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**THE IMPACT OF THE 2021-2023 ENERGY CRISIS ON THE NUCLEAR
ENERGY POLICY OF THE EUROPEAN UNION. COMPARATIVE
ANALYSIS ON THE EXAMPLES OF SWEDEN AND POLAND**

Bachelor's thesis

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Declaration of authorship

I have prepared this thesis independently. All the views of other authors, as well as data from literary sources and elsewhere, have been cited.

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A handwritten signature in black ink, appearing to read 'Selart', with a large, elegant loop at the beginning.

Riin Selart, 18.05.2025.

Abstract

This thesis conducts a comparative analysis of the impact of the 2021-2023 energy crisis on the nuclear energy policies of Sweden and Poland. The crisis was triggered by supply chain disruptions from the COVID-19 pandemic and exacerbated by Russia's invasion of Ukraine, which led to unprecedented price surges and heightened energy security concerns in the European Union. The study uses the Most Different Same Outcome framework to examine the changes in the countries' National Energy and Climate Plans before and after the crisis across six policy features. Poland and Sweden were selected as case countries representing different pre-crisis nuclear policy stances. The research demonstrates that the crisis accelerated nuclear energy developments in both countries, although through different mechanisms. In Poland, which already had a long-standing pro-nuclear policy, the crisis served to reinforce the strategic importance and urgency of its existing plans for energy security and sovereignty. In Sweden, which was on a trajectory towards nuclear power phase out, the crisis acted as a catalyst for a fundamental policy reversal, which led to a shift towards supporting significant nuclear expansion for accomplishing both climate targets and energy security goals. The analysis shows similarities in the post-crisis prioritization of nuclear for security, climate goals, and system stability, but emphasizes that the difference in the nature and extent of the policy change (reinforcement vs. reversal) is largely due to their path dependencies and the specific vulnerabilities exposed by the crisis. The findings support broader predictions regarding increased state involvement in energy sectors and the resurgence of energy geopolitics in the wake of the crisis.

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Abbreviations and Terminology

BWR – Boiling Water Reactor

CO₂ – Carbon Dioxide

DQA – Deductive Qualitative Analysis

ERA-NET Programmes – European Research Area Network Programmes

EU – European Union

GHG – Greenhouse Gas

HTGR – High Temperature Gas Cooled Reactor

IEA – International Energy Agency

LR – Large Reactor

MDSD – Most Different System Design

MDSO – Most Different Same Outcome

MW – Megawatt

NECP – National Energy and Climate Plan

NPP – Nuclear Power Plant

NRP – National Research Programme of Poland

OAPEC – Organization of Arab Petroleum Exporting Countries

PNP Programme – Polish Nuclear Power programme (*PPEJ – Program polskiej energetyki jądrowej*)

PV – Photovoltaic

SET Plan – European Strategic Energy Technology Plan

SMR – Small Modular Reactor

TWh – Terawatt-hour

1. Introduction

The period of 2021-2023 witnessed a significant energy crisis across the European Union (EU) with unprecedented price surges and heightened concerns regarding energy security. This crisis was triggered by a rapid global economic recovery post-COVID-19, a cold winter, and significantly escalated after Russia's invasion of Ukraine in early 2022, which drove the natural gas prices to record highs in the EU. The crisis exposed vulnerabilities in energy supply chains and dependence on imported fuels. Energy crises typically force states to rethink their energy strategies, although existing systems can be resistant to change due to "path dependency" or the "lock-in effect".

Energy policy focuses on growth, affordability, security, and sustainability—often framed as the energy trilemma. In response to the crisis and decarbonization needs, nuclear energy has seen a European resurgence, driven by its reliability and role in energy security, especially amid the Russian-Ukrainian conflict. High energy prices also boosted public support, enabling proactive nuclear policy shifts.

This thesis investigates the impact of the 2021-2023 energy crisis on the nuclear energy policy of EU countries through a comparative analysis of Sweden and Poland. By analyzing policy changes in these countries, the thesis tries to determine the extent of the energy crisis's influence on renewed nuclear support and the underlying reasons for policy shifts and how external shocks reshape national energy strategies and the role of nuclear power in the European energy transition. The thesis seeks answers to the following research questions:

1. To what extent did the 2022-2023 energy crisis accelerate nuclear energy developments in Poland and Sweden?
2. What are the key similarities and differences in the policy approaches of Poland and Sweden toward nuclear energy and what factors account for these differences?

Researching the 2021–2023 energy crisis reveals how external shocks can reshape EU energy policy and accelerate transitions to secure, sustainable systems. The crisis exposed vulnerabilities and revived support for options like nuclear power. By analyzing Sweden and Poland, this thesis shows how national contexts shape responses, offering insights for policymaking amid climate urgency and geopolitical tensions.

2. Theoretical background

2.1. 2021-2024 Energy Crisis in the European Union

The theoretical part of this thesis is based on a classical literature review, examining relevant scholarly sources. This chapter lays the groundwork for analyzing how the 2021–2023 energy crisis influenced nuclear energy strategies in European countries.

The Second Edition of Dictionary of Energy defines the energy crisis as a term as “a general term for economic, political and social disruptions in a nation or society, caused by an extreme shortage of available energy resources” (Cleveland & Morris 2014, 198). Energy crises affect all aspects of countries’ economies and usually have numerous, intertwined causes.

First, the aspects and causes that brought on the energy crisis of the 2021-2023 are examined. The 2021-2023 energy crisis was caused by the plunge in the global energy consumption and global supply chain disruptions in the early months of COVID-19 pandemic and then the rapid recovery of global economy, tightening the market in 2021, the cold and long winter in the Northern Hemisphere contributed to the crisis in Europe (Alvarez & Molnar 2021). The tight market escalated into a full energy crisis after Russia's invasion of Ukraine in the beginning of the year 2022, which sent the price of natural gas into record highs (International Energy Agency n.d.), especially in the EU.

The Energy crisis in the EU and the impact on its economy can be described through different statistics, describing the supply, demand and prices. The Russian gas imports to the EU fell from 45% of total gas imports to 14% in just the first nine months of the year 2022 (European Commission n.d.). The reduced gas supply drove up energy prices, as previous research shows that natural gas became the primary driver of electricity pricing in Europe during the energy transition, setting rates in over 80% of the hours in 2021 (Zakeri, Staffel, Dodds, et al. 2023, 2787). According to Eurostat, the average gas prices rose in the first half of 2023 compared to the same period in 2022, increasing from €8.6 to €11.9 per 100 kWh (Eurostat 2025a). With high prices, the demand for gas plummeted. The estimates prior to the Russian invasion of Ukraine and the energy crisis showed expected demand for natural gas to grow between the years of 2021 and 2030 by approximately 300 bcm more than current forecasts, with Europe

alone accounting for 45 bcm less growth due to the crisis (Fluwood 2023, 4). That also indicates the need for alternative fuels to replace gas.

The energy crisis had an impact on the EU's economy, affecting the purchasing power, economic growth, public finances and competitiveness through high inflation, with the high price of electricity and oil being one of the main causes for high inflation (European Economic and Social Committee 2023). Before the COVID-19 pandemic and the EU's energy crisis, the EU's annual inflation was around 1.5% in January 2019 and 1.7% in January 2020, however following the start of the energy crisis, inflation surged significantly, reaching 5.6% in January 2022 and peaking at 10.0% in January 2023, before decreasing to 3.1% in January 2024 (Eurostat 2025b). The annual inflation for electricity, gas and other fuels in the EU was 4.3% in January 2019 and deflating to -0.1% in January 2020 but following the crisis, inflation in this sector surged, reaching 28.7% in January 2022 before dropping to -6.3% in January 2024 (Eurostat 2025b). This sharp fluctuation in inflation shows the significant impact of the energy crisis on the EU economy.

While EU experienced disruptions before the Russian invasion of Ukraine, with the Nord Stream 2 pipeline opening being postponed by EU “unbundling” rules requiring the owners of pipelines to be different from the suppliers (Eesti Rahvusringhääling 2022) and the Russian gas imports to EU through the Ukraine being reduced (Barner, Holz, von Hirschhausen & Kemfert 2024, 2), the invasion prompted most EU states to seek alternatives to Russian gas, which they had relied on for decades, with nuclear energy emerging as one of the key options

Various sources (Nordhaus & Lloyd 2022, 18; Brugidou & Bouillet 2023, 1) describe the “return to grace” or “resurgence” of nuclear energy in Europe. Many highlight the Russian-Ukrainian conflict as a key factor in strengthening the perception of nuclear energy as a reliable and sustainable power source (Muhammad-Amir & Zeler 2024, 180; Nriezedi-Anejionu 2024, 2) and as a crucial component for ensuring energy security (Nordhaus & Lloyd 2022, 18). Articles emphasize broader efforts to reduce greenhouse gas (GHG) emissions as a driving force behind recent developments in the European nuclear energy sector (Nriezedi-Anejionu 2024, 1).

2.2. Energy Policy as a concept

Anna Bluszcz defines in her article energy policy's 4 main objectives: economic growth, affordability, security of supply and sustainability (2020, 2). The same objectives are also reflected in the EU's general principles of energy policy, with added principles like competitiveness and decarbonisation (Ciucci 2024), which can be sorted under the aforementioned objectives of sustainability and affordability. These 4 main objectives are encapsulated by energy trilemma: access to energy services, reliability and security of energy supply and environmental sustainability (Bridge, Barr, Bouzarovski, et al. 2018, 2). In this context, nuclear energy enhancement is seen as a political measure to help solve these three competing social demands.

Energy policy encompasses a wide range of government interventions and measures, through which states influence the consumption, production, distribution, energy supply and utilization efficiency (Prontera 2009, 12, 16). Hodel (1991, 10) emphasizes the need to differentiate between energy policy and energy programmes to enhance decision-making in the energy sector. Energy policy sets broad principles, goals and strategies for development and regulation, shaping the sector's overall direction. In contrast, energy programmes implement these policies through specific initiatives, projects and regulations (Hodel 1991, 11-12). This thesis focuses on the broader policy strategy reflected in the National Energy and Climate Plans, which are the 10-year plans for the years of 2021-2030 of the EU Member States.

Energy policy stakeholders include individuals, organizations and entities involved in its creation, implementation and oversight, varying by context and country. Jeřábek (2024, 32-33) brings out following key actors in the energy policy:

- Government Institutions – set policies, regulate and oversee energy activities at national, regional and local levels;
- Legislators – shape policy through laws and regulations on energy production, distribution and consumption;
- Energy Companies – influence policy through lobbying, given their role in energy production and supply;
- Industry Associations – advocate for sector-specific interests in policy discussions;
- Environmental Organizations – promote sustainability and policies favoring renewable energy and efficiency;

- International Organizations – influence global and national energy policies
- Consumers – affect policy through energy consumption patterns and demand for efficiency.

Energy policy defines goals, regulations and strategies that shape the energy sector, balancing economic growth, affordability, security and sustainability. Various stakeholders play a role in its development and implementation.

2.3. Energy crisis impact on policy

Energy crises usually force states to act and rethink their previous energy strategies. Literature argues, that the reason behind policy changes in the times of crisis rise from the capability of policy reforms to alter voter's demands (Drazen & Easterly 2001, 132, 445; Drazen 2000, 414; 2020; Guiso Herrera, Morelli, et al. 2019, 95, 97), making the policy changes inherently connected to the electoral system (in the context of democratic states). Drazen and Easterly (2001, 132) bring out how crises make individuals, groups and policy makers more accepting towards proposed policy changes, making it a good time to enact a policy change. Drazen (2001, 445) bring out how reforms and therefore policy changes are more likely adopted during the crisis rather than during the “good times”, but also emphasizing that the effects of the negative shock should be considered, as the net benefit of adopting a policy change versus staying with the status quo decides the likeness of the policy change and its extensiveness.

It is important to take into account the “path dependency” or “lock-in effect” that comes into play when discussing the slow implementation of alternative solutions in the state's energy sector's structure. Path Dependency is a term that describes the reason why certain technologies, processes and practices (e.g. energy systems) continue to be used and are hard to change in their rigidity, even if they are inefficient or out-dated (Bridge, Barr, Bouzarovski, et al. 2018, 75). The energy crisis might not definitely force a drastic policy change but it can make states double down on their path dependency and reinforce the regulatory environment around it (Chiplunkar & Das 2021, 648).

An example of energy crisis impacting policy is the 1973 oil crisis, caused by an OAPEC embargo on Western nations, led to fuel shortages and spiking prices, pushing countries to

reduce oil dependency through alternative energy, efficiency measures, and strategic reserves (Schramm 2024, 61–63). Similarly, the 2021–2023 energy crisis reshaped how governments approach energy security.

Short-term responses to the energy crisis in the EU have prioritized securing available supply and protecting consumers, while new policies and measures have been adopted to significantly boost investments in clean energy and efficiency, strengthening energy security and investing into building domestic production capacity (International Energy Agency 2022 85-86). For example, Poland introduced fixed price for electricity to the customers (The Chancellery of the Prime Minister 2023) and gave large-scale government aid to coal and lignite mining sector, invested into renewable energy, including biogas plants, new energy eco-innovations and reinstated their interest in nuclear energy (Prokopowicz 2023, 124-125).

Nuclear energy resurgence has been partly accelerated by the growing developments and policy directions in renewable energy, as the energy crisis has encouraged sustainable energy policymaking conditions. Those EU sustainable energy policymaking conditions are including nuclear energy only in parts, where sustainability is judged narrowly, in the lines of GHG emissions (Kuzemko, Blondeel, Dupont & Brsbois 2022, 3). The EU has not established any targets for nuclear power development (Schneider & Froggatt 2024, 380). So, the resurgence of nuclear energy is mainly in the guise of renewable energy transition, supply security and domestic production enlargement.

Due to democratic systems, nuclear controversy post-Fukushima and Chernobyl, and high capital costs (Nuclear Energy Agency 2009, 7-8), state participation in the project is necessary and public opinion is highly required to make tangible policy changes regarding the nuclear energy policy. Analysts (Bridge, Barr, Bouzarovski, et al. 2018, 8; Haney & Pollitt 2010, 2-3, 10) have also predicted a move towards state governed nationalized energy sectors and the return of energy geopolitics, including resource mercantilism and nationalism. Therefore the far-reaching state participation in the nuclear energy sector developments is expected.

Changes in nuclear energy policy strategies can be expected as a response to the economic disruption caused by the energy crisis. However, the extent of these changes remains uncertain, given that most crisis responses tend to be short-term, while nuclear energy development requires long-term commitment. The depth of policy shifts in Poland and

Sweden will likely depend on the severity of the crisis' impact in each country. Still, the combination of economic pressure and growing public support provides a favorable foundation for more substantial nuclear policy developments.

3. Methodology: the use of MDSO framework, data sources and metrics

3.1. MDSO framework as research method

The empirical part of this thesis consists of pre 2021-2023 energy crisis nuclear policy (system) analysis of Sweden and Poland under the most different same outcome (MDSO) framework. Anckar outlines in his 2008 article the most different system design (MDSD) framework as one of the comparative political research systems. According to the MDSD framework, the research objects are political systems that are as different from each other as possible (Anckar 2008, 389). MDSO, a subtype of MDSD, compare research objects a with the most different systems, but with the same outcome. The hypothesis of this thesis is that the main factor outside the system that brought change, was the energy crisis 2021-2023.

According to the Skocpol & Somers' (1980, 184) explanation of MDSD framework, it consists of bringing out different features or metrics defining the researched systems as different, key explanatory factors explaining the same outcome and the same outcome needed to be explained, look at the table 1 below. In this thesis, the key explanatory factor is presumed to be the Energy crisis of 2021-2023. The key “explanatory factor” is also called an “independent variable” and the “outcome to be explained” is called a “dependent variable” (Steinmetz 2019, 20).

Table 1. Most different system design and same outcome framework

	Country 1	Country 2
Features	a f	b g
Key explanatory factors (independent variable)	y	y
Outcome to be explained (dependent variable)	x	x

Source: adapted from Skocpol & Somers 1980, 184; Steinmetz 2019, 20.

This study uses the MDSO approach as multiple sources (e.g., Brugidou & Bouillet 2023; Nordhaus & Lloyd 2022) note a rise in nuclear support across the EU post-crisis—an example of the same outcome in different systems. Poland and Sweden represent these differing systems. The comparison examines each country’s energy plans before and after the crisis, considering historical and political context to assess path dependency. The first MDSO segment analyzes pre-crisis nuclear policy and the second examines crisis-driven changes using the same features.

3.2. System analysis and qualitative data

The system analysis consists of two broader analyses that will be later compared to each other. First analysis will focus on identifying the key differences between the pre energy crisis and post-energy crisis nuclear energy policies in the case countries by comparing the National energy and climate plans (NECPs). The first analysis will seek the answer to the first research question: to what extent did the 2022-2023 energy crisis accelerate nuclear energy developments in Poland and Sweden?

NECP, introduced under EU Regulation 2018/1999 (Regulation (EU) 2018/1999, 2018), are the 10-year national energy and climate plans for the years of 2021-2030 of the EU Member States. The plans act as a way for the European Commission to assess and monitor EU’s progress towards fulfilling the targets of the Energy Union (Regulation (EU) 2018/1999, 2018). By mandating the submission and review of NECPs, the EU ensures that national policies align with collective objectives, promoting consistency and comparability across countries. The Commission provides recommendations and assessments of the NECPs. This structured reporting process promotes transparency in how each Member State contributes to overarching EU targets (Regulation (EU) 2018/1999, 2018). As a result, NECPs influence national energy policy by encouraging long-term planning, cross-sectoral coordination and integration of climate objectives into economic and industrial strategies. They serve as both a compliance tool and a policy-shaping mechanism, pushing governments to adopt more ambitious and coherent energy policies. The changes between NECP submitted in 2020 and updated version of NECP submitted in 2024 show the differences in policy pre and post energy crisis and therefore shows the differences being made in national energy policy due to the energy crisis of 2021-2023.

It's important to analyse the “pre-set” energy landscape, to correctly assess the influence of “path dependency” or “lock-in effect” and to recognize changes brought on by the energy crisis. First we will use different features/metrics to analyse the energy policy before the energy crisis to bring out the differences between the case countries. Those features will describe the past systems in the MDSO framework.

Within the MDSO framework, we examined features that differentiate the nuclear energy policies of Poland and Sweden before the crisis through the analysis of the NECPs. The features are both quantitative and qualitative and are following:

- a. *Nuclear energy prioritization in national energy strategies.* This feature will determine, whether and how much was nuclear energy prioritized or being phased out before the energy crisis and how it changed after the energy crisis.
- b. *Sustainability targets and nuclear's role in meeting them.* This feature will determine how the nuclear energy fits into the sustainability targets. There has been a notion for countries to define their sustainability goals away from “sustainable energy” to “carbon emission free”. Nuclear energy fits better into the sustainability framework, that is defined through emissions (Kuzemko, Blondeel, Dupont & Brsbois 2022, 3).
- c. *Investment priorities and funding mechanisms.* This feature will look at the planned funding of NPP (nuclear power plant) projects, mainly focusing on the state involvement, interest and readiness to invest into the projects. Larger state involvement should indicate a trustworthy, solid initiative with higher chances of actualization, because NPPs are capital intensive, therefore usually requiring state involvement (Nuclear Energy Agency 2009, 12).
- d. *Research and development commitments.* This feature will examine the modernity of the nuclear energy systems regarding the technology: next-gen reactors, SMRs, fusion reactors. SMRs are considered more high-risk ventures than LRs, because any SMRs haven't been built yet, but in long term perspective SMRs have a potential to become more lucrative because of their modularity (Mignacca & Locatelli 2020, 1-2).
- e. *Energy security goals.* This feature will look at the country's energy security goals (diversification, independence from fossil fuels) voiced in the documents regarding the energy/economy sector, to see how well nuclear energy fits into those broader goals.
- f. *Energy mix regarding the electricity generation.* This feature will look at the countries' energy mix and the share or the lack of electricity generation through NPPs

and the planned nuclear capacities in the mix in the future. Nuclear energy is seen as a dispatchable source of electricity, which can complement the non-dispatchable energy sources like wind energy and PVs (Gerškšič, Vrančič, Čalič, et al. 2023, 12).

These features can be used in the context of the energy trilemma — balancing energy security, environmental sustainability, and affordability. Each policy shift analyzed in this thesis can be interpreted through the lens of which pillar was prioritized.

The second analysis will compare the changes made in each country's nuclear energy policy to each other. The same features just described are used in that analysis and fitted into the “outcome to be explained” part of the MDSO framework. The analysis will focus on whether the nuclear policies of the case countries did become similar due to the energy crisis and ask to what extent did the 2022-2023 energy crisis accelerate nuclear energy developments in Poland and Sweden, which is the second research question.

3.3. Deductive qualitative analysis as the content analysis

Fife and Gossner (2024, 1) explain in their paper, that deductive qualitative analysis (DQA) is particularly suited for studies aimed at testing, narrowing down, or generalizing extant theories by importing them to new data context. This thesis tries to expand the existing theory in this research, by using the MDSO framework and pre-defined categories as features of the researched systems. The DQA allows one to assess how far extant theory can account for a phenomenon in a manner open to emergent conceptions and it does not aim at generating new grounded theory but rather explores and develops settled frameworks by empirical testing and interpretative synthesis (Fife & Gossner 2024, 2).

The guiding theory can also be theoretical, thereby taken from the literature (Fife & Gossner 2024, 3) – as is the case in this research. The second part consists of operationalizing the theory and in the third stage, a purposive sample is gathered to ensure diverse perspectives are represented (Fife & Gossner 2024, 4, 6). In coding and analysis, the fourth stage, deductive as well as inductive methods are used to identify four types of evidence — supporting, contradicting, refining and expanding — while special emphasis is laid on negative case analysis in order not to be trapped by confirmation bias (Fife & Gossner 2024, 6–7). During the final theorizing phase, the outcomes are interpreted as determining which elements of the

theory are confirmed, modified, negated, or expanded, and thus a theoretical model representing the phenomenon being researched more precisely is constructed (Fife & Gossner 2024, 7–8).

3.4. Case selection: Sweden and Poland

The case countries were selected based on the MDSD strategy's alteration MDSO. The selected case countries put into the MDSO framework are Sweden and Poland. Those countries represent different systems. This subsection will justify the selection of case studies and will reason why and how they fit into the MDSO model as countries with the most different system design. More comprehensive analysis of the case countries energy system will be given in the analytical part of the thesis.

Almost every government in Poland, starting from the 1989 administration, has promised to work on developing nuclear energy in the country (Brodacki, Horbaczewska, Sawicki, et al. 2023, 18). Poland is characterized by a strong pro-nuclear energy policy, despite its relatively limited experience in the nuclear field. Poland's most significant nuclear projects date back to the 1980s. The Żarnowiec NPP project began in 1982 and the construction of the Warta NPP started in 1988, but both projects were permanently halted in 1989 due to protests. Poland has never produced nuclear energy. It represents a system with strong support for nuclear energy both before and after the energy crisis, but with no actual nuclear energy production capabilities.

Sweden currently operates six nuclear reactors and nuclear energy accounted for 26.8% of the country's energy mix in 2023 and 36.5% of domestic energy produced (International Energy Agency 2024a). In 1980, the Swedish government decided to gradually phase out nuclear energy, but a 2010 parliamentary vote invalidated this policy. In 2015, a decision was made to close four older reactors by 2020 instead of renewing their operating licenses. After the energy crisis, in June 2023, Sweden replaced its energy target of "100% renewable energy by 2040" with a goal of "100% fossil-free electricity," allowing the government to continue with plans for new NPPs. In November of the same year, the government announced plans to build two new reactors by 2035 and 10 new reactors by 2045, including small modular reactors (SMRs) (World Nuclear Association 2024a). Prior to the energy crisis, Sweden was moving towards reducing the share of nuclear energy, but after the crisis, it's planning a significant

expansion of the nuclear sector. Sweden represents a system that was on the road of phasing out nuclear energy before the crisis but made a sharp turn in policy after the crisis by starting to prioritize nuclear energy again.

Therefore, Poland and Sweden represent two different systems in the MDSO system with Poland being in favor of nuclear energy before the energy crisis but exhilarating the developments in nuclear energy sector after the effects of energy crisis and Sweden having negative views on the development of nuclear energy before the energy crisis but starting to strongly favor it after the energy crisis of 2021-2023. An added layer to the differences between the countries is also the fact that Sweden already has an established nuclear energy industry, accounting for path-dependency, while Poland is a newcomer and has no previously established nuclear energy production capabilities.

4. Changes in nuclear energy policies in Poland and Sweden

This chapter will focus on the differences between the Poland's and Sweden's NECPs, the commission assessments of the NECPs aren't taken into account. Poland's analysis is based on their final NECP submitted in 2019 and on a draft of updated NECP submitted in 2023. Poland does not have a final updated version of their NECP available on their national NECP website or on the European Commission website. Sweden's analysis is based on their final NECP submitted in 2019 and on a final updated NECP submitted in 2024. Countries' NECPs differences, when it comes to nuclear energy policy development, are analysed in the next chapter. This chapter will solely focus on the comparison of post and pre energy crisis NECPs.

4.1. Changes in Poland's nuclear energy policy

4.1.1. Poland in context – path dependency

As stated previously, almost every government in Poland, starting from the 1989 administration, has promised to work on developing nuclear energy in the country (Brodacki, Horbaczewska, Sawicki, et al. 2023, 18). While Poland has never produced nuclear energy, their most significant nuclear projects date back to the 1980s, when the construction of Żarnowiec NPP project began in 1982 and the construction of the Warta NPP started in 1988. Both projects were halted permanently in 1989 due to protests happening because of the Chernobyl catastrophe (Szulecki, Borewicz, & Waluszko, 2015, 28–29). The next possible nuclear energy project was under discussion briefly in 2006, when Poland joined the Estonian–Latvian–Lithuanian NPP project. The project failed later for various political and economic reasons (Jermalavičius, Bergmann, Crail, O'donnell, Janeliunas & Idarand 2022, 56–57). Poland represents a system with strong support for nuclear energy both before and after the energy crisis. Today, Poland's state nuclear energy company and private firms are developing various SMR projects. Poland is characterized by a strong pro-nuclear energy policy, despite its relatively limited experience in the nuclear field compared to Sweden.

Otherwise, Poland's domestic energy production is currently dominated by the use of coal (65,8% in 2023), with biofuels and waste taking the second place (20,7%), wind and solar the

third (5,7%), natural gas forth (5,8%) and hydro and crude oil making up the rest (International Energy Agency 2024b).

This fossil-fuel legacy has significant implications for nuclear energy policy. On one hand, the push to decarbonize and reduce reliance on coal creates an incentive to accelerate nuclear development as a reliable, low-carbon dispatchable baseload source. On the other hand, rooted interests in coal and associated industries with institutional inertia can prevent the reallocation of resources and political capital toward nuclear energy. Path dependency operates in two directions: it constrains rapid shifts away from fossil fuels but it also reinforces the political appeal of nuclear power as a strategic tool to overcome Poland's structural reliance on carbon-intensive sources without compromising energy sovereignty or stability, by being a good alternative to the base load and dispatchable in its nature.

The nature of fossil fuel systems affects policy implementation capacity. Regulatory frameworks, workforce skills, and investment pipelines have historically been oriented toward coal, creating a divergence between pro-nuclear political rhetoric and institutional readiness. In this context, SMRs are often framed as a compromise with nuclear energy being technologically innovative yet potentially less disruptive to existing grid and planning structures than large-scale NPPs, especially in the terms of centralization vs decentralization of electric grid. Usually renewable energy pushes towards decentralization of the electricity grid, meanwhile nuclear energy warrants centralized electricity grid.

4.1.2. Differences between Poland's NECPs after the energy crisis

While all of the changes made in nuclear energy policy in the NECP aren't only because of the energy crisis, but can be seen as a natural culmination and development of the nuclear energy policy, the changes in justification behind the policies prove the influence of energy crisis on the policy. Nuclear energy was already a planned component of Poland's energy policy before the energy crisis of 2021-2023 with the Polish Nuclear Power programme (PNP programme). However, the crisis significantly reinforced the strategic importance of nuclear power in achieving primary policy objectives like energy security.

The main difference highlighted when comparing the NCEPs is not a sudden introduction of nuclear policy due to the crisis, but rather the crisis emphasizing and heightening the

imperative for energy security and sovereignty (Ministry of Climate and Environment 2023, 60-61), thereby reinforcing the strategic value and necessity of the already planned nuclear power programme as a stable, domestic, zero-emission source (Ministry of Climate and Environment 2023, 74). The crisis validated the prior emphasis on energy security (Ministry of State Assets 2019, 11-10) and accelerated the need to reduce dependence on potentially volatile imported fuel supplies, a need that a domestic nuclear capacity helps address (Ministry of Climate and Environment 2023, 60-61). While the timeline for the first unit (2030-2035 vs 2033) remains broadly similar, the geopolitical context post-crisis elevates the strategic importance of securing domestic energy sources (Ministry of Climate and Environment 2023, 60-61). The exploration of SMRs or high temperature gas cooled reactors (HTGRs) (Ministry of Climate and Environment 2023, 69) might represent an increased interest in potentially quicker or complementary nuclear options in the new, more challenging energy security environment.

The energy crisis, which began in 2021 and was intensified by the outbreak of the war in Ukraine in February 2022, is mentioned in the updated NECP as an event that made energy security necessary to intervene directly and immediately for the first time in many years (Ministry of Climate and Environment 2023, 60-61). This crisis highlighted the risk of disrupting the security of fuel and energy supply and the impact of single events on prices and inflation (Ministry of Climate and Environment 2023, 60-61). It made it necessary to redefine strategic priorities for sectors like oil and liquid fuels, leading to 2040 diversification away from Russian supplies (Ministry of Climate and Environment 2023, 68). The diversification of energy mix encompasses nuclear energy as one of the energy sources diversifying the production sources.

In this post-crisis context, the updated NECP reiterates the plan to deploy nuclear energy. The first large-scale NPP unit is now planned for the period 2030-2035 (Ministry of Climate and Environment 2023, 69). Total installed capacity of large-scale nuclear units could reach close to 7.4 GW (net) in 2040 (Ministry of Climate and Environment 2023, 69). The updated plan mentions the potential for SMRs and HTGRs (Ministry of Climate and Environment 2023, 69-70). Nuclear energy is stated to play an important role in covering needs for sufficiency after 2030 and will positively impact capacity balance and decarbonisation with "Deployment of large-scale nuclear energy" listed as a key action (Ministry of Climate and Environment 2023, 74, 70). The policy tries to create multi-annual stocks of nuclear fuel for energy security

(Ministry of Climate and Environment 2023, 70). The updated document, like the previous one, positions nuclear power as a fundamental element for long-term energy security and independence, alongside diversifying energy carriers and increasing the use of renewable energy sources and natural gas as a transitional fuel (Ministry of Climate and Environment 2023, 60-61, 74; Ministry of State Assets 2019, 11). Next, the features previously listed are used to further examine the changes in the nuclear energy policy.

Nuclear energy prioritization in national energy strategies: Both NECP documents prioritize nuclear energy as a key strategic element for Poland's energy sector's future (Ministry of State Assets 2019, 11, 19; Ministry of Climate and Environment 2023, 74). The updated NECP reinforces this by designating the deployment of large-scale nuclear energy as a specific Action 112, highlighting it as a critical element of capacity adequacy policy (Ministry of Climate and Environment 2023, 10, 23, 74). It is integrated as a priority area within the national science policy (Ministry of Climate and Environment 2023, 91). While both acknowledge its importance, the updated NECP appears to place nuclear deployment more within the list of concrete actions and links it directly to energy system capacity needs (Ministry of Climate and Environment 2023, 74).

Sustainability targets and nuclear's role in meeting them: Both NECP documents present nuclear power as a technology crucial for reducing GHG emissions and contributing to the energy transition (Ministry of State Assets 2019, 25-26, 55). The updated NECP is more definitive, stating that nuclear energy is "totally carbon-free" and positioning it as a zero-carbon source essential for diversifying the generation structure and helping to avoid CO₂ emissions in the pursuit of climate neutrality (Ministry of Climate and Environment 2023, 12, 60, 113). This reinforces nuclear's role as a clean energy source important for achieving climate goals alongside renewable energy development.

Investment priorities and funding mechanism: Both documents talk about the financing required for nuclear development. The original NECP mentions that the PNP programme includes financial tools (Ministry of Climate and Environment 2023, 94) and notes the capacity market's role in supporting technologies contributing to supply security (Ministry of Climate and Environment 2023, 98, 100). The updated NECP provides more specific details regarding investment. It includes completing the financing model as part of the actions for large-scale nuclear deployment (Ministry of State Assets 2019, 10) and mentions that

large-scale nuclear is planned as a private partnership investment (Ministry of State Assets 2019, 69). It links specific financial instruments like the Capacity Market (Action 111) and the Modernisation Fund (Action 73) to nuclear development, particularly for SMRs (Ministry of Climate and Environment 2023, 74, 77). Support through Projects of Common Interest lists and the Connecting Europe Facility are noted in both for strategic infrastructure projects (Ministry of State Assets 2019, 107-108; Ministry of Climate and Environment 2023, 83, 113) which would be relevant for nuclear-related infrastructure.

Research and development commitments: Both NECPs show a strong commitment to research and development supporting the energy transition, including nuclear energy. Both set an ambitious target to increase research and development expenditure to 2.5% of GDP by 2030 (Ministry of State Assets 2019, 20, 45; Ministry of Climate and Environment 2023, 91). Nuclear energy is integrated into national science policy frameworks, specifically the National Research programme (NRP) in the original NECP (Ministry of State Assets 2019, 45, 123) and into the State Scientific Policy (PNP) in the updated NECP (Ministry of Climate and Environment 2023, 91-92). Both mention cooperation within the European Strategic Energy Technology (SET) plan and note Poland's participation in the nuclear working group (Ministry of State Assets 2019, 20, 127). The updated NECP provides more details on specific research areas and list actions like the conceptual design for a HTGR (Action 135) (Ministry of Climate and Environment 2023, 93, 113) and ensure conditions for the development of SMRs (Action 22) (Ministry of Climate and Environment 2023, 74).

Energy security goals and how nuclear energy relates to them: Both documents highlight nuclear's role in providing a stable and reliable supply of electricity and diversifying energy sources (Ministry of State Assets 2019, 11-12, 19, 32). Nuclear is seen as a long-term foundation for the power system, strengthening electricity security (Ministry of State Assets 2019, 19; Ministry of Climate and Environment 2023, 74). Both also address the security of nuclear fuel supply, including assessing potential domestic uranium deposits (Ministry of State Assets 2019, 36; Ministry of Climate and Environment 2023, 70). The updated NECP goes further by setting a specific target: at least 5 years of fuel supply once the first unit is operational and outlines a policy to pursue multi-annual fuel stocks (Ministry of Climate and Environment 2023, 69-70). The updated NECP points out that nuclear power can have a positive impact on energy sovereignty through these stocks (Ministry of Climate and Environment 2023, 60-61).

Energy mix regarding electricity generation and nuclear energy: The planned timeline for integrating nuclear power into Poland's energy mix is presented in both documents. The original NECP projects the commissioning of the first unit around 2033 and a total installed capacity of approximately 6-9 GW from six units (Ministry of State Assets 2019, 19, 33, 94). The updated NECP refines this, giving a timeframe of 2030-2035 for the first unit and projecting total capacity reaching close to 7.4 GW in 2040, potentially up to 9.4 GW in the longer term (Ministry of Climate and Environment 2023, 69, 74). Importantly, the updated NECP explicitly mentions the potential for SMRs to complement the large-scale units (Ministry of Climate and Environment 2023, 69, 74), reflecting a broader strategic approach. Both documents link nuclear deployment to the gradual decline in the share of coal in electricity generation (Ministry of State Assets 2019, 19, 32, 55; Ministry of Climate and Environment 2023, 22) and describe nuclear as a stable source needed to back up variable renewable energy (Ministry of State Assets 2019, 32, 41; Ministry of Climate and Environment 2023, 19).

Table 2. Overview of the changes made in Poland's NECPs.

Nuclear Energy Aspect	Pre-energy crisis Poland	Post-energy crisis Poland
Strategic Priority	Prioritized in energy and science policy	Action 112 – concrete priority in capacity planning
Future Planning	6–9 GW by 2043, first unit ~2033	7.4–9.4 GW; first unit 2030–2035; includes SMRs
Role in Sustainability Goals	Helps reduce GHG, contributes to transition	Declared “totally carbon-free”, key to climate neutrality
Part of GHG Reduction Plan	Positioned as a clean tech	Defined as essential to zero-carbon strategy
Investment Support & Mechanisms	Mentions Capacity Market and EU funds	Actions for financing, public-private model, Modernisation Fund, Action 73/111
R&D Commitment (nuclear)	Strong R&D targets (2.5% GDP), general scope	Same target, plus detailed actions (HTGR – Action 135, SMRs – Action 22)

Support for SMRs	Not addressed	Explicitly supported; linked to policy and research plans
Energy Security Role	Stable supply, diversification, fuel security addressed	Same + multi-annual fuel stock policy (5+ years supply goal)
Nuclear in Electricity Mix	6–9 GW by 2043, backing up renewables	7.4 GW by 2040; up to 9.4 GW; SMRs add flexibility

Source: Ministry of Climate and Environment 2023 and Ministry of State Assets 2019.

The summarized overview of changes can be seen in table 2. The updated Polish NECP places greater emphasis on nuclear energy, elevating it to a concrete action linked to capacity adequacy and national science policy, compared to the more general prioritization in the original plan. It strengthens nuclear's role in climate policy, explicitly labeling it a zero-carbon technology key to achieving climate neutrality. Investment plans are more detailed, with specific funding mechanisms such as the Capacity Market, Modernisation Fund, and private partnerships outlined, including for SMRs. R&D goals remain consistent, but the updated NECP introduces specific actions like HTGR conceptual design and SMR development. On energy security, the updated version introduces clearer targets for nuclear fuel stockpiling to enhance sovereignty. Finally, the updated NECP refines deployment timelines, expands projected nuclear capacity, and integrates SMRs more explicitly, reinforcing nuclear's role in supporting the transition from coal and balancing renewables. For a more comprehensive comparison of changes in NECPs and nuclear energy policies, look at the comparative table of Poland's NECPs under the appendix 1.

4.2. Changes in Sweden's nuclear energy policy

4.2.1. Sweden in context- path dependency

Sweden currently operates six nuclear reactors and nuclear energy accounted for 26.8% of the country's energy mix in 2023 (International Energy Agency 2024). Sweden has a longer history with nuclear energy than Poland, with the first established atomic energy research organization established in 1947 and first experimental reactor commissioned in 1954 (World Nuclear Association 2024a). Two other reactors were commissioned in 1956 and the fourth

reactor commissioned in 1964. Another small boiling water reactor (BWR) was proposed in 1966 and it started up in 1972 with two other BWRs starting operation in 1981 and 1983. Another four reactors entered commercial service in the 1980s. Together there have been 13 operable reactors in Sweden, with 7 of them being shut down (World Nuclear Association 2024a). In 1980, the Swedish government decided to gradually phase out nuclear energy, but a 2010 parliamentary vote invalidated this policy, then in 2015, a decision was made to close four older reactors by 2020 instead of renewing their operating licenses (World Nuclear Association 2024a). In 2016, the Swedish government stated it envisioned all the present operating nuclear reactors to be shut down by 2050, even though they emphasized that “it does not mean the closure of nuclear power through political decisions” (Ministry of the Environment and Energy 2018, 3), but their goal to have “100% renewable energy by 2040” does entail gradual phase-out. After the energy crisis, in June 2023, Sweden replaced its energy target of “100% renewable energy by 2040” with a goal of “100% fossil-free electricity,” allowing the government to continue with plans for new NPPs. In November of the same year, the government announced plans to build two new reactors by 2035 and 10 new reactors by 2045, including SMRs (World Nuclear Association 2024a). Prior to the energy crisis, Sweden was moving towards reducing the share of nuclear energy, but after the crisis, it is planning a significant expansion of the nuclear sector. Sweden represents a system that was against nuclear energy before the crisis but in favor after the crisis.

Sweden's domestic energy production is currently dominated by the use of nuclear energy (36,5% in 2023), with biofuels and waste taking the second place (35,5%), hydro third (5,7%), wind, solar, etc forth (10,9%) and heat and coal making up the rest (International Energy Agency 2024a). This low-carbon energy mix shows a long-standing structure shaped by decades of policy stability and technological investment. At the same time, the dominance of nuclear energy within this electricity mix shows path dependence. Sweden's energy institutions, technical expertise, and regulatory systems remain aligned with nuclear operations, making the sector somewhat resilient even during periods, when public and political narratives lean toward phase-out. This path dependence plays a role in facilitating Sweden's recent policy reversal. Unlike countries starting from scratch, Sweden has the existing infrastructure, regulatory capabilities, and workforce knowledge. From this aspect, we can talk about nuclear energy as path dependency. These legacy systems reduced the cost, complexity, and political risk of renewing nuclear commitments, so in a way Sweden's

historical alignment with nuclear energy created a foundation that allowed for rapid policy adjustment in response to the energy crisis.

However, the legacy of the 1980 phase-out decision and 2016 envision of “100% renewable energy by 2040” also introduced a parallel form of path dependence. For decades, anti-nuclear sentiment influenced regulatory decisions and limited new developments. The reframing of national goals from “renewable” to “fossil-free” enabled nuclear energy to be reintroduced without directly challenging Sweden’s decarbonization ambitions.

4.2.2. Differences between Sweden’s NECPs after the energy crisis

The updated NECP discusses the energy crisis of 2022-2023. This crisis, which was driven by factors such as the suspension of gas supplies from Russia to Europe and issues with nuclear power in France, led to a significant increase in electricity prices (Ministry of Climate and Enterprise 2024, 142). The government communicated the risk of manual disconnection of electricity users during the winter of 2022/2023 due to potential power shortages during peak hours (Ministry of Climate and Enterprise 2024, 142). This period of high prices and supply vulnerability emphasized the need for secure, dispatchable power (Ministry of Climate and Enterprise 2024, 13, 276).

In response to the energy crisis, Sweden's energy policy underwent a fundamental shift. The energy policy target was officially changed from 100% "renewable" to 100% "fossil-free" electricity production by 2040 (Ministry of Climate and Enterprise 2024, 11, 284). This change is noted as opening up for non-renewable sources like nuclear power (Ministry of Climate and Enterprise 2024, 284). The updated NECP now presents nuclear energy not just as a part of the existing mix, but as a critical and essential component and a “prerequisite for reaching climate objectives”, important for providing the "vast amounts of fossil-free electricity" needed for the climate transition (Ministry of Climate and Enterprise 2024, 13). It can be considered as a critical element for capacity adequacy policy and ensuring a secure supply of electricity.

This reinforced narrative has translated into concrete actions aimed at expanding nuclear power. The government presented a bill proposing to remove legal barriers that limited the number of reactors and restricted construction to existing sites (Ministry of Climate and

Enterprise 2024, 16, 146). A roadmap for new nuclear power was presented, setting ambitious targets for around 2500 MW by 2035 and approximately ten large-scale reactors by 2045 (Ministry of Climate and Enterprise 2024, 16). The state is actively investigating financing models and proposing state credit guarantees to strengthen investment conditions and a national nuclear coordinator has been appointed to support deployment efforts (Ministry of Climate and Enterprise 2024, 17). These steps signal a move from managing a potentially declining nuclear output to actively enabling significant new nuclear capacity, a shift influenced by the lessons learned from the energy crisis regarding security of supply and price volatility (Ministry of Climate and Enterprise 2024, 276). Next, the features previously listed are used to further examine the changes in the nuclear energy policy. Next, the features previously listed are used to further examine the changes in the nuclear energy policy.

Nuclear energy prioritization in national strategies: The two NECPs show a significant shift in the prioritization of nuclear energy. The initial NECP mentions nuclear power mainly within the context of the existing 100% renewable electricity target, clarifying it does not mandate a ban but assuming a gradual phase-out after a 60-year operational life (The Ministry of Infrastructure 2020, 24, 146). Its continued operation is presented as dependent on profitability and safety (The Ministry of Infrastructure 2020, 146). In contrast, the updated NECP positions nuclear energy as a prerequisite for reaching climate objectives and enabling the electrification of transport and industry (Ministry of Climate and Enterprise 2024, 13). It is called the "single most important measure" for reducing national emissions (Ministry of Climate and Enterprise 2024, 12-13). The updated plan shows concrete governmental actions, including a bill to remove restrictions on the number and location of reactors (Ministry of Climate and Enterprise 2024, 17), a roadmap for new nuclear power aiming for significant capacity increases by 2035 and 2045 (Ministry of Climate and Enterprise 2024, 17, 204, 263), the appointment of a special investigator to facilitate the process and a national coordinator to support establishment (Ministry of Climate and Enterprise 2024, 18, 147). This shows a strategic prioritization of nuclear expansion in the updated plan, moving from an assumed phase-out to active promotion and facilitation.

Sustainability targets and nuclear's role: Both plans relate nuclear energy to Sweden's broader climate and energy goals. The initial NECP is framed within a target of 100% renewable electricity production by 2040 (The Ministry of Infrastructure 2020, 24, 170-171), where nuclear is identified as the primary non-renewable source remaining in the mix (The Ministry

of Infrastructure 2020, 24). The updated NECP signifies a fundamental change by setting a target for 100% fossil-free electricity production by 2040, which includes nuclear power (Ministry of Climate and Enterprise 2024, 17). This reframing positions nuclear not as a non-renewable source to be phased out within a renewable context, but as an important fossil-free component, which is necessary for achieving climate targets. The updated plan states that nuclear expansion is the "single most important measure" for national emissions reduction through electrification (Ministry of Climate and Enterprise 2024, 12-13). Calculations in the updated plan present a "fossil-free share" that incorporates nuclear production (Ministry of Climate and Enterprise 2024, 189, 197), showing a projected fossil-free share of 78% or 80% in 2030, higher than the renewable-only projection (Ministry of Climate and Enterprise 2024, 198).

Investment priorities and funding mechanisms: The initial NECP mentions investments in electricity production technologies, including extending the lifespan of NPPs from 35 to 60 years (The Ministry of Infrastructure 2020, 175-177). It presents a general overview of investment flows. The updated NECP focuses heavily on the financial aspects of new nuclear investments, acknowledging the significant financial risks involved (Ministry of Climate and Enterprise 2024, 266). It shows that state risk-bearing may be crucial for such investments to occur (Ministry of Climate and Enterprise 2024, 266). The updated plan details specific government initiatives aimed at facilitating funding, including instructing the National Debt Office to prepare to provide state credit guarantees for investments in new nuclear energy and setting up an investigator to develop financing and risk-sharing models (Ministry of Climate and Enterprise 2024, 17, 266-267). This indicates a much higher level of governmental focus and concrete action directed at enabling investment in new nuclear capacity in the updated plan compared to the earlier focus on existing plant lifespan extensions.

Research and development commitments: Both NECPs emphasize the importance of energy research and innovation for achieving national energy and climate objectives (The Ministry of Infrastructure 2020, 39, 109; Ministry of Climate and Enterprise 2024 69). Both refer to national programmes like the National Energy Research and Innovation programme and acknowledge the role of international cooperation through platforms such as the European Strategic Energy Technology plan (SET plan) and European Research Area Network programmes (ERA-NET programmes) (The Ministry of Infrastructure 2020, 109; Ministry of Climate and Enterprise 2024, 164). However, the updated NECP introduces a specific focus

and prioritization for nuclear research. It notes that research in nuclear technology has lagged and that increased support for innovation and research in nuclear power is considered a priority to strengthen national competence (Ministry of Climate and Enterprise 2024, 70). The government states its intention to propose long-term funding for nuclear research and highlights that the Swedish Energy Agency has received funds for this area, leading to new initiatives (Ministry of Climate and Enterprise 2024, 70, 164). The updated plan mentions the Swedish Centre for Nuclear Technology supporting research related to SMRs (Ministry of Climate and Enterprise 2024, 233). This represents a targeted increase in research and development emphasis on nuclear technology in the updated plan.

Energy security goals and how nuclear energy relates to them: Both plans identify energy security as a key dimension of energy policy, including diversification, system flexibility and resilience to supply interruptions (The Ministry of Infrastructure 2020, 28; Ministry of Climate and Enterprise 2024 5, 55). The updated NECP integrates nuclear energy more into the energy security discussion, mentioning it from an energy security perspective (Ministry of Climate and Enterprise 2024, 5) and stating it contributes to the security of electricity supply (Ministry of Climate and Enterprise 2024, 146). Furthermore, the updated plan details several specific government actions to strengthen energy security, including an inquiry to clarify system responsibility and increase system robustness and security of supply (Ministry of Climate and Enterprise 2024, 151-152) and an analysis of energy supply needs for total defence (Ministry of Climate and Enterprise 2024, 146). It notes steps taken by energy companies to reduce reliance on certain fuel sources, such as Russian uranium (Ministry of Climate and Enterprise 2024, 147). These elements suggest a more comprehensive and action-oriented approach to energy security in the updated plan, with a link to nuclear power and national defence considerations and supply security.

The energy mix regarding electricity generation: Both NECPs describe an energy mix that relies significantly on both renewable sources and nuclear power for electricity generation (The Ministry of Infrastructure 2020, 23-24; Ministry of Climate and Enterprise 2024, 217). The fundamental difference lies in the projected future role of nuclear power. The initial plan's scenarios assume a gradual phase-out of existing nuclear reactors, with only a reduced capacity (around 25 TWh) expected to remain by 2040 after approximately 60 years of operation (The Ministry of Infrastructure 2020, 145-146). In contrast, the updated NECP introduces a concrete objective for new nuclear capacity beyond the existing output, aiming

for ~2500 MW by 2035 and the equivalent of ~ten large reactors by 2045 (Ministry of Climate and Enterprise 2024, 16, 203, 261). While the updated plan still includes production from existing reactors (around 52 TWh) (Ministry of Climate and Enterprise 2024, 200) and mentions investments for lifespan extensions, the addition of significant new capacity represents a planned expansion, not a phase-out. The target shift from 100% renewable to 100% fossil-free electricity (Ministry of Climate and Enterprise 2024, 17) impacts how the future energy mix is framed and measured, including nuclear in the fossil-free share calculation (Ministry of Climate and Enterprise 2024, 188, 196-197, 239-240).

Table 3. Overview of the changes made in Sweden's NECPs.

Nuclear Energy Aspect	Pre-energy crisis Sweden	Post-energy crisis Sweden
Strategic Priority	Mentioned, but not prioritized	Declared “most important measure”
Future Planning	Gradual phase-out assumed	Roadmap for ~10 new reactors by 2045
Role in Climate/Sustainability Goals	Excluded from 100% renewable goal	Included in 100% fossil-free target
Part of GHG Reduction Plan	Indirectly via electricity mix	Central role in electrification strategy
Investment Support & Mechanisms	Some support for life extension	State guarantees, new financing models
R&D Commitment (specifically nuclear)	General funding across tech types	Increased nuclear research funding
Support for SMRs (Small Modular Reactors)	Not mentioned	Actively supported via Nuclear Tech Centre
Energy Security Role	Flexibility focus, not nuclear-specific	Nuclear included in energy security policy
Nuclear in Electricity Mix	~25 TWh by 2040, declining role	~52 TWh existing, plus expansion planned
Nuclear Phase-out	Implied (~60% phased out by 2040)	Reversed — large-scale new build planned

Source: The Ministry of Infrastructure 2020 and Ministry of Climate and Enterprise 2024.

Table 3 gives a general summarized overview of the most important changes made in the NECPs. To summarize, the updated Swedish NECP marks a clear shift from assuming a gradual nuclear phase-out to actively promoting nuclear expansion, calling it the “single most important measure” for emissions reduction and electrification. It reframes national targets from 100% renewable to 100% fossil-free electricity, explicitly incorporating nuclear as a key fossil-free source. Investment policy has shifted from extending existing reactors’ lifespans to enabling new builds through state credit guarantees and risk-sharing mechanisms. While both plans stress R&D, the updated NECP prioritizes nuclear innovation, with new funding and institutional support. Energy security is addressed more directly, linking nuclear power to supply resilience and strategic autonomy, including reduced dependence on foreign fuel sources. Finally, whereas the initial NECP projected declining nuclear output, the updated plan sets ambitious goals for new capacity by 2035 and 2045, reflecting a redefined long-term role for nuclear in Sweden’s electricity mix. For more comprehensive comparison of changes in NECPs and nuclear energy policies, look at the comparative table under the appendix 2

4.3. Acceleration in nuclear energy policies of Poland and Sweden

The 2022-2023 energy crisis, intensified by factors like the suspension of Russian gas supplies and issues with French nuclear power, had a notable impact on the narrative surrounding nuclear energy in both Poland and Sweden, though the extent and nature of this impact differed between the two countries.

In Poland, the energy crisis served primarily to reinforce and intensify an already established pro-nuclear policy. Poland had a strong policy of developing nuclear energy dating back decades, despite no operational plants. The PNP programme was already a planned component of energy policy before the crisis. The crisis significantly reinforced the strategic importance of nuclear power and emphasized and heightened the imperative for energy security and sovereignty, which justified the prior emphasis on energy security. It accelerated the need for reducing dependence on potentially volatile imported fuel supplies like gas and oil. While the timeline for the first nuclear unit remained broadly similar (from around 2033 in the original plan to 2030-2035 in the updated one), the crisis highlighted the risk of supply disruption and reinforced the strategic value of nuclear as a stable, domestic, zero-emission source. The updated plan includes more concrete details like exploring SMRs and HTGRs as

potentially quicker options and setting a specific target for multi-annual fuel stocks, which were likely amplified by the crisis context.

In Sweden, the energy crisis triggered a more fundamental and transformative shift in policy. Prior to the crisis, Sweden was moving towards reducing its reliance on nuclear energy, having decided to close older reactors and operate under an energy target of 100% "renewable" electricity by 2040, which assumed a gradual phase-out of non-renewable nuclear power. The crisis, which exposed the risk of power shortages and led to high prices, emphasized the need for secure and dispatchable power. In response, Sweden's energy policy target was officially changed to 100% "fossil-free" electricity production by 2040. This change meant opening up for nuclear power. The updated NECP now portrays nuclear energy as a critical and essential component and a prerequisite for reaching climate objectives, important for energy security, capacity adequacy and enabling the electrification of transport and industry. Concrete steps driven by this shift include presenting a bill to remove legal barriers on reactor numbers and locations, setting ambitious targets for new nuclear capacity by 2035 and 2045, actively investigating state financing/guarantee models and appointing a national coordinator for deployment.

Comparing the two, the energy crisis appears to have affected Sweden more significantly. While in Poland the crisis reinforced and added detail to an existing pro-nuclear path, in Sweden it prompted a fundamental policy reversal, moving from planning for phase-out to actively pursuing significant expansion and removing legal barriers that had prevented new construction. This suggests the crisis acted as more of a catalyst for a complete change in direction in Sweden, compared to primarily strengthening the justification and urgency for an existing strategy in Poland.

6. Comparative analysis of the changes in the countries' nuclear energy policies

The energy policies of Poland and Sweden show both similarities and key differences regarding nuclear energy, particularly in how the 2022-2023 energy crisis affected their approaches. Both countries prioritize in their updated NECPs nuclear energy as a key strategic element for their energy future and nuclear energy is consistently presented as a contributor to energy security and providing a stable, reliable supply of electricity. Both documents highlight nuclear's role as a long-term foundation for the power system. Both NECPs view nuclear energy as a carbon-free or fossil-free source crucial for reducing GHG emissions, achieving climate goals and facilitating the energy transition and describe nuclear as a stable source needed to back up variable RES. The updated Polish NECP states nuclear power is "totally carbon-free" (Ministry of Climate and Environment 2023, 113). Sweden's updated NECP positions nuclear power as an important fossil-free component and the "single most important measure" for national emissions reduction through electrification (Ministry of Climate and Enterprise 2024, 12). Both NECPs show a strong commitment to research and development, supporting the energy transition, which includes nuclear energy and mentions international cooperation efforts. Both countries address the importance of security of nuclear fuel supply, including assessing domestic resources and outlining policies or targets for fuel stocks.

Despite these similarities, the policy approaches exhibit significant differences, largely influenced by their distinct historical contexts and the nature of the energy crisis's impact. Poland's policy reinforces energy security and affordability, while Sweden's shift focuses on sustainability and long-term system stability, reflecting differing energy trilemma priorities.

Poland and Sweden's approaches to nuclear energy policy in the wake of the 2022–2023 energy crisis diverge significantly due to their differing historical contexts and the distinct ways the crisis affected them. One of the most defining distinctions lies in path dependency. Poland has maintained a long-standing, though historically unrealized, pro-nuclear stance that dates back to the 1980s. Its policy trajectory had already been set prior to the energy crisis, with detailed plans under the PNP programme. Sweden, by contrast, had a more ambivalent nuclear history. After a 1980 referendum to phase out nuclear energy—though never fully

implemented—Sweden had more recently moved toward reducing its reliance on nuclear power in favor of a “100% renewable” electricity target. This positioned Sweden as a country moving “against” nuclear energy before the crisis.

The impact of the energy crisis on these countries’ energy narratives was consequently different. In Poland, the crisis acted to validate and intensify the urgency of an already existing policy direction. It reinforced the importance of national energy security and energy sovereignty, emphasizing the need to reduce reliance on volatile imported fuels. For Sweden, the crisis served as a turning point. It exposed vulnerabilities to price fluctuations and the risk of electricity shortages, which challenged the direction of its previous policy. As a result, Sweden underwent a fundamental policy reversal—from a planned phase-out to active support for nuclear expansion, driven by the need for secure, dispatchable power sources.

This divergence was reflected in energy target frameworks. Poland did not alter its overall energy transition targets but rather used the crisis to reinforce the strategic rationale for its nuclear agenda within its energy security objectives. Sweden, however, made a deliberate change. It replaced its previous “100% renewable” electricity target with a “100% fossil-free” goal by 2040. This subtle but significant reframing opened the door for nuclear power to be reconsidered as part of its energy future, marking a major conceptual shift in policy.

The removal of legal and regulatory barriers further illustrates the difference in approaches. Sweden’s updated NECP includes concrete steps taken after the crisis to remove legal restrictions on the number and location of nuclear reactors—acknowledging that such obstacles had previously hindered new developments. Poland, by contrast, places less emphasis on legal reforms, as its policy is more focused on the implementation of an existing programme rather than on initiating a new one.

Differences are evident in capacity targets and timelines. Poland had already set nuclear development milestones before the crisis, targeting 6–9 GW of capacity by 2040, with the first reactor scheduled around 2033. The updated Polish NECP maintained this general timeline, refining the goal to approximately 7.4 GW net by 2040. The crisis added a sense of urgency but did not alter the main plan. Sweden, coming from an assumed trajectory of nuclear phase-out, introduced entirely new and ambitious targets. The post-crisis plan includes

approximately 2,500 MW by 2035 and a vision for up to ten large-scale reactors by 2045, which shows a significant departure from the previous policy.

In terms of investment and funding, both countries recognize the financial challenges of nuclear energy development, but Sweden's plan gives greater attention to state financial mechanisms. Sweden's updated NECP outlines initiatives such as state credit guarantees and detailed explorations of public financing models to address investment risk in new nuclear projects. Poland, on the other hand, ties nuclear development to existing EU financial instruments, such as the Capacity Market and the Modernisation Fund. While it mentions support for SMRs within this context, it does not propose new national financial instruments on the scale described in Sweden's plan.

A related contrast appears in their emphasis on research and development. Although both NECPs support research and development activities, Sweden's updated document acknowledges that nuclear research has lagged behind and signals a renewed commitment to rebuilding national expertise. It proposes long-term funding to strengthen nuclear competence, underscoring the need to support the policy shift with corresponding academic and technical capacity. Poland's approach does not place comparable emphasis on expanding or restoring nuclear research and development, likely because its programme had already been underway prior to the crisis.

In summary, the 2022-2023 energy crisis led both Poland and Sweden to emphasize nuclear energy for energy security and climate goals. However, the crisis primarily served to reinforce and accelerate Poland's long-standing pro-nuclear stance, while leading to the inclusion of new elements such as small modular reactor (SMR) exploration and fuel stockpile targets. In contrast, the crisis acted as a catalyst for a fundamental policy reversal in Sweden, creating a shift from phase-out to actively enabling and targeting significant new nuclear capacity, including removing legal barriers and exploring state financial support for these new projects. This difference is largely accounted for by their different starting points ("path dependency") before the crisis and the specific energy security vulnerabilities the crisis exposed in each country.

7. Discussion: changes in nuclear politics in the European Union, the wider context and implications

One could think that Sweden stepping back from their goal to have 100% renewable electricity target and changing it to 100% fossil free electricity target could indicate a broader change from defining the climate goals through renewable energy. The wording of the goal is relevant when it comes to nuclear energy policy, because nuclear energy doesn't fit into the renewable energy goal, but does fit into the GHG free goal. However, Sweden's previous focus on renewables was more of an exception within the EU rather than the norm. The European Climate Law sets the overall objective of reaching net-zero GHG emissions by 2050 (Regulation (EU) 2021/1119, 2021), allowing each Member State to decide how to get there. Although the energy crisis has led to setbacks in achieving short-term renewable energy targets across EU countries, for example France expects to reach its 2020 target of 23% renewable energy share in gross final energy consumption in 2024 (Ministry for the Ecological Transition, Energy, the Climate and Risk Prevention 2024, 65), but the extent of this trend still requires further analysis. While the EU has not established targets specifically for nuclear power development, the Member States are increasingly framing their climate goals in terms of GHG or fossil-free emissions reduction, rather than solely in the context of renewable energy.

Continuing on with terminology and definitions, a joint letter was released to the European Commission by a coalition of seven European nuclear countries including France, Czech Republic, Finland, Hungary, Poland, Slovenia and Slovakia, stating that “all available zero and low emission technologies” should be “actively supported by the European Union” (World Nuclear News 2021). They expressed that this is particularly relevant for nuclear power, whose development is a main objective of the Treaty establishing the Euratom Community, which therefore obliges EU institutions to support it (World Nuclear News 2021). Additionally, the letter stated that the European Commission has acknowledged nuclear power as an objective of common interest in its state aid decisions, even if not all Member States choose to pursue it (World Nuclear News 2021). This shows a larger push towards allowing similar support mechanisms for nuclear energy in the EU level like done with renewable energy, which could bring on even more developments in the sector. That kind of

support by EU frameworks could make more private investors willing and more interested to invest in the nuclear energy projects, as EU support would lower the investment risks. Currently EU sustainable energy policymaking conditions are including nuclear energy only in parts, where sustainability is judged narrowly, in the lines of GHG emissions.

State participation in nuclear energy projects is considered necessary due to their controversiality, capital intensiveness and strategic importance for energy security. In Poland, while large-scale NPPs are planned as private partnership investments according to the updated NECP, the overall framework remains heavily influenced by state policy and support. In Sweden, the government is actively exploring and proposing state credit guarantees and investigating other financing and risk-sharing models to facilitate investment in new reactors. This shows a significant increase in the active public/state financial facilitation role for new nuclear projects, moving from a more passive stance towards facilitating the management of existing plants based on their profitability. Analysts (Bridge, Barr, Bouzarovski, et al. 2018, 8; Haney & Pollitt 2010, 2-3, 10) have anticipated a shift toward state-led, nationalized energy sectors and a resurgence of energy geopolitics, including forms of resource mercantilism and nationalism. This research supports that view, highlighting how recent policy changes were justified in the context of the energy crisis, emphasizing the strategic role of nuclear energy in ensuring national energy security.

Theory suggests that although the energy crisis might not definitely force a drastic policy change, it can rather make states double down on their path dependency and reinforce the regulatory environment around it (Chiplunkar & Das 2021, 648). Both Poland and Sweden are examples of this. In response to the energy crisis, Poland adhered to its PNP Programme and reinforced past policies and measures rather than attempting an alternative approach. Similarly, Sweden's case can be looked through the lens of path dependency. Prior to the crisis, Sweden had begun to detach itself from nuclear power, with a plan to phase out nuclear power over time. But the crisis prompted a strategic review, and the country reaffirmed its commitment to the nuclear energy path it had been trying to abandon. This analysis supports the theory that a worsening economic situation results in changes in political strategy and in nuclear energy policies. The nuclear energy policies are in their nature far-reaching, compared to the other short-term policies that the energy crisis brought.

8. Conclusion

Based on the analysis presented in this thesis, the 2021-2023 energy crisis significantly impacted the nuclear energy policies of both Poland and Sweden, leading to an acceleration in their respective nuclear development efforts. However, the nature and extent of this acceleration differed substantially, reflecting their path dependencies.

In Poland, a country with a long-standing, albeit unrealized, pro-nuclear stance, the crisis primarily served to validate, reinforce, and add urgency to the existing plans under the PNP programme. The heightened imperative for energy security and sovereignty, exposed by the crisis's impact on volatile imported fuels, highlighted the strategic value of nuclear power as a stable, domestic, zero-emission source. While timelines remained broadly similar, the policy was deepened with specific considerations like exploring SMRs and securing fuel stocks, showing an acceleration of detail and justification within an established trajectory.

For Sweden, a country previously navigating a trajectory towards gradual nuclear phase-out, the energy crisis acted as a powerful catalyst for a fundamental policy reversal. The crisis's exposure of vulnerability to price volatility and supply shortages underscored the need for secure, dispatchable power, challenging the viability of a system based solely on intermittent renewables. This led to the explicit change in the national energy target from "100% renewable" to "100% fossil-free" electricity, thereby positioning nuclear as a critical prerequisite for both climate objectives and energy security. The response included concrete, rapid actions to remove legal barriers, set ambitious new capacity targets, and actively explore state financial support, signifying a move from passively managing a decline to actively enabling significant expansion.

Despite these differing policy responses, similarities emerged: both countries now explicitly prioritize nuclear energy for its contribution to energy security, climate goals (as a carbon/fossil-free source), and grid stability, particularly in complementing variable renewables. Both also recognize the need for continued research and development and fuel supply security. The differences in policy responses are rooted in the path dependencies of each country's energy systems and historical contexts.

Studying the 2021–2023 energy crisis reveals how external shocks can reshape EU nuclear policy and accelerate shifts toward secure, sustainable energy. This thesis uses Sweden and Poland to show how varied national contexts respond to shared challenges. In conclusion, while Poland leveraged the crisis to accelerate the implementation and justification of an existing pro-nuclear policy, Sweden used the crisis as a justification and catalyst for a complete policy reorientation and active pursuit of nuclear expansion. These case studies highlight how energy crises can dramatically reshape national energy strategies, particularly regarding contentious sources like nuclear power, underscoring its renewed strategic importance for energy security and decarbonisation goals in the European context. The findings support the notion that such crises can indeed lead to increased state involvement in energy sectors and reinforce the role of energy geopolitics.

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Appendix 1 - Comparative table of Poland's NECPs

Table 4. Comparative table of Poland's NECPs, created based on the National Energy and Climate Plans of Poland

	Pre-energy crisis Poland	Post-energy crisis Poland
Nuclear energy prioritization in national strategies	Prioritized as a key strategic element for Poland's energy sector's future. Integrated into national science policy frameworks, specifically the NRP.	Prioritized as a key strategic element for Poland's energy sector's future. Designates deployment of large-scale nuclear energy as a specific Action 112, highlighting it as a critical element of capacity adequacy policy. Integrated as a priority area within the national science policy (State Scientific Policy - PNP). Appears to place nuclear deployment more within concrete actions and links it directly to energy system capacity needs.
Sustainability targets and nuclear's role	Presented as a technology crucial for reducing GHG emissions and contributing to the energy transition.	Presented as a technology crucial for reducing GHG emissions and contributing to the energy transition. More definitive, stating nuclear energy is "totally carbon-free". Positioned as a zero-carbon source essential for diversifying generation structure and helping avoid CO ₂ emissions in the pursuit of climate neutrality.
Investment priorities and funding mechanisms	Mentions that the PNP programme includes financial tools. Notes the Capacity Market's role in supporting technologies contributing to supply security. Support through PCI lists and Connecting Europe Facility (CEF) are noted for strategic infrastructure projects relevant for nuclear-related infrastructure.	Provides more specific details regarding investment. Includes completing the financing model as part of actions for large-scale nuclear deployment. Mentions large-scale nuclear is planned as a private partnership investment. Links specific financial instruments like the Capacity Market (Action 111) and the Modernisation Fund (Action 73) to nuclear development, particularly for SMRs. Support through PCI lists and CEF are noted for strategic infrastructure projects relevant for nuclear-related infrastructure.
Research and development commitments	Shows a strong commitment to research and development supporting the energy transition, including nuclear energy. Sets an ambitious target to increase research and development expenditure to 2.5% of GDP by 2030. Integrated into the NRP. Mentions cooperation within the European Strategic Energy Technology (SET) plan and notes Poland's participation in the nuclear working group.	Shows a strong commitment to research and development supporting the energy transition, including nuclear energy. Sets an ambitious target to increase research and development expenditure to 2.5% of GDP by 2030. Integrated into the State Scientific Policy (PNP). Mentions cooperation within the European Strategic Energy Technology (SET) plan and notes Poland's participation in the nuclear working group. Provides more details on specific research areas and lists actions like the conceptual design for a HTGR (Action 135) and ensures conditions for the development of SMRs

		(Action 22).
Energy security goals	Consistently presented as a key contributor to energy security. Highlights nuclear's role in providing a stable and reliable supply of electricity and diversifying energy sources. Seen as a long-term foundation for the power system, strengthening electricity security. Addresses the security of nuclear fuel supply, including assessing potential domestic uranium deposits.	Consistently presented as a key contributor to energy security. Highlights nuclear's role in providing a stable and reliable supply of electricity and diversifying energy sources. Seen as a long-term foundation for the power system, strengthening electricity security. Addresses the security of nuclear fuel supply, including assessing potential domestic uranium deposits. Goes further by setting a specific target: at least 5 years of fuel supply once the first unit is operational and outlines a policy to pursue multi-annual fuel stocks. Points out that nuclear can have a positive impact on energy sovereignty through these stocks.
Energy mix regarding electricity generation	Projects the commissioning of the first unit around 2033. Projects a total installed capacity of approximately 6-9 GW from six units. Links nuclear deployment to the gradual decline in the share of coal. Describes nuclear as a stable source needed to back up variable renewable energy.	Refines the planned timeline for integrating nuclear power. Gives a timeframe of 2030-2035 for the first unit. Projects total capacity reaching close to 7.4 GW in 2040, potentially up to 9.4 GW in the longer term. Explicitly mentions the potential for SMRs to complement the large-scale units. Links nuclear deployment to the gradual decline in the share of coal. Describes nuclear as a stable source needed to back up variable renewable energy.

Source: Ministry of State Assets 2019; Ministry of Climate and Environment 2023

Appendix 2 - Comparative table of Sweden's NECPs

Table 5. Comparative table of Sweden's NECPs, created based on the National Energy and Climate Planes of Sweden

	Pre-energy crisis Sweden	Post-energy crisis Sweden
Nuclear energy prioritization in national strategies	Nuclear power mentioned primarily in the context of the 100% renewable target (clarifying it's not a ban). Assumes gradual phase-out after 60 years. The future depends on profitability and meeting safety requirements. Localized in price area 3 and expected to phase out as reactors age/profitability decreases.	Nuclear energy is a prerequisite for reaching climate objectives and electrification. Stated as the "single most important measure" nationally. Government bill proposes removing restrictions on the number and location of reactors. Roadmap launched for new nuclear, aiming for ~2500 MW by 2035 and effect of ~10 large reactors by 2045. Special investigator appointed to review rules for facilitation. National coordinator appointed to support establishment and liaise with stakeholders.
Sustainability targets and nuclear's role	Sweden aims for net-zero GHG emissions by 2045. Target of 100% renewable electricity production by 2040. Nuclear accounts for most non-renewable electricity generation. Its future affects primary energy consumption.	Nuclear expansion is the "single most important measure" for national emissions reduction via electrification. Prerequisite for reaching climate objectives and producing fossil-free electricity for transition. Target for 100% fossil-free electricity production by 2040, including nuclear power. Fossil-free share calculation includes nuclear.
Investment priorities and funding mechanisms	Investments in electricity production include various technologies, including nuclear lifespan extensions. Figure 40 shows investments in monetary terms.	Investment in nuclear involves significant financial risks; state risk-bearing may be crucial. National Debt Office instructed to take preparatory steps for state credit guarantees for new nuclear investments. Investigators set up to develop financing and risk-sharing models for new reactors.
Research and development commitments	Energy research and innovation policies based on Government bills. Public funding for National Energy Research and Innovation Programme. Participation in SET plan working groups and ERA-NET programmes. Research areas include electricity generation/system.	Overall objective is to contribute to energy/climate goals. Increased support for innovation and research in nuclear power is a priority to strengthen national competence. Government intends to propose long-term funding for nuclear research. Swedish Energy Agency received funds for nuclear research effort, launching initiatives/calls. Swedish Centre for Nuclear Technology supports SMR research. Participation in SET plan, CETPartnership, DUTPartnership, ETIPs and Nordic Energy Research.

Energy security goals	Energy policy aims to combine sustainability, security of supply and competitiveness. Increase diversification, flexibility, resilience. Flexibility needed for system with variable wind/solar. Svenska kraftnät cooperates with ENTSO-E and Nordic grid companies on security.	Energy security dimension updated; text supplemented with wording on nuclear energy from an energy security perspective. Aim to reduce import dependence. Increase flexibility and manage supply interruptions. Nuclear power contributes to electricity supply security. Steps taken to reduce dependence on Russian fuel. Government strategy on information/cybersecurity. Inquiry to clarify system responsibility, increase security of supply and robustness and analyse energy supply needs for total defence.
Energy mix regarding electricity generation	Energy mix dominated by biofuels, crude oil/petroleum products, nuclear. Renewable share in electricity generation increasing, projected to 84% in 2040. Nuclear energy accounts for most non-renewable generation. Assumes gradual phase-out of nuclear, with ~60% phased out by 2040 (25 TWh remaining). Wind power expanding, solar increasing.	Total installed capacity projected to increase significantly. Wind power expected to grow most, followed by solar/PVs. Nuclear power produces large proportion of fossil-free electricity. Existing reactors produce ~52 TWh annually. Target is 100% fossil-free electricity by 2040. Fossil-free share (including nuclear) projected to 78-80% in 2030. Objective for new nuclear capacity: ~2500 MW by 2035, effect of ~10 large reactors by 2045. Investments include lifespan extensions.

Source: The Ministry of Infrastructure 2020; Ministry of Climate and Enterprise 2024

Lihtlitsens

Mina, Riin Selart, (isikukood: 60209172759) annan Tartu Ülikoolile tasuta loa (lihtlitsentsi) enda loodud teose

The Impact of the 2021–2023 Energy Crisis on the Nuclear Energy Policy of the European Union: Comparative Analysis on the Examples of Sweden and Poland, mille juhendaja on Raul Toomla,

- reprodutseerimiseks säilitamise ja üldsusele kättesaadavaks tegemise eesmärgil, sealhulgas digitaalarhiivi DSpace'is lisamise eesmärgil kuni autoriõiguse kehtivuse tähtaja lõppemiseni;
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