

The Future of the Polish Nuclear Power Program: A post-Soviet panacea? Extended Summary

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ABSTRACT

The current geopolitical and environmental situation in Poland has prompted the government there to introduce plans to phase out coal power plants and replace them with nuclear power plants. This transition is not without its issues, however, and Poland and the international community must work together to curb illicit proliferation.

Keywords: civilian, country study, non-proliferation, Poland, nuclear power, nuclear weapons

I. Overview

Poland, situated in Eastern Europe and encompassing the largest economy of the former Soviet Bloc, has a highly coal-dependent energy makeup; fifty per cent of the total primary energy supply is coal. Poland is highly dependent on imports for its oil and gas, and Russia is the main supplier of supplemental energy resources for Poland; sixty-six per cent of Poland's natural gas and one hundred per cent of oil is imported to Poland from Russia.

Initial reactor is planned to start construction soon after 2020, with capacity of 3000 MWe. Reactor type and site are not determined yet, and Russian technology is not under consideration. Poland possesses a 30 MWt multi-purpose research reactor, which was commissioned in 1974 and is still in operation today. In a recent poll, the National Atomic Energy Agency determined that sixty per cent of the Poland general public supports the construction of nuclear power plants.

II. Poland Motivations for Pursuing Nuclear

Poland has expressed a keen interest in maintaining its own "energy security," which can be understood as "security of supply and low prices." As stated by the Polish Ministry of Economy, these goals can be understood as "assuring long-term security of electricity supply" and "maintaining electricity prices at levels acceptable by the national economy and the society."

The Polish government "is conscious of the inherent risks of being dependent on limited sources of oil" and gas from Russia, and actively seeks to

loosen what it perceives as a Russian "energy noose" on the European market and a projection of Russian soft power vis-a-vis the energy industry. This soft power can be used by Russia to "extend its influence over the states" which depend on it for energy. In the past, Russia has used its position as an energy giant to leverage power over neighboring states by charging different states different prices for gas and shutting off gas to Ukraine and Belarus, most notably in the winters of 2009 and 2015.

Another motive derives from Poland's high coal usage, which precludes them from reaching EU standards now and in the future. According to EU standards, CO₂ "emissions should reduce by forty per cent in 2030 and by eighty per cent in 2050, compared with 1990" levels. Nuclear power plants are expected to replace coal power plants to supply the base load for Polish energy demand, as nuclear power is more reliable and more energy dense than renewable energy sources.

III. Nuclear Technical Availability

The evaluation on Polish nuclear technology covers overall area, from political measurement to future nuclear R&D systems. This enables us to view the current status of Poland, and provide insights on how a Polish nuclear power program would look in the future. Also, another key finding in developing a nuclear technology is that non-proliferation planning and support are essential from the outset of the Polish nuclear power program.

Capacity values (25%) includes UF₆ Conversion Capacity (tU), UO₂ Conversion Capacity (tU), Enrichment Capacity (SWUs), Cooperation (25%) section was omitted, Nuclear Safety Index (20%) included Theft and Sabotage Ranking, Overseas Export (10%) covered US dollars and 2015 under construction, Future Techniques (10%) includes R&D Organizations and SMR under Development, and Corporate Social Responsibility(10%) measured CO₂ cut down in metric Tons.

Raw data are as follows:

Table 1. Nuclear Technical Availability Ranking Raw Data for twelve countries

	Capacity (25%)		Nuclear Safety Index (20%)			Overseas Export (10%)		Future Techniques (10%)			Corporate Social Responsibility (10%)			
	UFS Com	CO ₂ Con	Enrichment	Capex	Heft	Rat	Sabotage	Overseas Export	Overseas	R&D Org	EMR Und	Electricity Gen	CO ₂ cut	down (metric Tons)
Canada	12,500	2,700	0	87	90	0	0	0	4	0	0	97.4	68,472,200	
China Mai	4,000	200	4,200	60	59	2,370,000,000	1	8	1	210.5	147,981,500			
France	19,900	0	7,000	81	86	0	0	1	3	384	289,992,000			
Germany	0	0	4750	83	83	0	0	2	0	0	80.1	56,310,300		
Korea, S	0	400	0	90	81	150,630,000	4	7	1	154.2	108,402,800			
Poland	0	0	0	84	83	0	0	11	0	0	0	0	0	0
Russia	12,500	0	26,600	64	72	17,000,000,000	5	10	11	179.7	128,328,100			
Sweden	0	0	0	98	87	0	0	2	0	0	60.6	42,601,800		
UK	0	0	4750	79	90	0	0	2	0	0	85.1	45,765,300		
Ukraine	0	0	0	77	65	0	0	1	0	0	81	56,943,000		
USA	15,000	0	4750	80	88	0	0	4	7	0	805.3	566,123,000		
Japan	0	0	150	78	89	0	0	4	2	0	17.5	12,302,500		

	Sum	Rank
Canada	0.459779	4
China Mai	0.39186	6
France	0.799504	3
Germany	0.298959	7
Korea, S	0.410953	5
Poland	0.190577	11
Russia	0.834497	2
Sweden	0.270574	9
UK	0.292387	8
Ukraine	0.164675	12
USA	1.332879	1
Japan	0.19175	10

Table 2. (right) Nuclear Technical Availability Ranking for twelve countries After normalization and weight-averaging, the Poland country ranking was eleven out of twelve. Compared with strong nuclear countries, Poland still has a long way to develop. However, they showed a positive indication in

Nuclear Safety Index. This indicates low possibility for Poland to choose proliferation. It is vital to understand that non-proliferation movements along the nuclear technology development is essential. Keeping nuclear for civil use-only is vital in the sense that Poland has just begun to adapt nuclear, and has unlimited potentials to grow.

IV. Future; Responses as a Nuclear Developed Country

IV.A. Possible Proliferation Routes

IV.A.1. Illicit Proliferation

The threat of nuclear material theft is a problem felt acutely among the states of the former Soviet Union, which are notorious for “lightly guarded medical facilities and research institutes with radioactive materials.” The horror of nuclear theft has, so far, not been experienced by Poland’s MARIA research reactor, which is globally recognized for its security efforts.

With the help of the US-based National Nuclear Security Administration (NNSA), Poland has completed an effort to switch from “highly enriched uranium (HEU) to low-enriched uranium (LEU) fuel” in order to prevent spent or stolen fuel from being used in bomb making.

Despite these positive developments, if Poland introduces nuclear power plants into its domestic power mix, it runs the risk of nuclear material theft. The greater volume of fuel needed to produce nuclear power and the larger amount of spent fuel that will be produced will offer rife opportunities for nuclear smuggling, and Poland is geographically situated in a region that is a global hotspot for nuclear smuggling. When the Cold War ended, states of the former Soviet Union experienced a security vacuum which allowed organized crime groups to more easily “engage in transnational criminal activity,” and for the “consolidation of existing

criminal groups, the rise of new organizations, and the diversification of criminal activity.”

While Poland is already well-versed in facility security due to their existing research reactor, once there is a nuclear power plant they will have to grapple with an increased number of employees who could pose potential insider threats. Insider threats can be understood as the threat of attacks from within an organization, and include such attacks as: “(i) Low-tech attacks, such as modifying or stealing confidential or sensitive information for personal gain; (ii) Theft of trade secrets or customer information to be used for business advantage or to give to a foreign government or organization; and (iii) Technically sophisticated crimes that sabotage an organization's data, systems or network.” Human error and failure is often associated with this category of risk, as innocent mistakes can aid malicious actors in their criminal deeds. Insiders generally include those people who have access to nuclear sites, and include “civilian employees..., military personnel, and security guards.” Sometimes, organized crime or terrorist groups simply bribe an unscrupulous employee to smuggle out fissile material, or nuclear “amateurs” who “mistakenly believe that anything radioactive can be sold on the black market as nuclear technology” try and supplement their paychecks in that way.

When considering outside threats, i.e. the threat of an outside group illegally obtaining nuclear materials, there is normally some element of insider assistance due to the controlled nature of nuclear facilities. Terrorist groups have long sought to build their own illicit nuclear weapons, a frightening possibility which must be mitigated by Polish authorities.

IV.A.2. State-Sponsored Nuclear Weapons Program

Although it is unlikely, one scenario stemming from Poland’s nuclear power program is a Polish state-sponsored nuclear weapons program. As discussed above, Poland has a tense relationship with Russia and an increasingly distrustful relationship with the EU; combined, these relationships have resulted in a Poland that feels as though it may be the subject of Russian aggression with no help or recourse coming from the EU. It would also mean that Poland no longer feels that it can rely on NATO troops, or on the US extended deterrent. Poland may come to decide that the deterrent power of nuclear latency as a side benefit of the nuclear power program is not enough, and only a declared nuclear weapons program can guarantee its security.

If Poland embarks upon this route, they will have to dissolve their signatory status to the NPT, a move that would cause political upheaval that would reverberate around the globe. States are within their rights to leave the NPT; Article X provides a “right”

to withdraw from the treaty if the withdrawing party “decides that extraordinary events, related to the subject matter of this [t]reaty, have jeopardized the supreme interests of its country.” Today, the only state which exercised its Article X rights is North Korea, meaning that any other country choosing to leave the treaty joins a club of dubious prestige. By leaving the treaty, Poland would incur the wrath of the EU, which, in May 2017, made a public declaration of its continued commitment to the NPT. Such a move would also alienate the US, which responded to the departure of North Korea from the NPT with heavy, persistent sanctions and multiple rounds of high-level negotiations. International organizations such as the IAEA condemned North Korea’s departure as well; the IAEA quickly drafted a resolution which “[deplored] North Korea’s action ‘in the strongest terms’ and [called] on Pyongyang to meet ‘immediately, as a first step’ with IAEA officials.” Russia, too, would likely have a very strong reaction to a Polish nuclear weapons program; having a pro-US, nuclear-armed adversary so close would heighten Russia’s feelings of insecurity, and could cause any number of bilateral tensions and skirmishes. Although Poland does not represent the same threat to global security as North Korea, its departure from the NPT would surely be met with strongly-worded condemnations of its action and its relations with other states and regions would likely cool considerably. This could affect Poland’s regional trade, national economy, and global standing.

Another consequence of Poland leaving the NPT and starting its own nuclear weapons program is a possible domino effect of other states abandoning the NPT in favor of developing their own nuclear weapons programs. States on the Russian periphery will observe Poland leaving the NNPT due to concerns about Russian aggression and EU impotence and wonder if they, too, are vulnerable. If they decide that they are, it might be rational to seek out a nuclear weapons program of their own. This move of states abandoning the NPT would be extremely destabilizing regionally and globally, and has the potential to change the face of international politics. Although it is unlikely that a former signatory of the NPT would be as insular and volatile as North Korea, it would not bode well for international peace for multiple states to abandon their commitments under the NPT.

IV.B. Suggestions for Non-proliferation

IV.B.1. Technical

Current reprocessing methods allow plutonium to be extracted alone, or do not measure how much plutonium or uranium is extracted at the final stage. Therefore, it must be further developed to cope with the proliferation issues they currently face.

Innovative research and development for electromagnetic or gas diffusion enrichment methods to lessen power requirements are possible sectors that Poland could explore and build. Also, global cooperation on weapon-test or uranium and plutonium paths tracking is needed for non-proliferation.

IV.B.2. Political

US/NATO/EU should hold commitments for Poland to stand up to Russia in times of crisis, which in turn will help easing Polish tensions with Russia. In addition, official US abandonment of "America First", US-Poland nuclear weapons sharing, outward pressure or incentives for Poland to recommit to the NPT are global teamwork in need. Extrapolate from existing Poland's existing nuclear research reactor on issues of nuclear security and safety is vital. Employee vetting culture of safety could dedicate to nuclear security, while mimicking construction and accident safeguard techniques could commit to nuclear safety. Export control regime, such as UNSC Resolution 1540, is also advisory.

V. CONCLUSIONS

Poland’s complex security environment presents challenges to its fledgling nuclear program, and may be fueling Poland’s pursuit of a nuclear power program in the first place. The myriad technical and geopolitical challenges encountered by Poland have the potential to lead to proliferation, either licitly or illicitly, and the international community should be aware of the reasons Poland might wish to proliferate and methods to prevent it from doing so.

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