest of Estonia. Maintaining this engagement will be increasingly difficult because the US repeatedly seeks to pivot to the Asia-Pacific, as the great power competition dynamics in that area of the globe requires its strong focus on countering the long-term challenge of increasingly assertive China, while European – let alone Baltic or Estonian – security concerns will often struggle to remain among the strategic priorities in Washington.

Adding civil nuclear energy cooperation to this continuous engagement is a unique opportunity, available both because of alignment with the bi-partisan pro-nuclear sentiment in energy policy of the United States and the need for the US companies to regain their competitive edge in the international nuclear energy market with novel technology to counter China. It also provides a useful vector for increasing US contribution to the energy security of Estonia and the entire Baltic region that goes beyond the present-day focus on LNG supply – a focus that will diminish in importance due to the temporary "bridging" role of natural gas in energy transition towards "zero carbon" future. In the long-term, it would also help to create a competence base in Estonia enabling country's integration into the US SMR technology chains, thus further strengthening the bilateral partnership. Full exploitation of this opportunity, however, is clearly contingent on Estonia being among the first movers in adopting the American SMR and thus positioning its programme to be a showcase of the successful adoption of the new generation US nuclear energy technology.

While military affairs have often dominated the bilateral relations with the United States, enabling the success of the private sector-led nuclear energy programme is bound to involve cooperation with the US in multiple other areas. Building technological and regulatory competence and capacities in Estonia would be at the core of such endeavour, with Estonia's involvement in the FIRST programme being just the initial step in forging closer government-to-government, business-to-business, and business-to-government partnerships. US foreign trade, technology export, and capacity-building support mechanisms – underwritten by strong political will and bi-partisan political consensus that exists in the US – would be available to Estonia and its companies in

advancing what is likely going to be the largest "green field" industrial investment project in Estonia's history and establish a "100-year relationship" in the energy sphere. Such opportunities will be less readily available through the EU, due to the continuing efforts of the anti-nuclear lobby to suppress nuclear energy's role in the future "zero carbon" energy systems of Europe.

However, given that the programme would face various hybrid threats to its successful implementation, there are many opportunities for enhancing US-Estonia cooperation across several areas of security policy. There would be opportunities and often imperatives to intensify contacts on various security issues: sharing threat intelligence, countering espionage against technological secrets, coordinating counter-terrorism, collaborating on critical-infrastructure protection and cybersecurity, and discussing nuclear security and non-proliferation. Even on defence planning and capability development, hosting a nuclear power plant – a potential target of a military attack – would generate new military requirements that would necessitate discussions and coordination with allies, including the United States. Lastly, the two countries would need to closely coordinate their strategic communication and counter-disinformation efforts to defuse the impact of disinformation campaigns directed against nuclear energy, Estonia's credibility, and trust in the US technology – and thus avoid a similar negative scenario that occurred in Lithuania a decade ago, with its regional NPP project in Visaginas as well as with the US plans for energy investments (e.g. shale gas exploration).

Given that the programme would face various hybrid threats to its successful implementation, there are many opportunities for enhancing US-Estonia cooperation across several areas of security policy

On the government side, this cooperation would involve not only diplomatic services, but also foreign intelligence and internal security agencies, environmental and customs authorities, armed forces, cybersecurity and crisis management institutions, and energy infrastructure management entities. However, the diplomats would have a key role, as the Estonian-US nuclear energy cooperation would foster more frequent high-profile contacts between political and policymaking communities – also within the multilateral fora such as 3SI – and would add an important agenda item for their discussions. Economic diplomacy and persistent high-level attention to progress on business-to-business and business-to-government cooperation would also be required to avoid losing momentum.

This partnership would not be exclusive, as the current proposal for a nuclear project entails geographically diverse business ties and collaborations necessary to construct, supply, and operate a plant. Estonian economic diplomacy would have to support intensive contacts and cooperation with Canada – likely the first nation to license an American SMR – as well as governments of Sweden and Latvia, as representing key stakeholders in the project, and some other countries. For instance, there will be a need for a formal agreement with Canada to facilitate smooth transfer of SMR licensing information and cooperation in regulatory capacity-building; likewise, an intergovernmental agreement pertaining to nuclear fuel cycle management with the US, Canada, and France would be required.

However, from the geopolitical standpoint and as far as diplomatic strategy concerns, three fellow EU member states and NATO allies – Germany, France, and Poland – stand out for Estonia when considering embracing US nuclear technology and cooperation. The former two have historically formed the most important tandem in shaping the direction of the EU, while the latter has emerged as an important hub for the Trimarium. All three are highly important security and defence partners for Estonia and other two Baltic states. They are, however, positioned on different points of two axes – anti-/pro-nuclear axis and transatlantic/Eurocentric axis – and thus pose different, if somewhat overlapping, sets of challenges. The report investigated their energy security and geopolitical perspectives in greater detail to understand how they could create obstacles and opportunities to Estonian nuclear aspirations.

When it comes to the nuclear part, France and Poland are natural allies in making a continued case in favour of nuclear energy's role in future climate neutral world. Poland also would be an important partner whenever collaborative efforts are required to maintain and benefit from the US involvement in nuclear energy development in the region.

Due to the scope of its nuclear ambitions, Poland may come to dominate the US attention and thus diminish the potential political benefits for Estonia, particularly in terms of visibility. Inevitably, Tallinn will have to be very careful and specific about which aspects of practical nuclear cooperation with Poland are desirable – for example, pooled training, specialist mobility, R&D, etc. – and which ones are not. It would be important for the Estonian government, ministerial and commercial actors, as well as civil organisations, such as think-tanks and academic organisations, to establish regular and institutionalised consultations with their Polish analogues in SMR deployment.

When it comes to the nuclear part, France and Poland are natural allies in making a continued case in favour of nuclear energy's role in future climate neutral world

A consistent, shared legal, regulatory and standards framework, if possible, would seem highly desirable, to simplify cooperation for decades hence. However, it is important to understand that, although the Polish SMR deployment – just as in Estonia – is more an industry-initiated and led endeavour with state support, the overall Polish programme specifically focuses on large scale reactors.

Germany's policy, on the other hand, continues to be dominated by anti-nuclear sentiment and "renewables-only" perspective about future energy supply, which is unlikely to change due to the structural and ideological forces at play in German economy and society. Contrary to Estonia's already strong emphasis on and commitment to renewables, such as offshore wind, Estonian nuclear aspirations are therefore likely to be unpopular in Berlin and will possibly draw continuous criticism. This criticism would lack credibility, given the complete failure – in geopolitical and energy security terms – of the German energy policy, exposed by Russia's war against Ukraine. However, unlikely as it is to do much significant damage to the overall bilateral relations in foreign and security affairs, Berlin's anti-nuclear stance – given the sheer lobbying weight of Germany – may still dampen the enthusiasm in the Baltic region and, more importantly, in Brussels over the long-term prospects of nuclear energy industry in the EU.

Furthermore, reliance of the Estonian programme on the US may kindle the anti-American instincts in those sections of the German political establishment and policy community that have long sought to balance out the US role in the European security order through energy relations with Russia and industrial relations with China. There will also be growing geoeconomic competition between Germany and the US over the shape of energy policies and the attendant commercial opportunities in the Trimarium, with the former advocating for more alignment with the philosophy of global *Energiewende* and with the latter emphasizing the need for nuclear power in the energy mix as a pathway to energy security of the region.

Tallinn will have to invest diplomatic efforts into cultivating the transatlanticist policy stakeholders in Berlin and highlighting the strategic benefits of the US involvement in energy security of the Baltic region and Europe as a whole. Estonia's constructive role in maintaining German interest in building

Estonian nuclear aspirations are likely to be unpopular in Berlin and will possibly draw continuous criticism. This criticism would lack credibility, given the complete failure – in geopolitical and energy security terms – of the German energy policy, exposed by Russia's war against Ukraine

synergies and complementarities with the US contribution to the region's energy security – including through the 3SI framework – rather than competing with the US would be beneficial to all sides. It might even help Berlin offset some of the loss of political capital and credibility in the Trimarium, incurred by the NS2 saga and then its ambivalence regarding the extent, speed, and nature of support to Ukraine during the war with Russia.

Reliance on the US in a nuclear energy programme, however, may prove more problematic in the geopolitical and geoeconomic analysis of Paris. Its agenda of pushing forward European sovereignty means that extensive technological dependence on

the US may not be viewed very favourably in some quarters, especially as France continues developing its own SMR for sales in international markets. Estonia should expect that France will make a persistent case for cooperation on the European SMR and will highlight that the EU framework already provides sufficient range of security cooperation instruments to address the risks associated with the adoption of nuclear energy. Some of the potential political opposition from France can be defused by integrating its nuclear industrial base into the supply chains of the Estonian nuclear energy programme, even after choosing the US SMR as the proposed project intends, but this will be hardly sufficient to avoid the optics that Estonia is not supportive of strengthening the EU's sovereignty aspirations in practice. Estonia will have to be prepared to make a strong case to Paris that dependency on the US – be it in energy technology or military technology – is not contrary to Europe's interests but rather conducive to greater cohesion and strength of the collective West.

Reliance on the US in a nuclear energy programme may prove more problematic in the geopolitical and geoeconomic analysis of Paris

In the conduct of foreign and security policy, in addition to all the practical work and steps required to enable and facilitate close cooperation with the governmental agencies and business entities from the countries involved in the Estonian SMR deployment project, Estonian diplomacy will have to sustain a conceptual narrative of the country's nuclear energy programme as beneficial for the transatlantic relations, EU's energy sovereignty and climate objectives, and regional energy security. It should be prepared to address the counter-narratives emanating both from the capitals of some fellow EU member states who have a different view on nuclear power and transatlantic relations, and from malignant actors who do not have any interest in seeing yet another Estonian success story unfold.

More importantly, Estonian foreign and security policymakers will need to fully appreciate the geopolitical importance of the decision to adopt nuclear energy and base it on the US SMR technology. Anchoring the US in the region and in wider Europe remains a strategic imperative for Estonia. Russia's aggression against Ukraine has abundantly demonstrated that the US leadership – amplified by the actions of its key transatlanticist allies such as the UK and Poland – is indispensable in managing security crises on the continent. On the other hand, prevarication in supporting Ukraine and containing Russia as well as generally poor geopolitical judgment based on faulty assumptions or perhaps cynical *realpolitik* calculations about Russia reflect badly on some European capitals but especially Berlin. Echoing, through the Estonian national energy policy decisions, those who have failed European security rather than those who come to its rescue at a critical moment, would be out of synch with Estonia's long-term strategic interests.

To prepare, in the event of an affirmative decision to pursue nuclear energy development and base it on the US SMR technology, exploit the identified opportunities and hedge against the identified risks, this report recommends:

Russia's aggression against Ukraine has abundantly demonstrated that the US leadership – amplified by the actions of its key transatlanticist allies such as the UK and Poland – is indispensable in managing security crises on the continent

- Fully exploit the opportunities provided by the US-Euratom NCA to develop bilateral nuclear partnership and by the FIRST programme to build credible capacity for competent nuclear energy governance. Similar possibilities should be explored in relation to Canada.

- Explore possibilities for the USG and associated funding to support various stages of nuclear project development, particularly through the US Trade and Development Agency, International Development Finance Corporation (DFC), and Ex-Im Bank.

- In the next iteration of the bilateral Estonia-US Security Cooperation Roadmap (for 2024-29), include items of cooperation that address the identified security risks to the nuclear energy programme in the areas such as counter-espionage, counter-terrorism, cybersecurity, and counter-proliferation.

- In defence planning, use the advice and assistance available through the US defence cooperation framework, like the FMF programme, to include defence against a conventional military threat to an Estonian NPP into the overall defence design. Finland should also be approached in this regard to learn from its approach and cooperate in more technical and tactical aspects of coastal and air defence missions related to the NPP's protection.

- In cooperation with the US, develop a strategic communication plan aimed at various target audiences in Estonia, Baltic region, and wider EU to explain the Estonian decision and characteristics of its nuclear energy programme and counter the disinformation campaigns.

- Work to institutionalise and advance multilateral nuclear energy cooperation within the framework of the 3SI and through the P-TECC, especially focusing on establishing and facilitating knowledge, learning and innovation networks in the region and on attracting the investments into the cross-border nuclear industry ecosystems.

- Maintain private sector's strong lead in the programme, as it better aligns with the US perspective and the 3SI philosophy of investing into energy sector than state-centric European approaches.

- Develop inter-governmental framework cooperation agreements or MOUs with the nations that will be of importance in managing Estonia's nuclear energy – from training and education, R&D and regulatory capacity-building to nuclear fuel cycle and output use in the energy systems. In addition to the US and Canada, those should include France, Sweden, Poland, Latvia, etc.

- Render political support to nuclear energy-related initiatives, especially concerning R&D and industrial cooperation on a new generation SMRs, within the framework of the EU and as part of the EU-US partnership. Advocate for the inclusion of nuclear energy technology in the discussions of climate and green tech working group within the EU-US Trade and Technology Council.

- Engage in a continuous dialogue with Germany (and other nuclear sceptics) over the role of nuclear energy in future energy mix dominated by the renewables, while maintaining vigilance over and being prepared to counter the anti-nuclear lobbying within the EU structures that may gradually erode the consensus over the "green taxonomy."

- Develop a clear strategy to address both the geopolitical and commercial underpinnings of the French agenda, should Paris raise objections to the expansive US involvement in the Estonian nuclear energy programme.

- Strengthen energy and climate diplomacy capacity in key embassies and representations within the countries and international organisations of interest and relevance to the Estonian nuclear energy aspirations and programme as well as to Estonia's general energy and climate security interests.

ANNEX A. BILATERAL ESTONIAN-US COOPERATION

Because of the global political and economic standing of the United States, bilateral Estonian-US partnership is vitally important for Estonia in ensuring a favourable international environment, addressing the threats to Estonia, and protecting regional security.[183] Estonia's goal for comprehensive cooperation with the US has been enhancing transatlantic relations and security, promoting common values, economic prosperity, and the rules-based international order through bilateral efforts and multilateral or regional partnerships.

A.1. Security Cooperation

The US attention in the Baltic Sea region is vital for the security of the Baltic states, which together with Nordic countries, have enjoyed the benefits of US engagement in the region through the NATO alliance and bilateral defence cooperation. Enhanced Partnership in Northern Europe (E-PINE) was created in 2003 as a format for dialogue on political, security, and economic issues between the United States and Nordic-Baltic countries. This forum contributes to multilateral engagement with the US which has been in the interests of all the participants. In last decade, the possibility that the US strategic focus and priorities will shift towards Indo-Pacific region and the US decreasing engagement in Europe and in the Baltic Sea region was seen by the countries in the region as alarming. It is in the interests of Estonia and other countries in the Baltic Sea area that the US attention and its diversified engagement in the region will continue. Multilateral and regional initiatives have been launched to work together with the US to face new challenges to the military, energy, or economic security on a regional or global level.

Security issues have been the priority area of cooperation with the US after Estonia regained independence. The US participation in European security, its military presence, and its cooperation within NATO is existentially important for Estonian security. After Estonia joined NATO in 2004, relations with the US and other allies strengthened significantly. The US support to Estonian accession to the Alliance was decisive.

After the Russian invasion of Ukraine in 2014 and the emergence of potential threats to the Baltic states, the United States increased its engagement in the region with a focus on defence cooperation and security assistance. For instance, in October 2014, the United States agreed to sell Javelin missiles to Estonia, recognising the need for Estonian forces to impose costs on Russian forces should it invade. In 2014, the US also established the European Reassurance Initiative, later renamed the European Deterrence Initiative, to significantly invest in US force posture in Europe. The United States negotiated new status of forces agreements and allocated significant funds to upgrade Estonian military bases and facilities to sustain and support a robust US and NATO force presence. This included upgrading facilities at Ämari air base to support NATO air policing and deployments of advanced fighter squadrons, spending more than $20 million. Additionally, the United States upgraded facilities for military units in Tapa.

The deterrence initiative enabled a greater pre-positioning of equipment and expanded military exercises and joint training. It has also financed the rotational deployments of roughly 6 000 US personnel to the Atlantic Resolve mission. The United States has also increased its participation in Baltic Air Policing missions. The presence of US forces in the Baltic Sea region and joint exercises with US Army, Air Force, Navy, and Cyber Command have strengthened the defence cooperation even further.

US has contributed to the development of the Estonian Defence Forces through bilateral assistance programmes, such as the Foreign Military Financing (FMF) programme and International Military Education and Training (IMET) programme. Estonia receives more than $1-2 million annually in IMET assistance to send Estonian officers to US military schools in the United States. Estonia uses defence-related aid from the United States to accelerate its defence investments, to develop independent defence capability, and to jointly procure systems with other Baltic states.

As a result of this cooperation, Estonia and other Baltic states have become significant customers of the US defence articles, as the US has sold hundreds of millions worth of

183 Ministry of Foreign Affairs of Estonia, *Estonian Foreign Policy Strategy 2030* (Tallinn: Ministry of Foreign Affairs, 2020).

military equipment to the Baltic States.[184] The United States has sold more than $500 million worth of US military equipment to the Baltics through sales of military equipment through the Foreign Military Sales programme and has also provided more than $500 million in security assistance. The Baltic states have also procured $350 million in defence articles through the "Direct Commercial Sales" system, which involves smaller procurements direct from US industry.

The US-Estonian Security Cooperation Roadmap from 2019 identifies the agreed-upon priorities for 2019-24. The plan focuses on the systematic development of bilateral security cooperation and achieving the objectives set forth in the Estonian national defence development plan.[185] Cooperation in the specified fields is meant to improve Estonia's independent defence capability, contribute to the interoperability of the Estonian Defence Forces with allies, and strengthen deterrence and defence posture on NATO's Eastern flank. Different areas of security and defence – training, military exercises, procurement, Estonia's military commitments abroad as well as cyber defence have considerably benefited from the US technical and financial support. US assistance through FMF also supported the development of capabilities such as electronic and hybrid warfare, border security, and maritime and air domain awareness.

At present, US security assistance to the Estonian Defence Forces takes place in the framework of Baltic Security Initiative instrument created in 2020, which helps to highlight the security concerns of the region for US lawmakers.[186] After the Russian invasion of Ukraine in February 2022, the US increased its security assistance to the Baltic states and its military presence in the Baltic Sea region. In 2022, the US legislature approved for security assistance to the Baltic states worth $180 million.

A.2. Cooperation on Cybersecurity

Cybersecurity is one of the priority areas indicated in the bilateral defence cooperation agreement and aims to combat cybercrime, cyber espionage, and the use of cyber tools in armed conflict.

Since April 2007, when intense and coordinated cyber-attacks afflicted its online services and networks, Estonia has become a focal point for issues related to cybersecurity. After these attacks the Estonian government decided to increase the country's cyber defence resources and infrastructure. Estonian digital society depends on security of its digital networks that must be tested and evaluated. This must be regularly done in cooperation with allies and partners. Estonia and the United States held a defensive joint cyber exercise in 2020 to support the development of the cyber defence capabilities of both countries.[187] Such joint actions give the opportunity to obtain, experience, and test Estonian cyber defence capabilities and the resilience of its networks and critical infrastructure. In 2011, the US joined the NATO Cooperative Cyber Defence Centre of Excellence (CCDCOE) hosted by Estonia. Cyber defence cooperation takes place on various levels within US Cyber Command, US European Command, Maryland National Guard, and Air Force Cyber Command.[188]

A.3. Economic Relations

Economy and trade are part of another priority area in the Estonian-US relations. Estonia is a member of the EU with which the US has the largest economic relationship in the world. Estonian-US economic transactions have steadily increased in last two decades. Since 2019, the United States has been the 4th largest export destination for Estonia, with €1.12 billion worth of goods exported to the US in 2021. Value of imports from United States in 2021 was €246 million, resulting in positive trade balance of €877 million for Estonia (see Figure A1).[189] In recent years, the export was led by communication equipment, which represent 52.8% of the total exports to United States. Principal imports from the United States were computer and electronic products, chemicals, machinery, and transportation equipment. [190]

The US direct investments to Estonia, which totalled €343 million, have stayed at the same level for last 10 years. It is 1.1% of total direct

184 Bureau of Political and Military Affairs, "US Security Cooperation With the Baltic States," Fact Sheet, US Department of State, 2 February 2022.

185 "Allied Contribution to Estonia's Defence as a Foreign Investment," Estonian National Defence Development, last accessed 4 April 2022.

186 BNS, "US allocates $169 million security assistance to Baltic states," *ERR*, 23 December 2020.

187 Information System Authority of Estonia, *Cyber Security in Estonia 2021* (Tallinn: Information System Authority, 2021).

188 US Cyber Command, "Estonia, US Conduct Joint Defensive Cyber Operation," News, US Department of Defense, 3 December 2020.

189 "Väliskaubandus alates 2004 a. [Foreign trade since 2004]," Majandus, Statistics Estonia, last accessed 4 April 2022.

190 "What does Estonia export to United States of America? (2021)," Visualizations, Statistics Estonia, last accessed 4 April 2022.

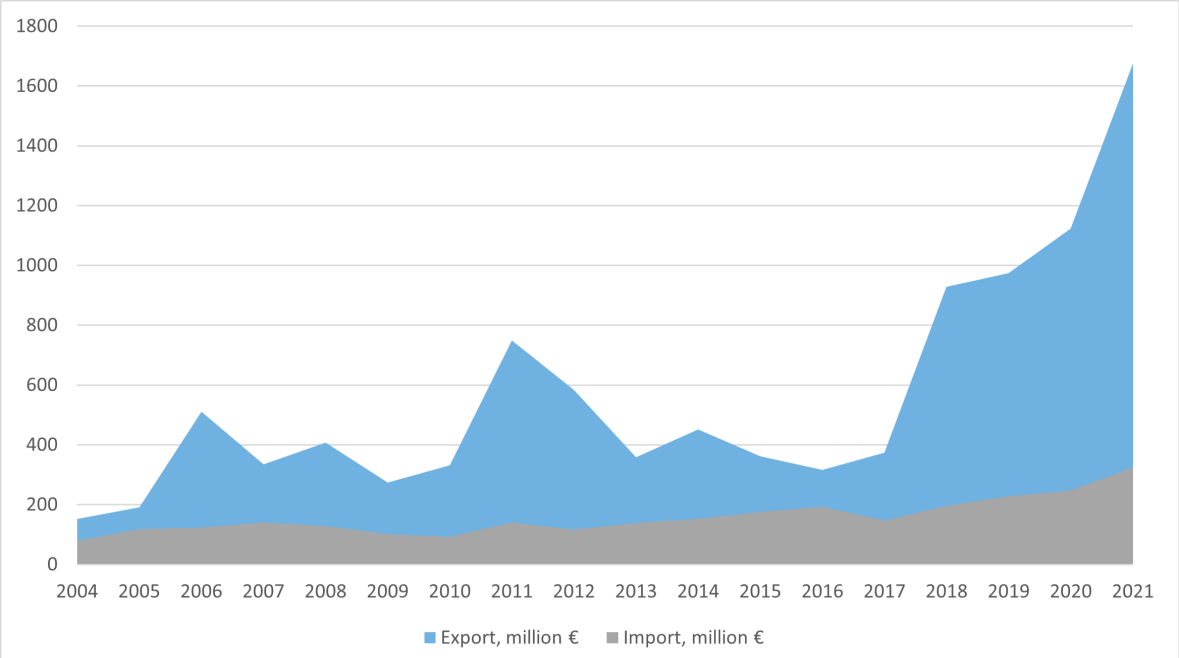

Figure A1. Estonian-US bilateral trade

foreign investments in Estonia (see Figure A2). This leads to a conclusion, that the US is far from being among the biggest foreign investors in Estonia, but it is important to keep in mind that many US companies operate in Estonia through their European subsidiaries. Since 2019, Estonian direct investments in the US have reached the comparable level of €322 million, which constitutes 2.8% of Estonian direct investments abroad.[191]

The USG has identified several sectors that may have commercial potential for US companies. The manufacturing, electrical machinery, telecommunication equipment, and medical, precision, and optical instruments sectors are highlighted. More than 80% of the products of this sector are exported to Estonia's main export partners, including the US. Robotics and mobility, transport, and logistics autonomous systems could be other prospective areas of interest for the US technology companies.[192]

There is a potential area of cooperation in the energy sector, where Estonia faces twin challenges of diversifying its energy supply and reducing its reliance on oil-shale based electricity generation to meet its decarbonisation goals. This can only be achieved by investments in renewables and in new low- or zero-carbon power generation capacities. Development of innovative technological solutions for electricity production, storage and transmission is an area where the US, with its technological potential, could have an interest in contributing. Furthermore, in recent decades US companies have been involved in the construction of new power generation capabilities in Estonia.[193] The USG and many members of Congress regard European energy security as important and of US interest and have encouraged EU member states to diversify their energy sources.[194]

The US and Estonia both participate in regional initiatives such as the 3SI, which was launched with the aim to promote North-South connectivity from the Baltic to the Black and Adriatic seas through joint investments, including into energy infrastructure to address the energy security challenges. The Partnership of Transatlantic Energy and Climate Cooperation (P-TECC) is an international platform of cooperation with the US DOE, providing resources and tools to develop resilient and climate friendly energy systems and, together with the EU and the 3SI, supports the energy security efforts in Central and Eastern Europe. In this partnership, the DOE focuses on technical cooperation with partner countries to promote energy security, capital investments in energy infrastructure, clean energy development, and the deployment of renewable energy and nuclear energy

191 "Direct investment position in Estonia and abroad by country (EUR million)," Statistical Indicators, Bank of Estonia, last updated 10 March 2022.

192 "Electronics and Electronic Components," Estonia – Country Commercial Guide, International Trade Administration, US Department of Commerce, last updated 15 October 2020.

193 Estonian Chamber of Commerce and Industry, "Auvere Power Plant in Estonia went over from General Electric to Eesti Energia," News, 21 August 2018,.

194 US Congress, "Energy Security Cooperation with Allied Partners in Europe Act of 2019 (S. 1830)," Calendar No. 334, 17 December 2019.

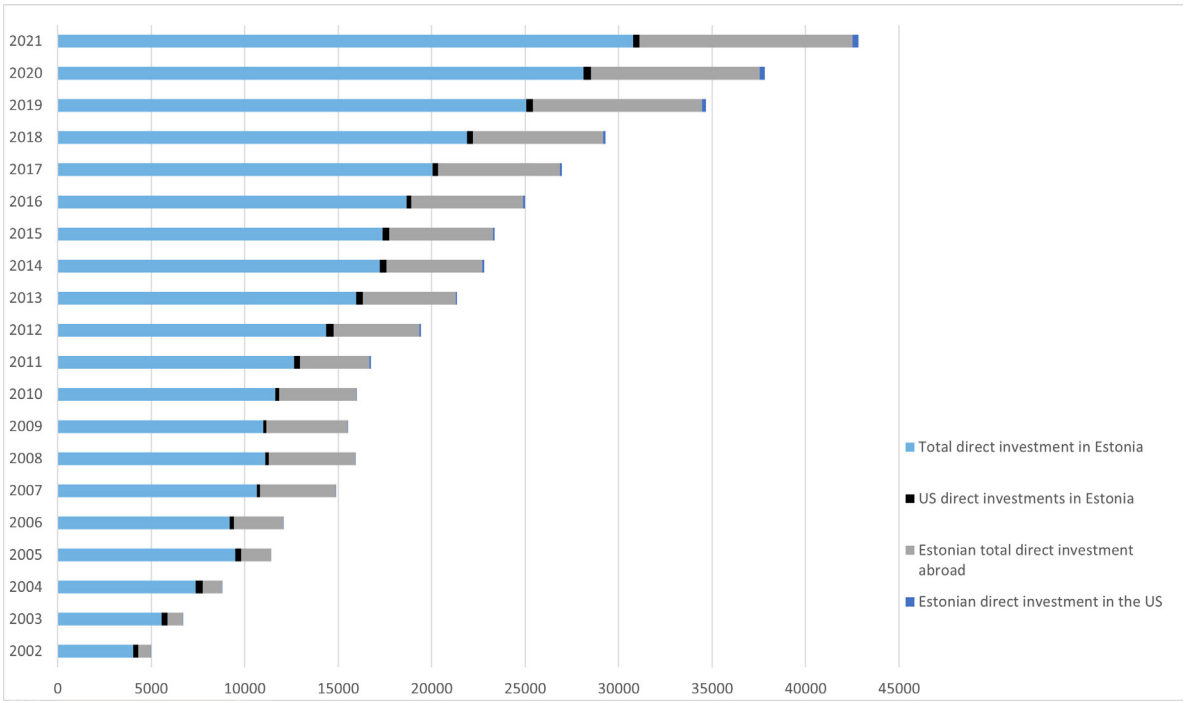

Figure A2. Estonian and US investments, million €

technologies.[195] Estonia has already benefited from this cooperation in enhancing its energy sector operators' cybersecurity preparedness.

A.4. Critical Minerals for Technology Sector

Successive US administrations have acknowledged the long-term challenges to US economic security, decarbonisation goals, and technological leadership, as the country's technological and defence industry remains heavily import-reliant in nearly all critical metals and minerals, which may have profound geopolitical implications in the future. [196]

Increasing mineral dependency associated with digitalisation and decarbonisation, deployment of clean technologies, and growing electricity demand has led the USG to find ways to reduce the risks to the supply of these minerals, which the development of new technologies relies on. In particular, the risks are associated with China's dominant role in key segments of the global mineral supply chain. China has captured large part of value-chain in several critical materials, as it accounts for the biggest share of processing capacity in the world. In June 2021, the White House published a review that highlighted the vulnerabilities to the supply and made some recommendations to improve the mineral resilience of the US technological industry.[197] One of the recommendations proposed to build international partnerships with like-minded foreign producers to reduce supply-side risks. In this partnership, Estonia can have a critical role, as its company NPM Silmet has been one of the major suppliers of some critical minerals and rare earth elements to the US, providing 6% of the US demand for rare earth compounds and metals in 2017-20.[198] This has been possible because the company operates one of the largest rare earth minerals' processing facilities in Europe. This separation facility, together with North American companies Neo Performance Materials and Energy Fuels, has the potential to increase its supply of rare earth elements to meet the needs of the US technological industry and make its contribution to the integrated supply chain of critical minerals in the US and Europe.[199]

195 "The Partnership for Transatlantic Energy and Climate Cooperation (P-TECC)," Initiatives, Office of International Affairs, US Department of Energy, last accessed 4 April 2022.

196 Marc Humphries, *Critical Minerals and US Public Policy* (Washington DC: Congressional Research Service, June 2019); US Department of Commerce, *A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals* (Washington DC: Department of Commerce, n.d..

197 The White House, *Revitalizing American Manufacturing, and Fostering Broad-based Growth: 100-Day Reviews under Executive Order 14017* (Washington DC: White House, June 2021).

198 US Geological Survey, "Rare Earths," Mineral Commodity Summaries, 2022.

199 Andy Bounds, "North American groups seek to break China's grip on rare earths supply," *The Financial Times,* 2 March 2021.

ANNEX B. MANIPULATION IN ACTION: LITHUANIAN LESSONS

B.1. Competing Plans for New NPPs in the Region

Until 2009, electricity production by Ignalina NPP was a key element in ensuring Lithuania's energy balance. However, Ignalina NPP was perceived by the European Commission as unsafe due to the operation of two Chernobyl-type nuclear reactors, so Lithuania agreed to close it at the end of 2009.[200] After 2010, Lithuania transformed from a net exporter to a net importer of electricity.[201] Electricity production in the country fell nearly three times, and electricity imports had already reached more than 7 TWh in 2010, from 1.68 TWh in 2008 and have continued to increase ever since. In 2021, 11.92 TWh of electricity was imported to Lithuania, while 2.87 TWh was exported.[202]

Plans to build a new NPP, replacing Ignalina NPP, started even before its closure. The Lithuanian authorities concluded that new electricity generation options were needed, and the nuclear option was selected as the most feasible one. A projected increase in domestic and regional electricity demand, experience in developing nuclear energy, qualified personnel, and nuclear decommissioning infrastructure were all viewed as favourable conditions to begin a new NPP project.[203] Lithuanian public opinion at that time was also positive. In 2007, more than 60% of Lithuanians were in favour of the continuation of nuclear power.[204] In the same year, the National Energy Strategy of Lithuania included an objective to "ensure the continuity and development of safe nuclear energy; to put into the operation of a new regional nuclear power plant not later than by 2015 in order to satisfy the needs of the Baltic countries and the region."[205]

As investment costs for the new NPP project were high, an initiative to share the expenses of a new NPP among the three Baltic states was formulated. Back in 2006, the prime ministers of Lithuania, Latvia, and Estonia signed the declaration that foresaw the construction of a new regional NPP in Lithuania, with Poland subsequently invited to join the project.[206] Later, the Japanese company Hitachi was selected as a strategic investor, providing a 1 350 MW reactor for the €5 billion plant.[207] The future NPP was labelled Visaginas NPP, despite its chosen site being the same as the closed Ignalina NPP.

When it became clear that Lithuania was actively preparing for the construction of a NPP, Russia announced plans to build nuclear power plants in Kaliningrad exclave and possibly Belarus. In 2008, Sergey Kiriyenko, the head of Rosatom, stated that Russia would build two reactors with a combined 2 300 MW in the region of Kaliningrad.[208] Later, in 2010, at a meeting between Lithuanian President Dalia Grybauskaitė and her Russian counterpart Vladimir Putin, Lithuania was offered to join this project, instead of building the Visaginas NPP.[209] However, in 2013, the Baltiyskaya NPP was suspended, which would only confirm the suspicion that the active development of nuclear energy near Lithuania was envisaged as a countermeasure to prevent the independence of the Baltic states in electricity generation. The Astravyets NPP in Belarus has become the main project on which Rosatom has focused, thus creating competitive pressure for the eventual Visaginas NPP.

200 Steven Paulikas, "Lithuania: Losing Power," *Bulletin of the Atomic Scientists*, 61(2) (2005): 12–14.

201 "Republic of Lithuania," Country Nuclear Power Profiles, IAEA, last updated 2020.

202 "Litgrid": augant ekonomikai, 2021 m. elektros vartojimas Lietuvoje buvo didžiausias per 30 metų [Litgrid: as the economy grows, 2021 electricity consumption in Lithuania was the highest in 30 years]," 15min.lt, 23 February 2022.

203 Tomas Janeliūnas, "Lithuania: When a Transition to Zero-Carbon Energy is the Only Option," in *The Palgrave Handbook of Zero Carbon Energy Systems and Energy Transitions*, eds. Geoffrey Wood, Vincent Onyango, Komali Yenneti, and Maria Anastasia Liakopoulou (Cham: Palgrave Macmillan, 2022).

204 M. Grinevicius, G. Klevinskas, and L. Koraliovas, "Implementation of the Visaginas Nuclear Power Plant Project in Lithuania," IAEA-CN—164, International Atomic Energy Agency, n.d..

205 Seimas of Lithuania, "National Energy Strategy," Resolution No X-1046, 18 January 2007.

206 Tomas Janeliūnas, "Energy Transformation in Lithuania: Aiming for the Grand Changes," in *From Economic to Energy Transition. Energy, Climate and the Environment*, 1st ed., M. Mišík and V. Oravcová (eds.) (Cham: Palgrave Macmillan, 2021), 283-313.

207 Joanna Hyndle-Hussein, "Visaginas Nuclear Power Plant – still high-risk investment," OSW Commentary, Issue 88, 25 July 2012.

208 "Russia plans nuclear plant for Kaliningrad exclave," *The Baltic Times,* 23 April 2008.

209 Tomas Janeliūnas, *Foreign Policy Analysis of a Baltic State: Lithuania and 'Grybauskaitė Doctrine'* (London: Routledge, 2021), 89.

B.2. Anti-Nuclear Campaign in Lithuania

In addition to the energy policy and geopolitical decisions that tried to suppress the project of the Lithuanian NPP, an active campaign of criticism was launched against nuclear energy in Lithuania as well, with anti-nuclear activists and populist political forces in the forefront and Russia-linked energy interests in the background. Moscow sought to actively shape the political debate in Lithuania, and its actions in stopping the Visaginas NPP project evolved in three directions:

- raising doubts about the economic viability of Visaginas NPP;
- politicising the question to convince the society that the nuclear power plant project is a kind of conspiracy or deception of the ruling parties;
- corrupting Lithuanian politicians seeking influence over political decisions.

Discussions on whether the Visaginas NPP could be cost-effective were probably the main topic in Lithuania during the period of the project. Although successive Lithuanian governments changed the possible investment model and several feasibility studies were prepared, no clear investment and return result was achieved. This provided a basis for various speculations, and the dominant message emerged here: the Visaginas NPP is too expensive for Lithuania, and the future cost of nuclear electricity will be higher than the current price of electricity. The typical example of such attempts to criticise the government's proposal to build Visaginas NPP is the 12 June 2012 conference, organised in the parliament, by some leaders of radical, Eurosceptic nationalist fringe parties.[210] The participants of the conference issued a resolution with some "alternative solutions" to Visaginas NPP.

B.2.1. Russia's Influence and Lithuanian Politics

Lithuanian intelligence has identified Russia's obvious interests and efforts to engage in these discussions and contribute to public manipulation. In its activity reports for 2011 and 2012, the Lithuanian State Security Department, VSD, concluded that "information, social, political and business structures are used to hinder the diversification of energy supply. Foreign countries, especially the Russian Federation, pay special attention to strategic energy projects in Lithuania. Among the most interesting issues is the EU's third package of energy market implementation, construction of a liquefied natural gas terminal, and perspectives of the Visaginas NPP project";[211] "in 2011, information campaigns were carried out against Lithuania, and more and more funds were allocated to them. Information directed against strategic energy projects in the country was published in foreign and Lithuanian media."[212] At that time, the flow of anti-nuclear disinformation was so intense, that even President Dalia Grybauskaitė called on the government to prevent it: "there is a lot of speculation, there is a lot of disinformation. And it is the government's responsibility to change that disinformation, the distorted information."[213]

Interestingly, the biggest opponents of the Visaginas NPP were not even the main political competitors of the Conservative-led government at that time – the Social Democrats – but much smaller, non-parliamentary parties, such as the Union of Nationalists, the Lithuanian Green Party, and the Lithuanian Peasants and Greens Union. They organised various events and rallies and thus attracted a lot of media attention. Some of the rallies were attended by foreign party representatives, though this was mainly from green parties of European countries.[214]

B.2.2. The Fateful Referendum

Perhaps the main idea put forward by opponents of nuclear power was a referendum initiative. Already on 1 March 2012, a group of referendum initiators – including Linas Balsys, Chairman of the Lithuanian Green Party – submitted requests to the Lithuanian Central Electoral Commission to hold a consultative referendum. It is peculiar that the exact request was not to abandon nuclear energy but to hold another referendum: "The decision to build a nuclear power plant in the territory of the Republic of Lithuania is made only by a

210 "Seime konferencija „Visagino atominė elektrinė – ką naujo atskleidė Vyriausybė" [Seimas Conference "Visaginas Nuclear Power Plant - What the Government Revealed]," Alkas.lt, 6 June 2012.

211 State Security Department of Lithuania, *Lietuvos Respublikos Valstybės saugumo departmento 2012 m. veiklos ataskaita visuomenei* [Activity report of the State Security Department of the Republic of Lithuania for 2012] (Vilnius: State Security Department, 2012), 15.

212 State Security Department, *Activity report*, 20.

213 Eglė Samoškaitė, "Prezidentė: Vyriausybė turi atremti dezinformaciją apie VAE [President: The government must counter misinformation about Visaginas NPP]," Delfi.lt / Technologijos.lt, 26 July 2012.

214 "Pabusk – akcija siekianti atkreipti dėmesį į artėjantį atominės energetikos referendumą [Wake up – action to draw attention to the upcoming referendum on nuclear energy]," News, Lithuanian Green Party, last accessed 7 April 2022.

referendum."[215] In order to hold a referendum in Lithuania on the initiative of citizens, 300 thousand signatures of citizens must be collected. The initiative was a complete failure, with initiators collecting only about 45 thousand signatures in three months.

However, this initiative became a good pretext for escalating and politicising the problem of the Visaginas NPP. Political opponents encouraged the public to believe that decision regarding a nuclear plant could not be entrusted to politicians alone. In their view, it was too expensive, too ambiguous, and would lead to deception. As economic feasibility arguments would be too sophisticated for the plurality of the population, the typical narrative was that the government and the Conservative party are preparing a "hanging rope" that will strangle Lithuania for many upcoming decades and that the government is trying to hypnotise the Lithuanian people with some foggy images of energy security.[216]

Later, another referendum proposal was already registered in the parliament by representatives of one of the opposition parties. Despite opposition from the Conservative-led government, the ruling majority in parliament failed to oppose such a vote, and a referendum was announced on 14 October 2012, along with the next parliamentary elections. This time, the wording of the consultative referendum was, "I support the construction of a new nuclear power plant in the Republic of Lithuania", although the main supporters of the referendum wanted the opposite result. Probably, the organisers of the referendum hoped that any result of the referendum could continue to be used for anti-nuclear propaganda; if the referendum participation level was low and not valid or there would be too few votes in favour, it could be said that politicians had no popular support for building nuclear power plant.

In fact, only 52.5 percent of voters participated in the election and referendum, which means; however, just 34 percent of those who voted in it agreed with the referendum statement.[217] Yet, having won the parliamentary elections in autumn of 2012, the Social Democrats decided to interpret the result as public's vote of non-confidence in nuclear energy and abandon the project. In the next parliamentary term (2016-20), some prominent figures of this party were compromised by Russia's influence operations.

B.2.3. Rosatom's Hand

In 2017, a special investigation by the National Security and Defence Committee (NSDC) of the Parliament revealed previously classified information about the direct involvement of politicians in political manipulation and lobbying. The NSDC, relying on the materials from the VSD and additional hearings, found that Mindaugas Bastys, a member of Parliament for Social Democrats, acted against national interests by maintaining close and continued contacts with representatives of Russia's state nuclear energy corporation Rosatom.[218] The inquiry confirmed that he acted on behalf of Russia's officials, and sought to influence the political processes through the highest state officials in Lithuania, which could have changed Lithuania's geopolitical direction and caused damage to its national interests.[219]

Rosatom sought to gain a foothold in Lithuania and invited it to participate in the Baltiyskaya NPP as a shareholder; Russians also wanted to use the Lithuanian Kruonis Pumped Storage Plant as part of a reserve unit, balancing the potential operation of Baltiyskaya NPP. In 2013, Bastys arranged several meetings, at the request of Rosatom, with the highest-level officials, including the speaker of the parliament and the prime minister. At first, there was some interest from the Lithuanian side to hear Rosatom's proposals. However, in early 2014, after the annexation of Crimea, the talks with Rosatom stopped.[220]

Bastys' story revealed that Russian energy companies, intelligence services, and state media – for example, RT representatives – directly interfered in Lithuania's energy policy decisions. It was one of Russia's projects in maintaining Russia's energy influence over the Baltic states by disrupting the Visaginas NPP project. The failure of the project was mainly due to political indecision, lack of clear communication activities, as well as potentially complicated project implementation, but Russia made considerable efforts to exploit those weaknesses for their gains.

215 Central Electoral Commission of Lithuania, "Dėl iniciatyvinės grupės konsultaciniam (patariamajam) referendumui paskelbti įregistravimo [On the registration of the initiating group for announcing a consultative (advisory) referendum]," Decision Sp-21, 20 March 2012.

216 Indrė Kleinaitė, "VAE statybos – užsitęsęs hipnozės seansas tautai [Visaginas NPP construction – a protracted hypnosis session for the nation]," *Delfi.lt*, 2 August 2012.

217 "2012 m. Lietuvos Respublikos Seimo rinkimai ir referendumas dėl naujos atominės elektrinės statybos Lietuvos Respublikoje [Elections to the Seimas of the Republic of Lithuania and the referendum on the construction a new nuclear power plant in the Republic of Lithuania]," Results in the Districts, Central Electoral Commission of Lithuania, last updated 18 October 2012.

218 BNS, «Seimas Panel to Vote on Bastys Impeachment,» *The Lithuania Tribune*, 31 May 2017.

219 The Constitutional Court of Lithuania, "On the actions of Seimas member Mindaugas Bastys. Conclusion," Case no 12/2017, 27 December 2017.

220 "Rosatom sought foothold in Lithuania - declassified intelligence info," *Delfi.lt,* 13 April 2017.

ANNEX C. POLAND'S EMERGING NUCLEAR ENERGY PROGRAMME

C.1. Poland's Plan for Large Generation III+ Nuclear Reactors

C.1.1. Communist-Era Legacies

Poland has no previous nuclear energy production experience. In the 1980's, while still in the Soviet camp, a VVER pressurised water reactor was started but abandoned after independence. Having been the only Soviet-bloc state, beside Russia, with an excess of power production, due to its abundance of lignite coal, it had no urgency to diversify and would have been the last Comecon state to build nuclear plants.[221]

Of note, Poland does have an established research nuclear reactor facility, Maria, located in Świerk-Otwock, near Warsaw, with skilled nuclear research personnel.[222] Since 1961, it has operated a small-scale nuclear waste storage site in Różan.[223]

C.1.2. New Era: On and Off Again Plans

Poland's plans to develop nuclear power, to replace the bulk of its coal generation, have been a complex "on again, off again" process, with repeated resets in reactor sizes and timelines since 2005. In 2005, the cabinet first decided to build nuclear plants by 2020.[224] In 2006, a feasibility study found a 11.5 GWe plant unaffordable, and a 4.5 GWe plant was chosen for 2030. However, in 2007, a large 10 GWe plant was supported, supplying 10% of national demand by 2030.[225] In July 2006, as the Soviet-era Ignalina NPP in Lithuania was being shut, Poland, Lithuania, Estonia, and Latvia decided to jointly build a replacement by 2015 and share its power. However, in 2012, a new left-leaning government coalition in Lithuania cancelled this project (see Annex B).

C.1.3. Financial Concerns

However, the reasons for changes were primarily the financial model. Most notably, in 2016, the Civic Platform government (*Platforma Obywatelska*, PO) had adopted a "market-based approach" of Contracts for Difference (CfD), modelled on the British system. However, in June 2016, the newly elected Law and Justice Party (*Prawo i Sprawiedliwość*, PiS) cancelled the plan as too expensive, asserting it would rely on coal.[226] However, it began to explore nuclear options too, particularly after its representatives visited China in July 2017 – a direction now abandoned by PiS due to geopolitical reasons.[227]

The previous PO government had, in November 2009, also signed agreements for pursuing Generation III+ reactors and involving French firms AREVA and EdF, who planned to offer EPR reactors, then another with GE Hitachi early in 2010 for its ABWR and ESBWR models, and with the US firm Westinghouse, planning to submit its AP1000. [228] Currently, GE Hitachi is focused on providing small-scale SMR reactor BRWX-300 reactors.[229]

Given the role of financial constraints to date, this issue should be understood as a key sticking point for the Polish side. It feels strongly that it must solve such financial concerns to advance a large-scale, 6-9 GWe reactor programme under PEP2040.

In many western states, nuclear facilities begin paying off loans and the interest that accumulates before electricity generation produces revenues. Hence, the recent global nuclear build-out has been accomplished by Chinese and Russian state-owned vendors, who offer a comprehensive state-backed financing scheme. The present Polish leadership is clearly looking for similar backing from Western vendors. This was stressed in recent discussions of one of the authors of this study with a Polish energy and economics official.[230]

This has been the position of Secretary of State, Government Plenipotentiary for Strategic Energy Infrastructure, Piotr Naimski,

221 William Q. Davey, *Nuclear Power in the Soviet Bloc* (Los Alamos, NM: Los Alamos National Laboratory, 1982).
222 "The MARIA research reactor," National Centre for Nuclear Research, last accessed 6 May 2022.
223 Patrycja Rapacka, "How will Poland handle radioactive waste from its nuclear power plant?," *Biznes Alert,* 26 February 2020.
224 "Nuclear Power in Poland," Information Library, Country Profiles, World Nuclear Association, last updated May 2022.
225 *Ibid.*
226 Ian Wood, John Danahy, and Rob Broom, "Poland's Nuclear Plans Regain Some Momentum," Squire Patton Boggs LLP, 15 June 2017.
227 Zheng Xin, "CGN eyes Poland for China's nuclear exports," *China Daily,* 26 July 2017.
228 "Nuclear Power in Poland," World Nuclear Association.
229 "Collaboration for Polish deployment of BWRX-300," *World Nuclear News*, 16 December 2021.
230 Private communication, 6 May 2022.

who stresses that Poland must soon identify "a strategic partner" willing to put take 49% of the nuclear project's ownership with the government holding the remaining 51% is the large-scale reactor programme is to proceed.[231]

In principle, a surprise agreement offered by President Trump, just two weeks before the US 2020 election, included an $18 billion US pledge that was exactly what Poland was searching for. In reality, the actual MOU language was more circumspect, not mentioning this figure, but this Trump-era flourish has still made the present administration appear *ipso facto* less willing to offer major financing.[232]

However, this should not be assumed, according to experts contacted in the USA and Warsaw.[233] There are at least two Congressional bills being watched closely in Warsaw, for state funding modalities of US-built foreign reactors. So too, there are explicit administration interests in providing competitive alternatives to the Chinese, Russian, and, to some extent, French model of winning projects via state-financing. It is not clear, however, how far the US financing support might go towards Poland's 49% target, as the Polish project is seen as in an early stage.

However, one expert points out the Polish side's insistence on joint financing is perhaps more of a model-preference than a necessity, and a country in Poland's situation would presumably have access to ample financing from the US Export Import Bank (Ex-Im Bank) or similar institutions.

C.2. Recent Advances: Large Reactors

C.2.1. Siting and Environmental Impact

In March 2022, Polskie Elektrownie Jadrowe (PEJ), the government enterprise tasked to build the country's reactors, submitted its environmental impact assessment (EIA) report for the first site. The plan considers up to 3.750 GWe (i.e., three reactors) on a site in the province of Pomerania on the Baltic, with two different methods of using sea water cooling considered.[234] The EIA plan was considered by the Polish parliament, the Sejm, in January 2022.[235]

Three foreign suppliers are approved to participate in the proposal process: Westinghouse, EDF, and South Korean KHNP. As of January 2022, KHNP's proposal was submitted – reportedly bidding 30% less than expected; France's EDF submitted its proposal September 2021 based on its EPR2, and USA's Westinghouse is preparing its proposal for AP1000's to be delivered by the September 2022 deadline.[236]

Westinghouse's partner in Poland, US firm Bechtel, has MOUs with 12 Polish firms for "the potential development of two new nuclear power plants in Poland. [Which] could support construction of Westinghouse 1 150 MWe AP1000s if Poland selects the company ."[237]

Westinghouse, together with Bechtel, is also developing the "front-end-engineering-and-design" (FEED) process with a grant from the US Trade and Development Agency. This was a key item in the Intergovernmental Agreement signed between Poland and the US to assist Poland to develop a civil nuclear power programme. The Polish ministry will then use this FEED to assist it in choosing a strategic partner.[238]

To further the FEED process, the Ministry of Climate and Environment approved the programme to support domestic industry for cooperation with nuclear energy based on the Westinghouse AP1000. Notably, this includes a financing plan. This FEED is mandated by the Polish Nuclear Power Program (PPEJ).[239] In March 2021, Westinghouse met with the Polish officials regarding the financial aspects of its interest in investments in Polish nuclear technology.[240]

231 James Shotter and Agata Majos, "Poland plays down fears over nuclear power plans despite Biden victory," *The Financial Times*, 3 January 2021.

232 "The actual agreement is far less ambitious — and specific — than what the energy department suggested: the parties agreed that "… over the next 18 months, the United States and Poland will work together on a report delivering a design for implementing Poland's nuclear power program, as well as potential financing arrangements. This will be the basis for US long-term involvement and for the Polish government to take final decisions ….'" See: Myles McCormick and James Shotter, "The $18bn Polish nuclear deal that wasn't," *The Financial Times*, 22 October 2020.

233 Private communications, 6 May 2022.

234 "EIA submitted for Poland's first nuclear power plant," *World Nuclear News*, 31 March 2022.

235 David Dalton, "Decision On Reactor Technology Expected This Year, Parliament Told," *NucNet*, 17 January 2022.

236 Dan Yurman, "Competition Heats Up for Poland's Nuclear New Build," *Neutron Bytes*, 23 January 2022.

237 Bechtel, "Bechtel forges partnerships with Polish companies for civil nuclear program," Press Release, 25 April 2022.

238 Dan Yurman, "Competition Heats Up."

239 Kamen Kraev, "Government Adopts Strategy to Help Local Industry Take Part in Nuclear Programme," *NucNews*, 26 January 2022; Ministry of Climate and Environment of Poland, "Program wsparcia krajowego przemysłu do współpracy z energetyką jądrową jako dokument wykonawczy do Programu polskiej energetyki jądrowej [Support programme for domestic industry to cooperate with nuclear power as an executive document to the Polish Nuclear Power Programme]," Warsaw, 23 December 2021.

240 "Westinghouse launches Polish nuclear FEED work," *World Nuclear News*, 1 July 2021.

The US priority of bolstering energy security through the 3SI and having a US vendor be accepted for Poland's large reactor programme was evidenced in the September 2021 launch of the P-TECC.[241] These US aims are obviously of increasingly high priority to the present administration.

Nevertheless, as a Polish non-governmental source interviewed for this report stressed, it is likely that Poland must eventually include a reactor or reactors of French design, considering the importance of France as a fellow EU member and its ally in Brussels on nuclear matters.[242]

C.2.2. A New Civilian Nuclear Sector

From t the interviews for this report and some earlier background discussions, it is clear that building a domestic civilian nuclear sector is of high priority for the Polish government and business associations.[243] From discussions with US personnel experienced in such endeavours and nuclear-knowledgeable Poles, it is clear that the time required to develop this sector and the amount of special training and certification for new products involves long-term planning by any enterprises interested in participating and clear roadmaps from officials as to what is required to qualify a product for nuclear-sector certification.

This differs, as the US actors stress, from the usual entrepreneurial expectations, where speed of preparation and quick entry into a newly opening market is key, and returns on preparatory investments are expected sooner. Expectations must be well informed, else tensions between business and ministerial actors can arise. It is not clear if, for example, the depth to which prospective French and South Korean vendors and governments engage in similar sector-governance capacity-building activities in Poland. However, the French nuclear construction company, Framatone, has long had relationships with existing Polish university engineering programmes, in particular having established a new training programme in 2021 with Wraclaw University.[244]

241 Frédéric Simon, "US lures Eastern Europe with nuclear power, $23tln clean energy market," *Euractiv*, 23 September 2021; Atlantic Council, "Partnership for Transatlantic Energy and Climate Cooperation (P-TECC): Day 1," YouTube video, 22 September 2021, Warsaw, Poland. See especially Panel session VII: "Nuclear energy financing and technologies."

242 Personal communication, Warsaw, February 2022.

243 Personal communications in Warsaw and Berlin with officials, managers and academics, October 2021-May 2022.

244 Framatome, "Framatome and Wrocław University of Technology train the next generation of nuclear professionals," Press Release, 11 February 2022.

In earlier nuclear-sector-related discussions with Polish officials, they were searching to find a model for the relationships that will be/are being established between Polish business, ministries, and academic research and development. This process is relevant to Estonian officials who would be developing a new Estonian sector. It would seem useful to approach Polish actors for consultations on one another's experiences and models.

C.3. Recent Advances: SMR Role

In the national plans, Poland stresses its intent to develop six large-scale reactors. While it gives support to the SMR developments, this is de facto led by business interests who want not only to use SMRs for electrical generation but for process heating in chemical and mineral processing industries. There are also proposals to install variable-multiples of SMRs in place of an existing coal plant, to reduce installation costs and utilise existing steam turbines, generators, and other equipment.

There are several MOUs associated with prospective SMR foreign vendors and their facilitating foreign partners and local supply/sub-contracting Polish partner firms. In 2020, there were three MOUs with Polish firms to bring SMRs, two of those are with the US company, NuScale, and one is with Canada's Cameco & GE Hitachi. Accordingly, in September 2021, *World Nuclear News* summarised:

> Two separate agreements have been announced between Polish companies and North American small modular reactor (SMR) vendors and suppliers. A memorandum of understanding (MoU) between Cameco, GE Hitachi Nuclear Energy (GEH), GEH SMR Technologies Canada, Ltd and Synthos Green Energy (SGE) will see those companies evaluate a potential Canadian supply chain for a fleet of BWRX-300 reactors in Poland. Separately, NuScale Power, KGHM Polska Miedź SA (KGHM) and Piela Business Engineering (PBE) are to explore the deployment of NuScale's SMR technology to repower or repurpose existing coal-fired power plants.[245]

The emerging number of relationships, MOUs, and types of applications are rather complex, as detailed by Nuclear Engineering International last September 2021.[246]

245 "Polish companies sign MoU's on SMR deployment and supply chain," *World Nuclear News*, 23 September 2022.

246 "SMR developers look to Poland," *Nuclear Engineering International*, 27 September 2022.

C.4. Nuclear Politics

C.4.1. Polish Bipartisan Support

Initial government public support started in about 2005, when the current PiS ruling party was first in power between the 2005 and 2007 elections. In addition, discussions with energy-sector experts in Warsaw indicate that the counties political polarisation does not extend to this matter and worries of a change of government should not undermine this programme.

However, as the issue has only recently come to be seen as a real action programme, one now more in the public eye, there is interest in researching whether there are any potential environmental-movement-based nuclear objections emerging within the opposition. However, generally this is not expected, especially in that the country's nuclear ambitions are tied closely to issues of national security and energy independence.

C.4.2. Polish Domestic Public Support

Polls of the public have shown majority support nuclear power. The annual Ministry of Climate and Environment poll showed acceptance at a record high of 74% in favour in November 2021, 11% above previous year. 58% supported a plant in their own area, showing a relatively low "NIMBY" effect.[247]

It seems evident that the current Russian war in neighbouring Ukraine will only strengthen this sentiment because of the nuclear issue's link to energy independence from Russian fossil fuels. In addition, ministerial officials indicate increased motivation for nuclear power, as the cost to import non-Russian natural gas on the scale that would be required considering the great amount of the coal production that must be replaced.[248]

C.4.3. Populist Opposition via Foreign Organisations

On the other hand, the possibility of domestic or international anti-nuclear groups increasing their agitation, especially from those parts of the German society that are strongly anti-nuclear, is likely and will find some domestic resonance.

This already exists to some extent. For example, the German Green party's state-supported think-tank (Heinrich Böll Stiftung, Warsaw) advocates for a populist, "renewables-only" Polish energy policy.[249] However, in the present national security environment and the Russo-Ukraine war, it would seem the only way the public might turn against nuclear power would be if the Russian military significantly damaged an operating Ukrainian nuclear facility.

247 "Polish support for nuclear on a high," *World Nuclear News*, 15 December 2021.

248 Kate Abnett, "Poland 'looking again' at role of gas in green energy transition," *Reuters,* 17 March 2022.

249 "Energy & Climate," Topics, Heinrich Böll Stiftung Warsaw, last accessed 19 May 2022.

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