Master of Arts Thesis

Euroculture

Palacký University in Olomouc

Jagiellonian University in Kraków

Energising European Security: Changing EU Energy Policy in the Light of the Russian Invasion of Ukraine

Submitted by:

Yevhen Abramov

80124258

1190146

yevhen.abramov01@upol.cz

yevhen.abramov@student.uj.edu.pl

Supervised by:

Lukáš Perutka

Maciej Stępka

Kraków, 01.08.2024

Signature

MA Programme Euroculture

Declaration

I, Yevhen Abramov, hereby declare that this thesis, entitled "Energising European Security: Changing EU Energy Policy in the Light of the Russian Invasion of Ukraine" submitted as a partial requirement for the MA Programme Euroculture, is my own original work and expressed in my own words. Any use made within this text of works of other authors in any form (e.g., ideas, figures, texts, tables, etc.) are properly acknowledged in the text as well as in the bibliography.

I declare that the written (printed and bound) and the electronic copy of the submitted MA thesis are identical.

I hereby also acknowledge that I was informed about the regulations pertaining to the assessment of the MA thesis Euroculture and about the general completion rules for the Master of Arts Programme Euroculture.

In case the research process involved participants (especially participants from vulnerable communities and populations), please ensure that the following boxes can be ticked before submitting the thesis, or tick the third box, if not applicable to your project:

☐ I declare that I have obtained the required permission from the relevant ethics committees of the two universities supervising my thesis concerning my research proposal in order to proceed with proposed research involving participants;

☐ I declare that I have obtained informed consent from these participants and that the consent forms are stored lawfully and in accordance with the rules of the two universities supervising my thesis.

☒ The two items above do not apply to this project.

Signed 

Date 01.08.2024

List of abbreviations

BCM - Billion Cubic Meters

CMEA - Council for Mutual Economic Assistance

CO2 - Carbon dioxide

CRM - Critical Raw Material

EC - European Commission

EDF - Électricité de France

EED - Energy Efficiency Directive

EGD - European Green Deal

EP - European Parliament

EU - European Union

EU ETS - EU Emissions Trading Scheme

GHG - Greenhouse gas

GPR - Geopolitical Risk

GWh - Gigawatt-hours

HHI - Herfindahl-Hirschman-Index

JETP - Just Energy Transition Partnerships

LNG - Liquefied Natural Gas

NECPs - National Environment and Climate Protection Plans

NPP - Nuclear Power Plant

OPEC - Organization of the Petroleum Exporting Countries

QMV - Qualified Majority Voting

RED Renewable Energy Directive

RED II - Revised Renewable Energy Directive

RES - Renewable Energy Sources

SMR - Small and Medium-sized Reactor

SWI - Shannon-Wiener Index

TFEU - Treaty on the Functioning of the European Union

TWh - Terawatt-hours

WESI - Weighted Energy Security Index

Abstract and Keywords

The Russian invasion of Ukraine in February 2022 triggered a deep energy crisis in the European Union, exposing its vulnerability due to its long-standing dependence on Russian energy sources. This thesis examines the multifaceted changes in the energy policies of the EU and its Member States since the Russian invasion of Ukraine, focusing on the interplay between energy security, diversification efforts and the evolving role of nuclear energy. The research uses a combination of Policy Discourse Analysis and Content Analysis to examine shifts in policy narratives, strategies and regulatory frameworks. The findings reveal a significant evolution in the EU's policy approach to energy, driven by the securitisation of renewables and a greater role for state intervention in energy markets. The crisis has accelerated the EU's transition towards renewable energy sources, while also prompting a partial reconsideration of nuclear power's potential contribution to decarbonisation goals. The thesis also highlights the challenges and complexities associated with diversifying energy supplies, reducing dependence on Russian gas and other fuels and the ambiguous role of nuclear power. The study stresses the need for a comprehensive and balanced approach that integrates energy security, diversification and the desired maximum environmental sustainability. Political and security issues and motivations are brought to the fore to understand the complexity of energy policy in the EU.

Keywords: EU energy policy, energy security, renewable energy, diversification, energy transition.

Wordcount: 20,353

Table of Contents

List of abbreviations 3
Abstract and Keywords 4
Introduction 6
Literature Review 7
Problem Statement 8
Methodology 10
Theoretical Framework 11
Chapter 1: Energy Policy of the EU until the 24th of February 2022 16
European Green Deal 16
Fit for 55 Package 18
Renewable Energy Directive 19
European Energy Market: Dependence on Russian Supply and Other Sources 20
Energy Crisis Maturation: 2021 Onwards 28
Chapter 2: the EU's New Energy – Less Dependence, More Security 31
Energy Crisis Tackling Measures – Immediate Response 32
Energy Policy Evolution 34
European Security and New Green Agenda 37
Diversification and Russian Gas 46
Possible ways of development 47
Germany as a Leader of Change 48
Chapter 3: Nuclear Power's Role in Energy Security 51
Advantages and Challenges of Nuclear-Powered Energetics 53
Nuclear Energy in the EU: Development and Nowadays 57
France's Nuclear Advocacy 62
Prospects of the Peaceful Atom in the EU 64
Conclusions 67

Introduction

In recent years, the EU has faced significant challenges in ensuring a stable and secure energy supply, particularly due to its heavy reliance on Russian energy sources. This vulnerability became apparent with the Russian invasion of Ukraine in February 2022, which disrupted energy flows and raised concerns about the EU's energy resilience. The absence of a comprehensive approach which will forecast such tragic outcomes damaged the EU significantly. EU's budget and Member States' economies suffered seriously which made them lose namely per cent of GDP growth as well as have a sharply increased inflation[1]. Security architecture was irrevocably ruined. This put the EU into a new reality — an imperative to re-evaluate and recalibrate its energy policies has become increasingly apparent. Being challenged by contradictory powers inside, nonetheless, the EU managed to pull itself together and look for an answer to the arising challenges. Understanding one of its aspects – the energy sector – is what this paper tends to fulfil.

This master's thesis focuses on the topic of energy security within the European Union, with a specific emphasis on the impact of the Russian invasion of Ukraine. This work aims to provide a comprehensive analysis of the EU's approach to energy sources before and after the invasion (its response to the energy crisis), particularly nuclear energy, in the light of the changing geopolitical landscape and background of conflicting views within Member States. By examining the changes in EU energy policies and the role of nuclear power, I would like to comprehend and explain how the EU's understanding of energy security has developed since the Russian invasion and how the EU secured its energy sovereignty – and did it?

The rationale behind this research is quite simple: it lies in the critical importance of energy security (sovereignty, independence) of the EU and its Member States. Energy is essential for economic development (or even a key factor) and national security. The EU's dependence on external energy sources, particularly from Russia, posed significant risks and vulnerabilities. The Russian invasion of Ukraine played a wake-up call, evidently exposing the fragility of the EU's energy security. Although the EU announced multiple sanctions and tried to secure its energetic supply, dependence is still quite big. European

[1] European Investment Bank, "How Bad Is the Ukraine War for the European Recovery?," June 2000, https://www.eib.org/attachments/publications/how_bad_is_the_ukraine_war_for_the_european_recovery_en.pdf.

economics can't function freely while not having enough resources both for people and economic usage.

The societal impact of this research can be significant, at least in the theoretical dimension. Energy security is not only a matter of economic stability but also a crucial aspect of national sovereignty and geopolitical influence. By examining the EU's response to the energy crisis, we can try to track what were the mistakes in planning and which conclusions were made. Bearing in mind all discoveries, we can get closer to understanding what should be done to avoid such mistakes in the future, highlighting an issue of nuclear power (and inevitably mentioning Green Transition).

Literature Review

There exists a serious corps of academic articles and materials on the topic of security in different dimensions including energy, politics, and international relations. The older articles were warning about growing dependence on foreign, especially Russian, fossil fuels. The Ukrainian-Russian disputes of the late 2000s received close attention too. However, the energy sector is most closely monitored by specialised organisations that consistently produce reports and market analyses. The main body of information on the energy sector and its state in the EU is provided by these organisations. Academic researchers, in turn, favour policy and document analysis.

The topic of energy, both in a political, economic and purely energetic sense, is well developed throughout history. Today, however, reports are the main source of information. It is necessary to admit that ongoing reports and other analytical materials of smaller formats are coping with the informative role better than classical articles which are being produced with a considerable delay. This thesis takes advantage of various types of reports, analyses and analytical notes, and policy briefs. However, these types of scientific work also lack uniformity, and they need to be summarised and analysed altogether, bearing in mind rapid changes.

Important to note that numerous statistics used in this work slightly differ, so it is essential to remember that the numbers can be rounded.

Problem Statement

My starting point is a personal conviction that the EU was mistakenly long relying on Russia as its main energy supplier. It became evident as soon as the Russian invasion of Ukraine took place but also shortly before when energy sources were used as a subject of bargaining. It has many outcomes and one of them was recognition of the vulnerability of the EU's situation, insecurity of supply chains, and dependence on Russian gas solely (first and foremost Germany). However, I want to enlarge this issue into three smaller ones and quite connected, on my opinion. These are comparisons of EU energy policies before and after the invasion where details and peculiarities are going to be described; secondly, changes caused by the invasion in all its complexity; and thirdly an issue of nuclear power is going to be considered since it was intensively discussed in the EU, and recently it only gained. Nuclear power seems to many member states as an opportunity which can supply them during the green transition but also during this turbulent crisis time. I don't think I need to pay much attention to why the change happened, because it's obvious. I want to know what has changed, what has been updated first and how.

Altogether these issues provide a comprehensive framework for exploring the interplay between Russia's influence, EU energy policies in past and present, and the changing dynamics of the energy sector, particularly regarding nuclear energy. Bearing it in mind I am asking: In the context of energy security, how has the EU's understanding of nuclear energy changed, especially in the light of conflicting views within member states, such as Germany's opposition to nuclear energy, despite its recognition as a 'green energy' by the European Commission (EC)? But a clear and concise research question is as follows: How has the EU's approach to its energy sources changed since the Russian invasion of Ukraine, and what is the role of nuclear energy in this?

To answer this question, the Master thesis holds the following objectives:

1) Analysis of Pre- and Post-Invasion EU Energy Policies:
    a) Investigate the evolution of EU energy policies, examining changes in strategies, regulations, and initiatives both before and after the Russian invasion of Ukraine.
    b) Examine the nuances and specificities of EU energy policies in response to the invasion, focusing on shifts in priorities, security measures, and diversification efforts.
2) Assessment of the Invasion on EU Energy Dynamics:

a) Analyse the multifaceted impacts of the Russian invasion on EU energy dynamics, finding changes in supply chains, geopolitical considerations, and perceptions of energy security.
b) Explore the consequences of the invasion on the EU's energy relationships with Russia and other partners.

3) Examination of Nuclear Energy within the EU's Energy Transition:
   a) Investigate the role of nuclear energy within the EU's energy transition agenda, considering its potential as a source of reliable and low-carbon energy amidst geopolitical uncertainties.
   b) Assess the varying perspectives and approaches of EU member states towards nuclear energy, with a focus on contrasting views.

In turn, to meet these objectives, the thesis is divided accordingly into chapters.

The First chapter will focus on outlining the framework of the EU's energy policy before and after the Russian invasion of Ukraine on 24 February 2022. The narrative will begin by examining the EU's priorities, revealing the context which shaped its energy landscape. The chapter focuses on the EU's external dependence, specifically on Russian gas as the main energy source of energy, as well as other alternatives. Besides the role of Russia in the supply chain, the chapter examines the situation on the market and in the EU before the invasion. In short, this chapter will lay the groundwork for comprehending the EU's position in the field of energy.

The Second chapter will examine the political implications of the energy crisis after the Russian invasion of Ukraine. It begins by examining the emergency measures that the EU immediately implemented in response to the crisis, providing insights into the strategic choices made in the face of challenges. The diversification of energy sources and supply routes receives considerable attention. The chapter examines collaborative efforts with Member States but also highlights some specific actions made by them. The amendments to current energy policies are given a central place, with an examination of new mind shifts which condition-specific policy choices. The chapter shortly analyses criticisms of new updated and accepted policies. Shortly, this chapter will examine the impact of the Russian invasion, with specific attention placed on the EU's attempts to adapt in the aftermath.

The Third chapter will explore how nuclear power could be used to strengthen the EU's energy sector. The chapter starting by examining recent developments in the atomic energy sector within the EU, will assess whether it poses a threat or an opportunity for energy security. This analysis will examine the existing Nuclear Power Plants (NPP), their capacities, and the dynamics of the nuclear energy market. A key aspect of this chapter will involve investigating conflicting views within the EU, highlighting the competition between Germany-Austria and France over the launch and promotion of nuclear energy. The chapter also will explore the complex interplay of different perspectives on the role of nuclear power in enhancing energy security. Finally, this chapter will sum up the potential capacities of nuclear power within the EU, unravelling the opportunities and challenges associated with using nuclear power as a strategic element in securing the region's energy landscape.

Methodology

After reviewing and comparing methods, it was found that Policy Discourse Analysis (PDA) fits the desired vision of the set problem at best. The use of this method is expected to facilitate the fulfilment of the primary objective: to provide a detailed description of the shifts in EU energy policy and the EU's framing of the energy crisis. As this method is primarily concerned with the study of political language (communication), it makes it possible to trace distinct shifts in worldviews through language and statements. In other words, it allows close observation of how perspectives evolve through verbal expression. Furthermore, it allows for a comprehensive study of political documents and direct statements by politicians on the topic of interest, thereby reconstructing the reality conveyed through language and framing. By summarising language into discourse, the full complexity between different levels and political entities within the EU (both national and supranational) can be understood.

For example, in framing the sanctions against Russia the EU used several framing technics. It used value-based and interest-based framings and different methods in approaching third- and partner countries. Interestingly, economic and political interests heavily prevail. EU uses the stick-and-carrot method while referring to third countries which might have helped Russia to avoid sanctions but also promise and encourage investments and economic cooperation. Instead, communication with candidate countries is based on political alignment and encourages integration. It demonstrates us two-faced approach when the EU isn't demanding conformity, but rather assistance in addressing

evasion of sanctions, often called circumvention sanctions.' [2] Parallelly to both above-mentioned methods EU consistently appeals to international law as a common value, an important condition of coexistence and cooperation. By utilising two distinct methods, the EU ensures that messages effectively reach and connect with a wider range of people. It achieves this by addressing both individual motivations and common beliefs.

The naming of the war itself is also part of the EU's work in strategic communication.

Theoretical Framework

To be able to grasp wide aspects of security in a broader, global sense the securitisation theory was chosen. This theory also addresses broader issues of politicisation, which in this context is also useful as it serves to explain the global energy sector debate in the EU. The Copenhagen School (mainly Barry Buzan, Ole Wæver, and Jaap de Wilde) emphasises that a political interpretation of threats becomes crucial in understanding how energy security became a priority. [3] Securitisation theory holds a solid place in the minds of security and international relations researchers and students. The answer to the enduring popularity of this theory is particularly interesting because of how it flipped the standard perception of security and threats and proposed a new upside-down approach to it. In general terms, securitisation explores how certain issues are becoming to be treated as pure matters of security. However, these issues do not need necessarily to pose a threat to security in the traditional meaning but to be perceived as those. The theory interlinks real politics and how it has been framed in text, political speeches, and communiques. Moreover, it provides interpretations of the justification as well as key drivers which motivate decisions to be undertaken. This perception justifies extraordinary measures and policy shifts that would not be done under ordinary political issues.

Moving away from the notion of security in a strictly military sense, securitisation allows us to take a broader look into the issue, in our case the recent energy crisis by recognising that security, as outlined by Barry Buzan, encompasses more than just military aspects (he highlights military, political, economic, societal, and environmental). In my case, this theory can help me to explain the changes within the EU that took place rapidly although before the invasion which was securitised, the EU was reluctant in this sphere.

---

[2] Balázs Gyimesi, "EU Strategic Communications to Support Sanctions against Russia," *RUSI*, June 4, 2024, https://static.rusi.org/eu-strategic-communications-to-support-sanctions-v-russia.pdf.
[3] Rita Taureck, "Securitization Theory and Securitization Studies," *Journal of International Relations and Development* 9, no. 1 (March 2006): 53–61, https://doi.org/10.1057/palgrave.jird.1800072.

Instead of applying a notion of security to several existing issues, the theory proposes that any kind of issue can be labelled as a threat, consequently as something from which the state, first of all, should be secured. This process is called 'securitisation' meaning that the issues are framed as security threats requiring urgent and exceptional responses. However, after the initial framing of a certain issue as a threat, usually as an existential one, the most important steps in securitisation follow. To tackle the issue, statesmen argue, some more extraordinary, exclusive decisions must be made first, explaining it that traditional, routine measures are inadequate in this exceptional case. These are the measures requiring special attention. [4] This process can be put in the next sequence:

Priority → urgency → extraordinary measures

Being formulated as a priority, an issue being hurried up by urgency and as a result, extra measures it requires are justified. This necessity lies in the certain belief that only these new measures are able to protect the existence of a state or nation under the pressure of particular new issues, usually external as, for example, incoming migrants. Its advocates insist that traditional, incremental approaches are insufficient in the face of existential dangers that require bold and decisive action.

In this context, the concept of securitisation helps to explain the changes in European energy policy after the Russian invasion by shedding light on who perceives energy issues as threats, what specific threats are identified and why these issues are securitised. Overall, securitisation proves to be an appropriate lens through which to analyse the evolving dynamics of European energy policy in response to the perceived threats posed by Russia's invasion of Ukraine.

Additionally, in his recent lecture on 'Climate change as a security issue' at the Helsinki Collegium for Advanced Studies in May 2022, Ole Wæver while speaking of climate change as a security issue, pointed out two kinds of climate security, and thus two policy agendas, casual military and per se threat.[5] The first one considers climate change under the traditional military optics, explaining that this issue can lead to the war. The latter one, instead, falls into the securitisation canvas, proposing to perceive it as the biggest, global, main threat itself, requiring preventative measures to confront it. The latter perspective is

[4] OpenLearn from The Open University, "Securitisation Theory - International Relations (3/7)," YouTube Video, *YouTube*, October 3, 2014, https://www.youtube.com/watch?v=wQ07tWOzE_c.
[5] Helsinki Collegium, "Public Lecture by Jane and Aatos Erkko Professor Ole Wæver: Climate Change as a Security Issue," www.youtube.com, May 12, 2022, https://www.youtube.com/watch?v=QE52mGzHsU8.

more conceptually challenging as it requires assessing whether other issues have the same urgency and ability to upset everything else as military security. O. Wæver notes that the easier approach has been more popular in policy-oriented work on climate change and security. Consequently, these approaches correspond to the traditional distinction between adaptation and mitigation in climate change discourse. For us, the latter one is important because exactly this one requires a wide number of instruments and first of all policy arrangements and prior to, this is a subject for securitisation. However, O. Wæver also argues that the securitisation of climate change has not been very successful so far. There is no clear consensus on how to address climate change as a security threat.

It is also important to recognise that securitisation theory itself is not inherently 'bad' or only conducive to authoritarian regimes. Rather, it only provides a framework for understanding how states (nations or Unions in the case of the EU) respond to perceived threats and the extraordinary measures they may take to do so. Whether in democratic or authoritarian contexts, states routinely grapple with issues they perceive as security threats and may employ securitisation tactics to garner support for decisive action. However, the implications of securitisation and the use of extraordinary measures can vary significantly depending on the political system and the extent to which checks and balances exist to prevent abuse of power. Thus, while the theory sheds light on the dynamics of state response to security concerns, its interpretation and application must always be critically examined within the broader political context.

It is worth mentioning the recent work of L. Tichý and Z. Dubský exploring the EU's energy security discourse of the energy relations with Russia for the last two pre-war years. Noticeably, they pay great attention to the sub-discourse of securitisation of energy relations. [6] This securitization narrative framed Russia as an unreliable and dangerous neighbour, especially since 2014, emphasizing the EU's vulnerability due to its dependence on Russian gas imports. The discourse highlighted potential threats such as supply disruptions, market manipulation, and the acquisition of strategic assets within the EU by Russian state-controlled facilities. Furthermore, the EU's unquestioned support for Ukraine and condemnation of Russia's aggressive actions solidified the perception of Russia as a security threat. This heightened threat perception reinforced the EU's

[6] Lukáš Tichý and Zbyněk Dubský, "The EU Energy Security Relations with Russia until the Ukraine War," *Energy Strategy Reviews* 52 (March 1, 2024): 7–8, https://doi.org/10.1016/j.esr.2024.101313.

defensive standpoint and fuelled its determination to reduce energy dependence on Russia.

In context wit, the securitisation discourse expanded beyond military threats to include economic and political risks linked to energy dependence. This broader view of security threats encouraged the EU to urgently diversify its energy sources and decrease reliance on Russian imports. The EU increasingly stressed the importance of investing in new infrastructure and collaborating with third countries, but also adopting a unified strategy among member states to address these risks. This securitisation narrative was central in shaping the EU's energy policies in the years following the 2022 Russian invasion of Ukraine until now.

In their other article about narratives, this time specifically discourse on energy security of the European Commission for the period of 2014-2022 towards Russia, they also identified three narratives: securitisation, geopolitics, and zero-sum game. [7] In general, the securitisation narrative itself is the same as mentioned above (as an unreliable and dangerous partner) and remains a predominant one, although it has another special point of attention – Nord Stream 2 (NS2) which is seen as a further step for deepening dependence and threatening to Ukraine as a transit state and its economy. This had been seen as the main subject to securitise. The reasons in favour of posing it as a threat were possible Gazprom's monopoly, geopolitical concerns, and environmental impact. Although there were published numerous materials trying to oppose it and convince in possible benefits, counterarguments are limited whereas the concerns raised by critics underscore the intricate economic, geopolitical, and environmental factors. [8] These narratives depict the EC's shift from cooperation to confrontation with Russia in the energy sector. The EC now highlights the risks of energy dependence on Russia, advocating for diversification and a stronger geopolitical stance.

The authors also illustrated with a charter how the discourse influences the EU and its interests in the energy sector. It shows the lifecycle of discourses and the way they can take part in decision-making processes.

[7] Zbyněk Dubský and Lukáš Tichý, "The Role of Narratives in the Discourse on Energy Security of the European Commission: The EU's Transition in Energy Relations with Russia," *The Extractive Industries and Society* 17 (March 2024): 6, https://doi.org/10.1016/j.exis.2023.101392.
[8] Alex Barnes, "Nord Stream 2 Friend or Enemy of Energy Security in Europe?" (CEPS Policy Insights, December 2017).

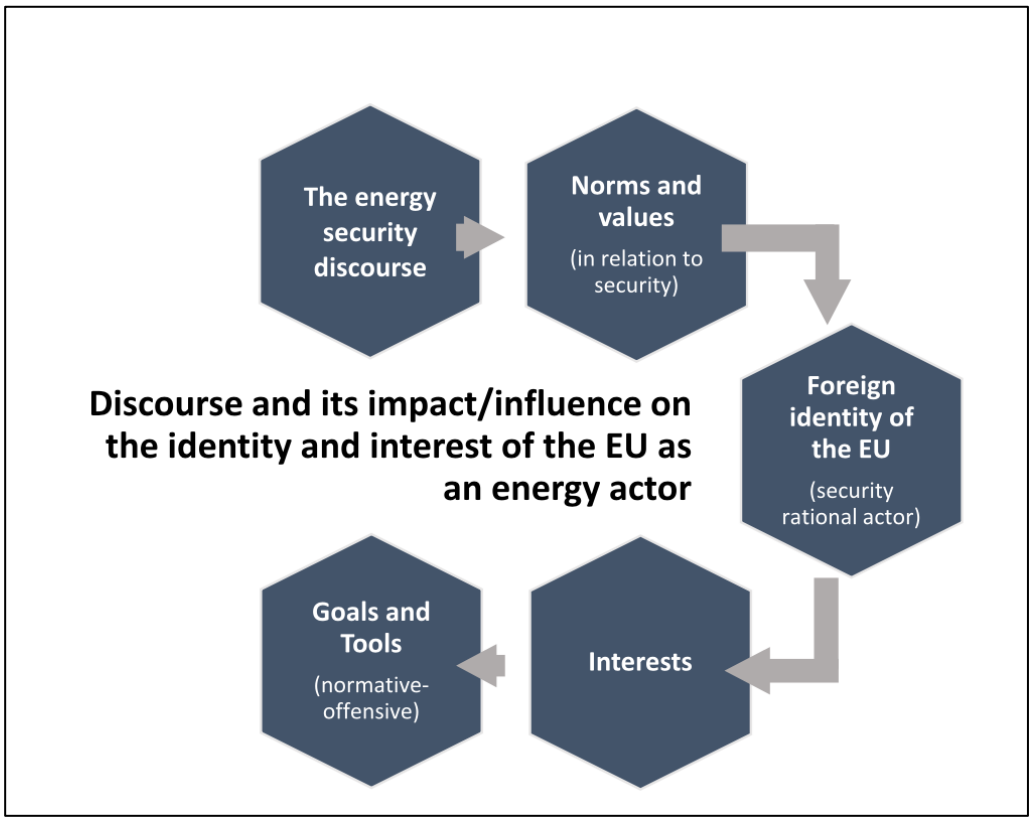

Figure 1. Discourse's impact on the EU's energy actor identity/interest (Tichý & Dubský).

The second important notion is energy security. This is a multifaceted and multi-level phenomenon. Among other numerous definitions, energy security may refer to energy availability, infrastructure, energy prices, societal effects, environment, governance, and energy efficiency. [9] While recognising the broader dimensions of energy security and their natural importance such as availability and affordability as significant and even vital characteristics, this analysis primarily focuses on the vulnerability of these supply chains to any kind of disruptions. Thus, as an important amendment, it should be mentioned that energy security in this work is mostly used in the meaning of the reliability of energy supply routes. This is a primary notion used in different contexts and regarding different events. Diversification is seen as a process strengthening energy security and is considered parallelly.

[9] B.W. Ang, W.L. Choong, and T.S. Ng, "Energy Security: Definitions, Dimensions and Indexes," *Renewable and Sustainable Energy Reviews* 42 (February 2015): 1077–93.

Chapter 1: Energy Policy of the EU until the 24th of February 2022

The European Union's energy policy used to be based on three pillars: competition, security of supply and sustainability. Clearly, these priorities would now correspond to the reality of recent years, when market turbulence and instability have become the new norm. There's no sign of concern about the security of supply, which is crucial in times of market volatility and shortages. This over-concentration of green emissions and green has pushed the real issues into the background, leaving no room for a comprehensive and flexible approach.

Early strategies, such as the 2010 initiative, focused on improving energy efficiency and promoting low-carbon technologies. The subsequent Energy Union Strategy in 2015 focused on several areas, the most important of which were: security, solidarity and trust among EU countries; energy market integration; energy efficiency and decarbonisation. The main goal was to create EU-wide energy markets which would "match supply with demand, in space and in time." Back then the main goal was called to reduce EU greenhouse gas (GHG). However, security remained the main concern. In fact, even back in 2013 53% of the EU's energy consumption came from imports. The Clean Energy for All Europeans package, introduced in 2019, set an ambitious target of carbon neutrality by 2050, mainly through a transition away from fossil fuels. The European Green Deal (EGD) reinforced this commitment. Without trying to overstate its importance, this plan became a crucial step in understanding European energy policy for the near future. [10]

European Green Deal

The description of the EU's activity in the area of energy should undoubtedly start from the European Green Deal. This is a pact adopted in 2019 in order to ensure the Union's transition towards a sustainable way of economy with the fundamental goal of reaching climate neutrality by 2050. The narrative starts from this point exactly because this legislative initiative became a steering wheel for the whole EU in energy, exactly this policy was decisive in energy and economy.

[10] Tomasz Rokicki, Piotr Bórawski, and András Szeberényi, "The Impact of the 2020–2022 Crises on EU Countries' Independence from Energy Imports, Particularly from Russia," *Energies* 16, no. 18 (September 15, 2023): 3–4, https://doi.org/10.3390/en16186629.

The energy transition, in turn, is a key part of a bigger shift called the green transition. In this shift, the EU is working to change the economy and society to meet climate and environmental goals. To be precise, the main goal is to reduce greenhouse emissions to at least 55% by 2030, compared to 1990 data, and be climate neutral by 2050. This is all part of a plan called, as mentioned above, the European Green Deal. To fulfil this ambitious plan the European Commission decided to allocate one-third of €1.8 trillion investment from the NextGenerationEU Recovery Plan. In absolute numbers, it constitutes an allocation of €396 billion annually between 2021 and 2030. Furthermore, a projected range of expenditures of €520 billion to €575 billion per year in the following decades leading up to 2050 is planned. [11] The intention is 'such as energy efficiency and deployment of renewables, energy infrastructure and smart energy systems.' Worth mentioning that the initial plan was humbler with €260 billion of additional annual investment, representing about 1.5% of the 2018 GDP. [12]

Based on this, renewable energy became another keystone priority for the EU. It experienced a wave of attention when the energy crisis shortly after the Invasion began. In fact, in 2022 23% of energy consumption was covered by renewable sources. In comparison to 2021, the growth was only 0.6% slowed since 2020. On the other hand, only less than half of the energy supplies needed are produced within the EU whereas the majority, i.e. 62.5%, was imported. [13] This demonstrates to us that real growth diverges from set goals. To meet its goals by 2030, the EU should ensure rapid growth. However, many member states remain reluctant when it comes to investments and development of green energy. Interesting in this regard is that nuclear energy represents a considerable part of the share of energy sources in EU production and this could be included in the classification of renewable ones too. The decision on this matter will be made later in 2024.

[11] European Parliamentary Research Service, "Energy Transition in the EU," Epthinktank, November 30, 2023, https://epthinktank.eu/2023/11/30/energy-transition-in-the-eu/.
[12] European Commission, "The European Green Deal Sets out How to Make Europe the First Climate-Neutral Continent by 2050, Boosting the Economy, Improving People's Health and Quality of Life, Caring for Nature, and Leaving No One Behind," European Commission, December 11, 2019, https://ec.europa.eu/commission/presscorner/detail/en/IP_19_6691.
[13] European Parliamentary Research Service, "Renewable Energy in the EU," Epthinktank, March 30, 2023, https://epthinktank.eu/2023/03/30/renewable-energy-in-the-eu/.

Fit for 55 Package

Initially proposed as a review of the Renewable Energy Directive (RED) and Energy Efficiency Directive (EED), the Fit for 55 package, adopted in July 2021, is a far-reaching set of legislative proposals. Designed as a key component of the European Green Deal, it has a primary objective of revising and extending existing climate and energy policies to meet the EU's ambitious target of reducing greenhouse gas emissions by at least 55% by 2030 compared to 1990 levels. This target, set out in the European Climate Change Act, represents a significant increase from the previous target of 40% and reflects the EU's commitment to tackling climate change. The package encompasses various sectors and policy areas, including energy, transport, and industry. The work on this proposal involved different EU council working groups like environment, energy, transport, and economic and financial affairs. [14] Implementing the full Fit for 55 package would reduce European gas consumption by 30% by 2030 which is equivalent to 100 billion cubic meters (bcm).

This package is a collection of various initiatives regarding multiple spheres. These include

- the promotion of the EU Emissions Trading Scheme (EU ETS) as the main tool for achieving reductions,
- the update of the Social Climate Fund,
- the introduction of the Carbon border adjustment mechanism and
- Emissions and removals from land use, land use change and forestry package,
- CO_2 emission standards for cars and vans,
- Reducing methane emissions in the energy sector,
- Sustainable aviation fuels,
- Decarbonised fuels in shipping and alternative fuels infrastructure,
- Energy performance of buildings,
- Hydrogen and decarbonised gas market package,
- Better energy taxation.

[14] Deloitte, "„Fit for 55" Package," delitte.com, August 24, 2021, https://www.deloitte.com/ce/en/issues/climate/ce-fit-for-55-package.html.

Later, this package as part of the REPowerEU plan, aimed at enhancing Europe's energy security, was revised to include more ambitious goals for renewable energy and energy efficiency in response to Russia's invasion of Ukraine. [15]

The EC's Fit for 55 package is a comprehensive set of legislative and policy proposals to achieve the EU's ambitious target of a 55% reduction in greenhouse gas emissions by 2030. In line with the Commission's impact assessment, this approach maintains a mix of price-based instruments, such as carbon pricing, and regulatory measures, such as energy efficiency standards, to tackle climate change. This package would further maintain the EU's existing approach to climate and energy legislation, combining market-based incentives with regulatory mandates. [16]

Renewable Energy Directive

The Renewable Energy Directive (RED) was launched back in 2009 to create a legal framework for the effective development of green energy and simplify cooperation between states with a specific set of 20% renewable energy share by 2020 at the EU level as well as specific targets for member states. The latter were calculated on the basis of existing shares. For example, Sweden, which already had a nearly 40% share of renewables in 2005, set a target of 49%, while Bulgaria had a more modest goal of growing from 9.4% to just 16%.[17] Besides that, a new initiative was intended "to reduce greenhouse gas emissions within the Community and reduce its dependence on energy imports". This is especially interesting to watch in the distance of a few decades since this intention was barely reached, disregarding the typical EU vague formulations. The development and results of this initiative will be considered in detail in the next chapters.

In fact, the goals were reached by 2015, thus in 2018, the directive was reconsidered and as a result, a Revised Renewable Energy Directive was adopted (RED II). This time, the EU set a target of 32% for 2030 with no individual binding targets for the Member States. In 2021, as a part of 'Fit for 55' this goal was set higher up to 40%.[18] Instead, the EU

[15] European Commission, "Commission Welcomes Completion of Key 'Fit for 55' Legislation, Putting EU on Track to Exceed 2030 Targets," European Commission, October 9, 2023, https://ec.europa.eu/commission/presscorner/detail/en/ip_23_4754.
[16] Sabine Schlacke et al., "Implementing the EU Climate Law via the 'Fit for 55' Package," *Oxford Open Energy* 1 (January 1, 2022), https://doi.org/10.1093/ooenergy/oiab002.
[17] The European Parliament And The Council, "Directive 2009/28/EC" (2009), https://faolex.fao.org/docs/pdf/eur88009.pdf.
[18] Ruth Losch, "EU 'Fit for 55': Scaling up Ambitions in the Renewable Energy Directive (RED II)," Linklaters.com, September 21, 2021, https://sustainablefutures.linklaters.com/post/102h54x/eu-fit-for-55-scaling-up-ambitions-in-the-renewable-energy-directive-red-ii.

proposed the states set their own goals, explaining it that "Member States have different renewable energy potentials and operate different support schemes at national level." [19] These are called their National Environment and Climate Protection Plans (NECPs). This updated more ambitious goal has paved the way for the Fit for 55 package in 2021, which proposed to revise the EU legislation and set higher goals. In particular, it proposed to refresh the revised RED and raise the target for 2030 to 40%. In fact, already by 2022, the percentage of shared renewables reached 23%.

European Energy Market: Dependence on Russian Supply and Other Sources

The cooperation between European states and the USSR and then Russia has a long and tight history of relations. Russia's strategic approach to energy infrastructure, particularly gas pipelines, has been a cornerstone of its relationship with Europe, shaping energy dynamics and political leverage. Post-war Europe desperately needed resources to rebuild faster its economies and the USSR which needed foreign currency found a solid reason for cooperation. This approach, initiated during the Cold War, involved leveraging Western European expertise and financing to overcome technological limitations in constructing pipelines like Druzhba. These pipelines served a dual purpose: meeting the energy demands of the Eastern Bloc and generating crucial hard currency through exports to Western Europe.[20] The establishment of the Council for Mutual Economic Assistance (CMEA) in 1949 marked a significant milestone in the initiation of such collaborative efforts. However, the first direct gas shipments to Western Europe happened later in 1969.

The collapse of the Soviet Union brought new challenges, including the need to renegotiate energy relationships with former Soviet states and address issues like pricing disputes and pipeline transit. Despite these hurdles, Russia continued to expand its pipeline network, exemplified by the Yamal-Europe pipeline, which aimed to diversify export routes and enhance energy security. This expansion, often achieved through partnerships with European companies and financial institutions, underscored the ongoing interdependence between Russia and Europe in the energy sector.

[19] The European Parliament And The Council, " Directive (EU) 2018/2001," December 21, 2018, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001.
[20] Daniel Connolly and Jae-Seung Lee, "Pipeline Politics between Europe and Russia: A Historical Review from the Cold War to the Post-Cold War," *The Korean Journal of International Studies* 14 (April 2016): 105, https://doi.org/10.14731/kjis.2016.4.14.1.105.

However, this interdependence has also been a source of tension. Russia's reliance on Western technology and financing has made it vulnerable to political pressure, as seen in the US sanctions during the Cold War. Additionally, the reliance of European nations on Russian gas has raised concerns about energy security and the potential for Russia to wield its energy resources as a political tool. The Energy Charter Treaty, [21] while intended to foster cooperation and protect investments, has been a point of contention due to Russia's reluctance to fully ratify it.

In conclusion, Russia's strategic development of gas pipelines to Europe, while driven by economic and geopolitical interests, has created a complex web of interdependence. This interdependence has brought both benefits and challenges, shaping the energy landscape and political relations between Russia and the EU.

Important to mention that Ukraine has been playing a key role in delivering Russian gas to the European states. The infrastructure built in the USSR was serving considerable amounts of gas delivered to Europe. For instance, in 2020 the volume of Russian gas transit to Europe amounted to 174,9 bcm according to Gazprom itself. This happened in the background of a several-year downward trend in supplies. In turn, the recent contract for 2020-2024 years between Russia and Ukraine guaranteed a supply of 65 bcm of natural gas in the first year and at least 40 bcm annually for the next four years. This gives 37% first year and around 23% within the next years of transit if the same amounts stay. It shows us the importance of the Ukrainian gas transport system in the Russia-EU flow.

Finon and Locatelli in their 2007 article argued that increasing dependence on Russian gas made the EU vulnerable. This reliance stems from the EU's limited domestic gas supplies and the absence of a cohesive energy policy among its member states. [22] Besides that, the authors also mention the European Commission's (EC) forecasts stating that "energy dependence (for all categories of energy) will rise from 52% in 2004 to about 75% in 2030". This dependence made the EU vulnerable to potential supply disruptions and price manipulations, a vulnerability that was fully exposed only following the 2022 invasion of Ukraine. Another notable detail is that the authorities are that Russian authorities have been resisting free-market regulations to maintain control over

[21] Energy Charter Secretariat, "The Energy Charter Treaty and Related Documents: A Legal Framework for International Energy Cooperation."
(2015), https://www.energycharter.org/fileadmin/DocumentsMedia/Legal/ECTC-en.pdf.
[22] Dominique Finon and Catherine Locatelli, "Russian and European Gas Interdependence. Can Market Forces Balance out Geopolitics?", February 2008.

independent producers and to block European and other companies from participating in supply.

In a 2008 article, Richard J. Anderson of the George C. Marshall European Center for Security Studies highlighted concerns regarding the European Union's increasing reliance on Russian natural gas imports. At the time, the market conditions were already alarming, and this dependency was viewed as a significant threat. This had several reasons. Firstly, EU countries were planning to phase out the use of nuclear power and coal. Secondly, domestic natural gas reserves were becoming depleted or in decline. Anderson urged the EU to diversify its energy imports by seeking alternative suppliers and investing in renewable energy sources. [23]

Back in 2008 when the Green Paper on a European Strategy for sustainable, competitive, and secure energy was published, half of the EU's gas consumption was supplied by only three countries Russia, Norway, and Algeria. [24] Throughout the time, Russia's role was only growing. The Green Paper, among other things, admitted (1) that large reliance on gas supply for power generation of one Member State can undermine the security of supply of its neighbours and the fact, (2) that decisions of every Member State regarding nuclear power also can significantly influence on other states 'in terms of the EU's dependence on imported fossil fuels and CO_2 emissions.' Both these facts have a significant connection to Russia as the biggest energy supplier.

It is worth noting that both abovementioned articles were written around the time of happening political conflict between Russia and Ukraine of 2006-2009. The essence of the conflict lay in the price disputes between Russia and Ukraine as the main transit country which led to temporary disruptions in the gas supply to the EU. Among others, the most affected countries were Poland, Hungary, and Lithuania. As a result, this was an important step in the EU's understanding of energy as a political instrument of pressure on states, as well as a political activity aimed at increasing influence and bargaining

[23] Richard J. Anderson, "Europe's Dependence on Russian Natural Gas: Perspectives and Recommendations for a Long-Term Strategy," *Marshall Center Occasional Paper*, no. 19 (September 2008), https://www.marshallcenter.org/en/publications/occasional-papers/europes-dependence-russian-natural-gas-perspectives-and-recommendations-long-term-strategy-0#Author_Blurb.

[24] EEA, (2018). COM(2006)105 final. Green Paper on a European Strategy for sustainable, competitive, and secure energy. European Commission, European Environment Agency, https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2006:0105:FIN:EN:PDF

power. [25] This conflict could also be considered under the concept of 'weaponisation' in terms of its artificiality. This idea derives from the conviction of the Russian leadership since the beginning of the 2000s that gas and oil companies should be subordinated to the state, and therefore to the politicians in power. [26]

Using a Weighted Energy Security Index (WESI) Rodríguez-Fernández et al**.** analysed the conflict and how the EU-27 developed their policies regarding their security for the period of 2005-2010. It stood out that Latvia was the only country that made significant progress in securing its energy supply, although it was still lower than Denmark, the leader in terms of security of supply. This, in turn, suggests that proximity to an aggressor country has a direct impact on threat perception and therefore on decision-making to minimise threats. Besides that, supporters of nuclear power in several European countries have used the crisis to advocate for the construction of new power plants. [27]

Another research made by De Rosa et al. and updated in April 2022 shows slightly different results regarding the energy security and diversification of the European Member States. To quantify the diversity of the supply, the authors used the Shannon-Wiener Index (SWI), a metric commonly used in ecology to measure species diversity. In this context, the SWI was adapted to assess the diversity and distribution of energy sources within a country's energy mix. They found that most EU countries have a moderate level of energy diversity, with some countries performing better than others due to factors such as geographical location and resource availability. For example, Cyprus and Malta are totally dependent due to their island nature, while Germany and Italy have high levels of dependence due to the size of their economies which have been relying on relatively cheap gas from Russia. [28]

Besides this, they also examined the renewable energy mix across the EU using the RESI – Renewable Energy Security Index. The study shows that between 2007 and 2017, the scores of EU countries ranged from 0 (Malta) to 0.521 (Austria), with a clear upward trend due to EU policies promoting the use of renewable energy. In particular, Lithuania

[25] Laura Rodríguez-Fernández, Ana Belén Fernández Carvajal, and Luis Manuel Ruiz-Gómez, "Evolution of European Union's Energy Security in Gas Supply during Russia–Ukraine Gas Crises (2006–2009)," *Energy Strategy Reviews* 30 (July 2020): 1–2, https://doi.org/10.1016/j.esr.2020.100518.
[26] Harley Balzer, "The Putin Thesis and Russian Energy Policy," *Post-Soviet Affairs* 21, no. 3 (January 2005): 221–22, https://doi.org/10.2747/1060-586x.21.3.210.
[27] Jonathan Stern, "Natural Gas Security Problems in Europe: The Russian–Ukrainian Crisis of 2006," *Asia-Pacific Review*13, no. 1 (May 2006): 51–52, https://doi.org/10.1080/13439000600697522.
[28] Mattia De Rosa et al., "Diversification, Concentration and Renewability of the Energy Supply in the European Union," *Energy* 253 (August 15, 2022): 8–12, https://doi.org/10.1016/j.energy.2022.124097.

and Croatia significantly improved their scores. In turn, other countries such as Germany, Italy and Spain also made significant improvements. Austria, together with Sweden, consistently maintained the highest RESI.

However, this study reveals an important policy-designing gap which hides in the impact of EU renewable energy policies varied from country to country. Due to different socio-economic and political conditions, the results of the same edited policy are drastically different. This demonstrates the need for tailored, customised energy policies and personalised targets that take into account each country's unique context in order to ensure more even progress in renewable energy uptake across the EU.

Notably, disregard the reluctance and bulkiness of the bureaucracy machine of the EU, crises and disruptions have not only underscored the vulnerabilities but also acted as catalysts, rushing the EU's efforts to fortify its energy security framework. Its enthusiasm solidified in a more active role of the European Commission and the Commission's influence in responding to energy crises by seeking a more unified and coordinated approach among member states. [29] Speaking of the role of the European Commission, it mandated changes to existing gas contracts, removing territorial restrictions on resale, to further encourage intra-European gas competition.

However, nowadays the situation has not changed significantly. As we can see on the graph below, while the overall EU dependency on its imports remained relatively stable since 2000, fluctuating around 50%, some individual countries experienced increases, raising concerns about energy security and potential geopolitical vulnerabilities. For instance, Germany consistently showed a high import dependency, which can be explained by factors like phasing out nuclear power and increased reliance on natural gas imports. Contrary, France has been maintaining a relatively lower import dependency. Probably, due to its continuing focus on nuclear power.

[29] Younes Gholizadeh and Müslüme Narin, "Energy Policy of European Union: An Evaluation with Regard to the Energy Supply Security," August 8, 2018, https://www.researchgate.net/publication/341030383_Energy_Policy_of_European_Union_An_Evaluation_with_regard_to_the_Energy_Supply_Security.

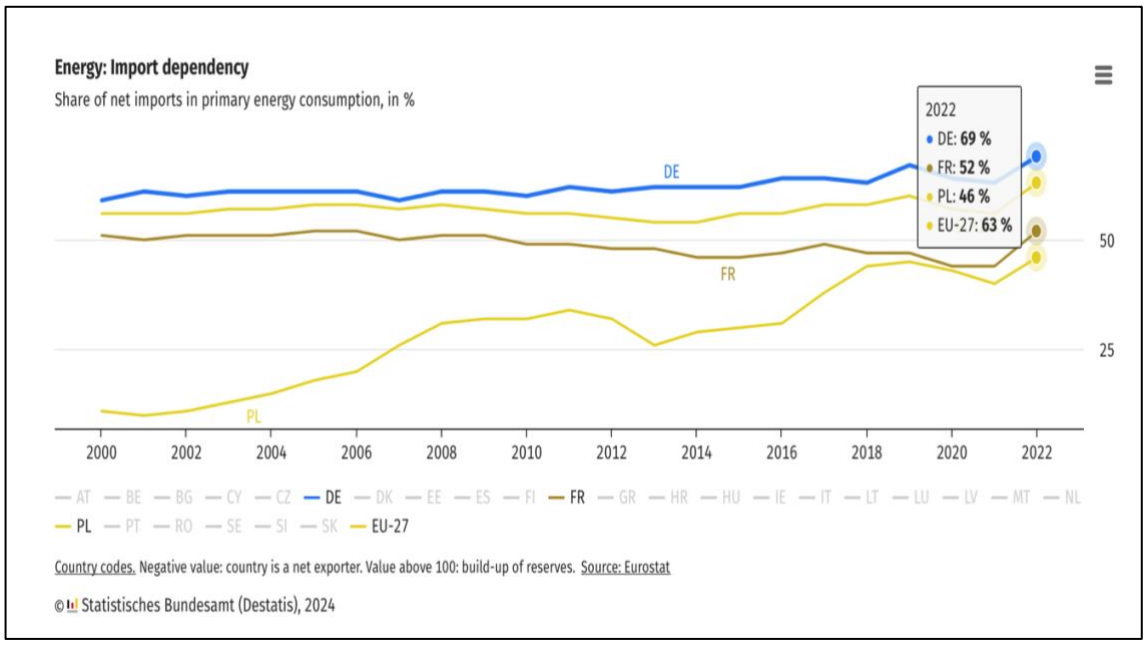

Figure 2. EU import dependency in 2024

Rokicki et al. found that the overall dependency rate remained between 55% and 60% from 2010 to 2022, with a slight increase from 2019 to 2022. The authors stress that this dependency rate is high and express concern that not enough is being done to reduce it. The dependence rates for individual energy sources are even more worrying. For solid fossil fuels, the dependency rate is between 70% and 75%, and for natural gas, it increases from 70% in 2010 to 90% in 2022. The dependency rate for oil and oil products is consistently high at 95%. [30]

When discussing dependency ratios, it is necessary to examine the overall situation in the EU energy market and review the origins of various energy sources. The most critical and controversial energy source is gas. This particular source significantly impacts people's daily lives, raising the loudest discussions within the EU. Consequently, it represents the primary area of contention within the EU. Besides that, this source is also interesting from the point of view of expenditures since it demands large investments. Thus, we will examine the situation with the gas supply first.

[30] Rokicki, Bórawski, and Szeberényi, "The Impact of the 2020–2022 Crises," 14.

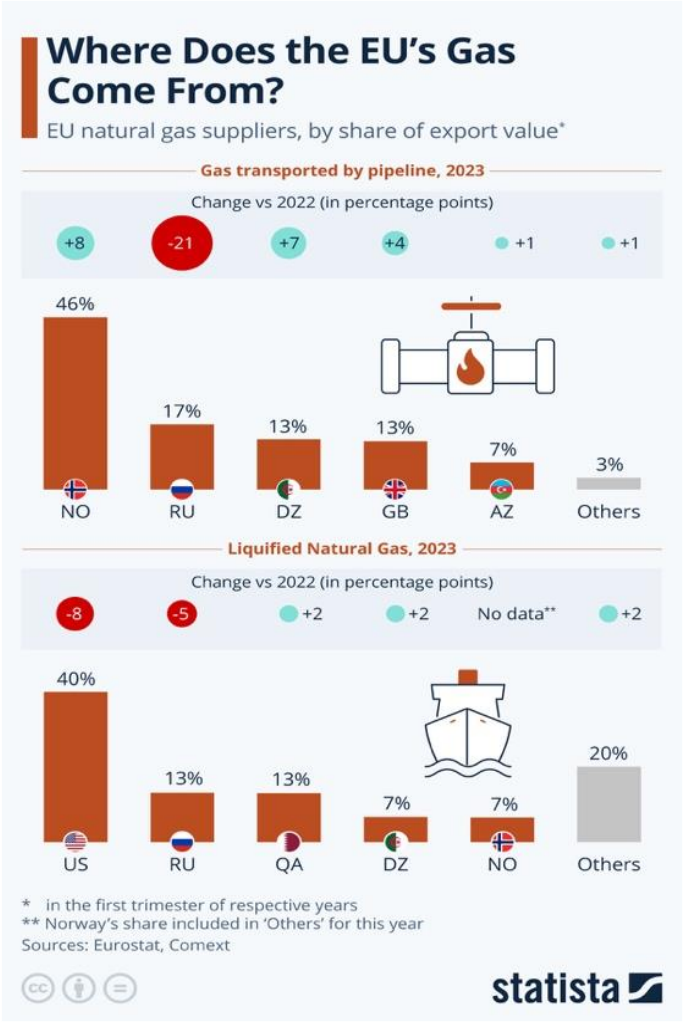

Figure 3. EU natural gas suppliers in 2023

Although the discourse of the EU turned to the terms of security of supply in recent years, the EU has been relying only on three countries in its gas import for a long time and recently it still has not changed. Norway, Russia, and Algeria are still the leaders. In particular, in 2021, the EU relied heavily on importing natural gas, with about 88% of its total gas consumption coming from other countries. Some EU countries, including Germany, Italy, France, Spain, Belgium, Czech Republic, Slovakia, and Bulgaria were largely dependent on gas imports, i.e. sharing 95-100%. The degree of dependence on Russian fossil fuels varies considerably between EU Member States. Russia was a major supplier, providing 37% of the EU's gas, and even more for certain countries like Germany and Hungary. [31] Even after 2014, following the Russian annexation of the Crimea peninsula, Western European states appeared to adopt a relatively indifferent stance, utilising their considerable bargaining power to negotiate favourable contracts with Russia, thereby gaining an advantage over other EU member states.

However, a few important changes in the EU energy market took place. First of all, the EU managed to reduce the import by pipelines from Russia by 56% year-on-year which

[31] S. V. Zhukov and I. A. Kopytin, "Crisis in the EU Gas Market: Genesis, Dynamics and Prospects," *Studies on Russian Economic Development* 34, no. 6 (November 21, 2023): 833–34, https://doi.org/10.1134/s1075700723060187.

was the largest supply country. Namely from over 150 bcm in 2021 to less than 43 bcm in 2023. [32]

In turn, the EU has been moving towards being the biggest hub of development of Liquefied Natural Gas (LNG) terminals which are much more expensive than pipeline gas and demand more complex servicing infrastructure. This shift reveals another weak side of EU policymaking. Although the supply via pipeline gas was reduced drastically, LNG supply from Russia rose by 35%, i.e. to about 19 bcm. [33] However, export growth is objectively limited for many reasons. First of all, Russia's LNG sector heavily relies on Western technologies. Technological cooperation after the start of the war became very difficult, if not completely interrupted because of the embargo. The imposed sanctions are creating additional logistical and infrastructural obstacles for operating and servicing LNG terminals and vessels which are, in fact, quite limited. Moreover, the sanctions have harshly limited Russia's access to foreign investment and financing for its LNG projects. [34] The cumulative effect of these constraints has had a significant impact on Russia's LNG production and export capabilities.

Nonetheless, the EU continues to look for support in reliable supply largely in Norway and the USA which can be seen in the growing role of their import. The latter, as the world's biggest gas producer with increasing LNG export capacity, is a key partner in this regard. Since the first shipment in 2016, reinforced by a 2018 July agreement, US LNG exports to the EU have been growing substantially. [35] This allowed the USA to almost triple from 2022 their volumes to the EU making almost 50% of the whole LNG import. The total amount of imported LNG gas in 2023 constituted over 120 bcm and general import capacities already grew by 40 bcm and additional 30 bcm are expected by 2024.[36]

---

[32] Council of the EU and European Council, "Where Does the EU's Gas Come From?," *Consilium.europa.eu*, 2023, https://www.consilium.europa.eu/en/infographics/eu-gas-supply/#0.
[33] Jim Todd, Urszula Gumińska-Kurek, and Agata Łoskot-Strachota, "The EU Gas Market: Revolutionary Changes and the Spectre of Another Winter," *Centre for Eastern Studies*, May 25, 2023, https://www.osw.waw.pl/en/publikacje/osw-commentary/2023-05-25/eu-gas-market-revolutionary-changes-and-spectre-another-winter.
[34] Filip Rudnik, "The Effect of the Sanctions: The Russian LNG Sector's Problems," Centre for Eastern Studies, March 7, 2024, https://www.osw.waw.pl/en/publikacje/osw-commentary/2024-03-07/effect-sanctions-russian-lng-sectors-problems.
[35] European Commission, "EU-US LNG Trade," February 2022, https://energy.ec.europa.eu/system/files/2022-02/EU-US_LNG_2022_2.pdf.
[36] Council of the EU and European Council, "Liquefied Natural Gas Infrastructure in the EU," *Consilium.europa.eu*, 2023, https://www.consilium.europa.eu/en/infographics/lng-infrastructure-in-the-eu/#0.

However, behind growing statistics, one of the main drawbacks of this energy storage type is not that accessible both in economic and infrastructure senses. Analysis by Mitrova et al. suggested that US LNG supplies, which have been intensively discussed in the post-2014 debate, would be competitive in the UK, the Netherlands and Belgium, but not in most of Europe. [37] It is worth adding that LNG networks are developed unevenly and so far, exist in Spain, France, Italy, Portugal, Belgium, the Netherlands, Croatia, Poland, Greece, Finland and Lithuania.

When it comes to utilisation of gas in the EU then 30% is consumed for electricity and heat production, 25.5% is utilised by households, almost 25% is used by the industrial sector, and the service industry consumes 11.2%.

Beneath this apparent stable cooperation, however, a crisis was brewing. Europe's growing dependence on Russian energy, particularly natural gas, had created a hidden vulnerability. This dependence, combined with simmering geopolitical tensions, set the stage for a major disruption. It would soon send shockwaves through the EU energy market. The disruption of war additionally caused huge volatility in the market. Instability became a mainstream characteristic of the market and made countries look for new ways of solving the crisis.

Energy Crisis Maturation: 2021 Onwards

To fully explain the aftermath of the Russian invasion of Ukraine in February 2022, it is worth outlining the background on which the crisis was developing. The intertwining of objective and subjective reasons caused volatility in the world energy market, especially in the European market. Firstly, the COVID-19 pandemic in 2019-2020 led to a rapid decline in energy demand as a consequence of numerous lockdowns and lower economic activity, thus a reduction in oil production. However, later the economies started recovering from the pandemic and this led to a higher demand for liquefied natural gas, especially in Asia. Secondly, even with the oil price war between Russia and Saudi Arabia in 2020, the Organization of Petroleum Exporting Countries (OPEC) was slow to adjust to recovering demand in the new normal, creating an imbalance between supply and demand. [38] The global supply chain crisis in 2021-2022 made it even more difficult to

[37] Tatiana Mitrova, Tim Boersma, and Anna Galkina, "Some Future Scenarios of Russian Natural Gas in Europe," *Energy Strategy Reviews* 11-12 (June 2016): 28, https://doi.org/10.1016/j.esr.2016.06.001.
[38] Richie Ruchuan Ma, Tao Xiong, and Yukun Bao, "The Russia–Saudi Arabia Oil Price War during the COVID-19 Pandemic," *Energy Economics* 102 (August 2021): 1-3, https://doi.org/10.1016/j.eneco.2021.105517.

deliver the oil produced. As a result, between December 2020 and December 2021, the cost of importing energy in the euro area more than doubled, i.e. (115%), reaching the highest in past 13 years prices. In turn, domestic producer prices for energy increased by almost 73%. [39]

Taking advantage of the current situation, Russia did not cooperate in increasing its exports, even though the European Union clearly needed additional imports to fill gas storage facilities that were only 75% full by October 2021. In particular, Russia's existing capacity allowed it to do so. Instead, Gazprom stuck to its treaty-defined export volumes and restrained itself from using the Yamal and Ukrainian pipelines, running them only at a third of capacity. [40] The gap between existing supply and demand only raised the prices.

From 2020 to 2022, the EU's reliance on gas imports from Russia reached 90%. This high level of dependency on Russian energy imports has been posing a significant risk to the EU's energy security. The EU's main challenge has been to balance competitiveness and efficiency, leading to a preference for cheaper raw materials from Russia and investments in infrastructure such as Nord Stream I and II under the Germany's lobbyism and leadership. However, it is argued that diversification should also include increasing energy imports from other sources like Norway, Algeria, and Azerbaijan. Nevertheless, alternative supplies remained constrained, and LNG imports were shortened due to higher costs relative to pipelines.

There are other reasons that have indirectly influenced the whole situation. It is argued that the roots of the crisis lie in the EU's shift towards a spot market for natural gas, prioritising short-term trading over long-term contracts, a move driven by its climate and energy strategy. In fact, this has been happening for the last 15 years. This made the EU vulnerable to price volatility, as seen in the price spike in 2021, which can be explained as "the exhaustion of opportunities to smooth out seasonal fluctuations in demand for gas by changing the level of its own production" and "the political decision of the EU is to build a spot market for natural gas at any cost." [41] Remembering that some choices were dictated by the mainstream of green energy transition, altogether, we can conclude that some policy decisions of the EU played into the hands of a quietly emerging crisis.

[39] Eurostat, "Energy Prices on the Rise in the Euro Area in 2021," ec.europa.eu, February 2022, https://ec.europa.eu/eurostat/web/products-eurostat-news/-/edn-20220210-2.
[40] Zuzanna Nowak and Maciej Zaniewicz, "Russia's Role in the European Gas Crisis," *Pism.pl*, November 5, 2021, https://pism.pl/publications/russias-role-in-the-european-gas-crisis.
[41] Kopytin, Maslennikov, Zhukov, "Crisis in the EU Gas Market: Genesis, Dynamics and Prospects," 831-32

Moreover, the strong push for low-carbon policies and the carbon market in the EU and the UK caused gas prices to rise in Europe and other regions, including Asia-Pacific (which imports gas) and North America (which exports gas). [42]

High inflation had to be the main focus of economic policymakers. On top of this, industrialised countries were more exposed to changes in the energy market, particularly due to disruptions in Russian oil and gas supplies. Finally, the decline in people's purchasing power could lead to political instability in Europe. [43]

The severity of this crisis, which hit the population first, can be clearly traced by the sums allocated to households. Since the energy crisis began in September 2021, the European Union have set aside €540 billion to help consumers with increasing energy costs. Interestingly, Germany has set aside €158 billion of that amount by itself. [44] This mainly happened because the price of electricity in the EU is tied to the price of fossil fuels like gas. The development of the crisis and the wide range of instruments and decisions made by the EU to mitigate a crisis and get secure in the future will be described in detail in the next chapters.

[42] Ivan Kopytin, Alexander Maslennikov, and Stanislav Zhukov, "Europe in World Natural Gas Market: International Transmission of European Price Shocks," *International Journal of Energy Economics and Policy* 12, no. 3 (May 18, 2022): 14, https://doi.org/10.32479/ijeep.12941.
[43] Miguel Á. Martínez-García, Carmen Ramos-Carvajal, and Ángeles Cámara, "Consequences of the Energy Measures Derived from the War in Ukraine on the Level of Prices of EU Countries," *Resources Policy* 86 (October 2023): 104114, https://doi.org/10.1016/j.resourpol.2023.104114.
[44] Giovanni Sgaravatti, Simone Tagliapietra, and Georg Zachmann, "National Policies to Shield Consumers from Rising Energy Prices," Bruegel, October 21, 2022, https://www.bruegel.org/dataset/national-policies-shield-consumers-rising-energy-prices.

Chapter 2: the EU's New Energy – Less Dependence, More Security

Although the EU does not make an impression of being fully conscious of the vulnerability of its energy supply, it would be an exaggeration to say that the war and the subsequent energy market turmoil caught the EU unprepared. Due to high economic growth and developed industry, European countries had a low level of energy independence, which has aggravated the energy discrepancy. However, it has made the establishment of Brussels technocrats and national governments much more sober about the recent development of diplomatic and political relations with the Russian Federation. Germany, which was considered and seen as a trustworthy partner because of its dependence on Russian energy sources, took particularly courageous steps. There is seen a clear change to the behaviour dictated by political needs and energy security considerations. Finally, the use of energy was labelled by the European Council plenty of times as 'a political weapon.'

The worsening of the energy crisis after a full-scale invasion has led to alterations in the planning and priorities of EU energy infrastructure. There has been a move away from using Russian fossil fuels, which has prompted the need for swift adjustments to energy networks. This includes creating new import routes and addressing limitations in the current infrastructure to ensure smoother operations. [45] These autonomous measures contributed to the rapid change that was impossible before that. The majority of countries began to move away from Russian raw energy sources aligning to the pan-European policy of renewables and green energy. However, some exceptions took place too. For example, Hungary has signed a new gas contract with Russia. Contrarily, the Czech Republic tried to replace the lacking volumes by more intense use of its coal reserves. All in all, the rapidly appeared crisis led to an intense focus on energy security again. In order to deal with this crisis, the EU has made various decisions that have led to the introduction and updating of numerous initiatives and regulations.

[45] European Parliamentary Research Service, "EU Energy Infrastructure: Boosting Energy Security," October 4, 2023, https://epthinktank.eu/2023/10/04/eu-energy-infrastructure-boosting-energy-security/.

Energy Crisis Tackling Measures – Immediate Response

The European Union's response to energy crises has largely been based on Article 122 of the Treaty on the Functioning of the European Union (TFEU). This provision provides a legal basis for adopting emergency measures in the event of serious difficulties in the supply of certain products, particularly in the energy sector. On the basis of a Commission proposal, the Council adopted exceptional economic regulations by a simple qualified majority (QMV). This decision-making system differs from the Ordinary Legislative Procedure (OLP) in that the European Parliament (EP) is not involved in the process, so decisions are taken purely at the top of the EU's political leadership, bypassing the EP and speeding up decision-making. However, states are not limited by regulations in the choice of energy security instruments, which allows them to use their potential in energetics and act in their interests. In fact, this is not the first time it has been used. Previously, it was used as a basis for the creation of the European Financial Stability Mechanism regulation during the eurozone crisis, the refugee crisis and the COVID-19 crisis. Although it raised additional discussions and doubts about the legality of such actions, it can be concluded that the ambiguous and broad nature of such a document as the TFEU justifies its use. [46]

After the invasion, it became more than obvious that the EU should pay more attention to its sources' security. The primary goal was and remains to reduce dependence on Russian energy supplies. [47] Thus, just in a few weeks EU Member State heads came up with a two-vector decision to move away from increased dependence on Russian energy sources:

1) To diversify its energy supply and
2) to use less fossil fuels overall by switching rapidly to green energy sources.

These two decisions, among other things, became two major streams according to which the EU and Member States started to act with special zeal. If the first decision turned out to be fully political and based on a new reality, the latter one was a continuation of the result of long-standing efforts in the field of green energy. It has become a new active

[46] François-Charles Laprévote and Thomas Harbor, "Article 122 TFEU as a Legal Basis for Energy Emergency Measures," Cleary Gottlieb, November 9, 2022, https://www.clearygottlieb.com/news-and-insights/publication-listing/article-122-tfeu-as-a-legal-basis-for-energy-emergency-measures.
[47] European Parliamentary Research Service, "Preparing for 'RepowerEU': Action for More Secure, More Affordable and Cleaner Energy," May 2022,

impetus for its development. This plan besides that outlined cutting imports by two-thirds (about 100 bcm) by the end of the year and completely stopping them by 2030.

In response to Russia's actions, European states, including the UK, rapidly reduced their reliance on Russian oil and gas. The Nord Stream 2 pipeline, recently finished, was never put into operation, and both Nord Stream 1 and 2 pipelines were sabotaged in September 2021. [48] Noteworthy that back in 2006 Polish foreign minister Radoslaw Sikorski compared the idea of the first Nord Stream to the Molotov-Ribbentrop pact, contrasting a such type of cooperation as a threat. [49] Drawing parallels to a historical agreement between Germany and Russia, the Polish minister accused Germany of colluding with Russia to endanger central Europe. [50] Thus, it is also not surprising that in April 2022 gas pumping through the Yamal–Europe natural gas pipeline going through Poland was stopped due to the decision of Polish and Bulgarian authorities not to pay for it in Russian rubbles as requested by Russian authorities. Moscow's decision to reduce the volume of gas sent to the West, combined with the EU's gradual abandonment of Russian supplies, has contributed to a major drop-off in pipeline gas exports.

To combat this crisis Member State governments continued to allocate additional money to sustain both households and the corporate sector, mostly national energy companies, thus reaching an amount of €750 billion. By January 2023 Germany already allocated 4.4% of GDP, France 3.7%, Poland 2.2%, and Italy 5.2%. [51] The money for this financial aid was taken as a result of another unprecedented decision. The EU undermined emergency market interventions to fix high prices. It constituted a temporary cap on excess revenues for inframarginal electricity producers (i.e. renewables, nuclear and lignite), aimed at redirecting windfall profits to support consumers burdened by high energy bills. A ceiling of €180 per megawatt-hour (MWh) has been set. While this intervention addressed immediate concerns, it depended on the discretion of Member States in the use of the revenues collected and their cooperation in fair distribution through solidarity arrangements. In addition, since some fossil fuel companies earned

[48] Michelle Kilfoyle, "Ukraine: What's the Global Economic Impact of Russia's Invasion?," Economics Observatory, October 24, 2023, https://www.economicsobservatory.com/ukraine-whats-the-global-economic-impact-of-russias-invasion.
[49] Bojan Pancevski, "How a Russian Gas Pipeline Is Driving a Wedge between the U.S. And Its Allies," *WSJ*, March 19, 2019, https://www.wsj.com/articles/how-a-russian-gas-pipeline-is-driving-a-wedge-between-the-u-s-and-its-allies-11552254955.
[50] Ian Traynor, "Poland Recalls Hitler-Stalin Pact amid Fears over Pipeline," *The Guardian*, April 30, 2006, sec. World news, https://www.theguardian.com/world/2006/may/01/eu.poland.
[51] Sgavaratti, Tagliapietra, Zachmann, "National Policies to Shield Consumers from Rising Energy Prices"

great money in 2022 and/or 2023 which can be considered as excess profit, the EU regulation required the Member States to make a solidarity contribution. This contribution, set at a minimum rate of 33%, is applied to profits exceeding 20% of the average profits of the previous four years (2018-2021). The funds collected had been used to support vulnerable households, reduce energy consumption, support energy-intensive industries and increase the EU's energy independence. [52] To support industry, the Green Deal Industrial Plan was published in February 2023. This plan focused on maintaining decarbonisation and promoting the production of clean technologies in Europe.

The Commission proposed joint gas purchasing under the REPowerEU plan, which, after approval by the Council, led to the creation of the EU Gas Platform in April 2022. [53] This platform should use the collective purchasing power of EU countries to secure more favourable gas contracts on the global market. It also recommended a legally binding way to secure at least 15% of storage needs in 2023. AggregateEU became the platform's flagship initiative to achieve the goals set. The platform also ensures multilateral communication between states, industry and the Energy Community for better expertise and decision-making.

Another important milestone was the decision to impose sanctions on the Russian Federation. These sanctions included export bans and import restrictions, targeting particular 'dual-use' technologies such as semiconductors, aviation-related goods and services, and oil and gas extraction.

Energy Policy Evolution

The visible complexity of the EU's actions in energy can be summarised in many ways. This sphere experienced a tremendous quantity of changes and developments. Before the policy-makers undermined actions in creating new rules and regulations, some clear changes happened in the minds of the whole political establishment. This includes perception shifts which became visible after a few years only. Goldthau and Youngs define three mainstream shifts which are ruling the energy evolution in the EU. These three significant changes in the EU's energy and climate policy approach include securitisation of renewables, renewables extractivism, and stronger state intervention of

[52] European Parliamentary Research Service, "Emergency Intervention to Address High Energy Prices in the EU," October 2022, https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/733687/EPRS_BRI(2022)733687_EN.pdf.
[53] European Commission, "EU Energy Platform," European Commission, accessed July 7, 2024, https://energy.ec.europa.eu/topics/energy-security/eu-energy-platform_en.

states. [54] Previously seen primarily through an environmental lens, renewables are now seen as critical to energy security. The most striking example of such behaviour is the nationalisation of national energy companies by Germany, France and the Netherlands. This shift is evident in policy discourse and framing of it, with terms such as 'freedom energy' highlighting their role in reducing dependence on foreign fossil fuels. Decarbonisation, the European Commission insists, is a way to get resilient. The focus on renewables as a security measure (and, consequently, the fundamental concept in policies) marks a departure from traditional energy security strategies centred on fossil fuels. The authors argue that this securitisation of renewables represents a structural change in the EU's definition of energy security, shifting the focus from the physical availability of fossil fuels to the technological and financial aspects of renewable energy infrastructure.

In addition, the issue of decarbonisation has also been securitised. This main idea of recent EU regulations, such as RED, has inherited a strong character of paradigm shifts mentioned above. Goldthau and Sitter even refer to this matter as a matter of 'high politics'. Among the examples of securitisation of decarbonisation, they cite exceptional actions such as increased government funding, relaxed financial aid regulations, and decisive choices regarding the balance between environmental concerns and the rapid development of renewable energy sources, such as offshore wind farms. [55]

The EU is increasingly seeking to extract renewable energy resources from third countries to meet its energy needs. This approach, often referred to as 'renewable extractivism,' reflects the historical pattern of Western powers extracting fossil fuels from developing countries. The above-mentioned authors even introduce such a concept as 'green-realpolitik.' While the EU emphasises its commitment to human rights and sustainable development in these partnerships, critics argue that the focus is on securing EU energy supplies rather than prioritising the needs of local populations. This approach has raised concerns about potential distortions in developing countries' energy transitions and a rise in resource nationalism. This shift certainly represents a more geopolitical approach to climate change, the view from the position of the strong which was always missing in the EU's approach to partnering countries.

[54] Andreas C. Goldthau and Richard Youngs, "The EU Energy Crisis and a New Geopolitics of Climate Transition," *JCMS: Journal of Common Market Studies* 61, no. S1 (August 29, 2023): 117–19, https://doi.org/10.1111/jcms.13539.

[55] Andreas Goldthau and Nick Sitter, "Whither the Liberal European Union Energy Model? The Public Policy Consequences of Russia's Weaponization of Energy," *EconPol Forum* 23, no. 6 (November 2022): 4–7.

The last and not least shift is that the EU has allowed itself to postpone the steady liberalisation and deregulation of the market. This liberal gas market model's main aim used to be to reduce the overall prices for energy and thus save money. It has been working and there was a clear long-lasting economic gain for all. Instead, measures such as the EU Energy Platform and gas price caps symbolised a shift towards greater state control over energy choices. [56] This shift is driven by the need to balance the political and economic loss of energy dependence and to secure energy supplies in the face of geopolitical challenges. Examples of market failure include supply rigidity, significant price fluctuations, shipping bottlenecks, and other factors. These are negative aspects of an open and competitive market which has been created since the 1990s. During the big crisis times this mechanism showed its negative sides.

New priorities for cooperation reflect further developments of the shifts. Especially with its energy suppliers who were always in the shadow of closer and more classical associates like Russia or Norway. The EU and its Member States separately signed numerous energy agreements to increase oil and gas imports, engaging in diplomatic efforts to secure additional gas from countries like Norway, Qatar, and the United States. However, these new agreements cover only a small part of the demand. For example, Qatar has a limited ability to ship sufficient quantities of natural gas to the EU and operates already near its maximum capacity. They also signed a deal with Azerbaijan to double gas supplies and have been exploring options for East Mediterranean gas through agreements with Egypt and Israel. Additionally, the EU initiated cooperation with Arab Gulf states on solar and hydrogen, established a Green Partnership with Morocco for hydrogen supplies, [57] and planned the H2MED pipeline to transport hydrogen from North Africa to European markets. Both decisions were taken already in October 2022. Additionally, the Carbon Border Adjustment Mechanism began to be implemented, and

[56] Boltz, W., K.D. Borchardt, T. Deschuyteneer, J. Pisani-Ferry, L. Hancher, F. Lévêque, B. McWilliams, A Ockenfels, S. Tagliapietra and G. Zachmann, "How to Make the EU Energy Platform an Effective Emergency Tool," Bruegel, June 12, 2022, https://www.bruegel.org/policy-brief/how-make-eu-energy-platform-effective-emergency-tool.

[57] Directorate-General for Neighbourhood and Enlargement Negotiations, "The EU and Morocco Launch the First Green Partnership on Energy, Climate and the Environment ahead of COP 27 - European Commission," neighbourhood-enlargement.ec.europa.eu, October 18, 2022, https://neighbourhood-enlargement.ec.europa.eu/news/eu-and-morocco-launch-first-green-partnership-energy-climate-and-environment-ahead-cop-27-2022-10-18_en#:~:text=The%20EU%2DMorocco%20Green%20Partnership.

more active participation and funding were seen in initiatives such as COP27 and the Just Energy Transition Partnerships (JETP) with India, Indonesia, Vietnam, and Senegal. [58]

Overall, all new contracts and strengthened energy and resource ties, especially with the Caucasus and Gulf regions, once again prove that the EU is willing to cooperate with non-democratic and even authoritarian states. At least when constrained and arbitrarily isolated from Russia's resources. Despite these multiple hurdles and objective limitations, the EU has given ecological commitments a new central place in its geopolitical strategy. This can be explained by the fact that to the point green transition in a broad sense became a part of the political identity of the Union's political elites. [59]

In addition, before the end of the term of office of this cabinet of the European Commission 2019-2024, it is planned to adopt and finalise initiatives such as Energy Performance of Buildings (EPBD), Electricity Market Design, Renewable Gasses and Hydrogen Package, Sustainable Products Initiative, Net-Zero Industry Act (NZIA legislation), Critical Raw Material (CRM legislation), etc.

European Security and New Green Agenda

The European Union has been neglecting the issues of energy security and safety for some time. These matters have been marginalised from the political agenda, which has resulted in a situation of clear insecurity. Now the Union finds itself at a defining moment, where the pursuit of energy security intersects with the pressing need for environmental sustainability. Two uncomfortable truths underline this topic: the persistent reliance on fossil fuels and the long-standing oversight of the geopolitical intricacies involving a key regional player, Russia. Despite the ambitious targets set out in the European Green Deal and others, the EU's energy mix remains heavily reliant on fossil fuels, which poses significant risks to both energy security and climate objectives. Furthermore, the unpredicted Russia's energy politics highlights the vulnerability and strategic dependencies within the EU. As the Union strives to transition towards greener and more secure energetics, it must navigate these complex realities. This posed the politicians and

[58] Katherine Kramer, "Just Energy Transition Partnerships: An Opportunity to Leapfrog from Coal to Clean Energy," International Institute for Sustainable Development, December 7, 2022, https://www.iisd.org/articles/insight/just-energy-transition-partnerships.
[59] Marco Giuli and Sebastian Oberthür, "Third Time Lucky? Reconciling EU Climate and External Energy Policy during Energy Security Crises," *Journal of European Integration* 45, no. 3 (April 3, 2023): 395–412, https://doi.org/10.1080/07036337.2023.2190588.

ordinary citizens with many complicated questions on issues they have never needed to decide on.

Continuing discussion on the dilemma, we can state that there is also conflict between short-term energy security and long-term sustainability goals. The necessity to replace Russian gas has resulted in a notable surge in the demand for LNG. This has triggered a 'scramble to locate new suppliers' and investments in new gas infrastructures such as terminals, pipelines, and storage facilities. [60] While these measures address the immediate security concerns arising from the war, they also raise concerns about potential lock-in effects. It can be suggested that these investments could create a long-term dependence on liquefied gas, thereby hindering the transition to green energy sources and potentially leading to stranded assets. The question of such enormous changes includes many dilemmas and uncertainties which as a result can also not pay off.

They argue that framing energy in terms of geopolitical security has been a recurring practice in the EU, often leading to rapid policy responses and reinterpretations of energy goals. The authors highlight that a renewed focus on the security of supply tends to coincide with a relative demotion of environmental and energy equity concerns. Bringing certain issues to the forefront of societal debate can facilitate the adoption and resolution of issues that would otherwise be politically and legally challenging. It also encourages policymakers to look for immediate solutions in the existing toolkit, rather than being inventive and flexible in using more risky and/or innovative options.

Another side of security is presented by E. Hill who introduces the concept of geopolitical risk (GPR) into the discussion of the security of supply issues. He argues that these risks in fossil fuel supplier countries have a multifaceted impact on the diffusion of renewable energy in Europe. [61] First and foremost, increased GPR resulting from events such as wars or political instability in these supplier countries can act as a catalyst for the diffusion of renewable energy. Energy security concerns drive this, as countries seek to reduce their dependence on volatile fossil fuel imports that are beyond their direct control. In addition, GPP-induced fluctuations in fossil fuel prices, particularly during peak periods, can make renewable energy sources more economically competitive, further encouraging their

[60] Caroline Kuzemko et al., "Russia's War on Ukraine, European Energy Policy Responses & Implications for Sustainable Transformations," *Energy Research & Social Science* 93, no. 102842 (November 1, 2022): 2–5, https://doi.org/10.1016/j.erss.2022.102842.

[61] Erik Hille, "Europe's Energy Crisis: Are Geopolitical Risks in Source Countries of Fossil Fuels Accelerating the Transition to Renewable Energy?," *Energy Economics* 127 (November 1, 2023): 5–6, https://doi.org/10.1016/j.eneco.2023.107061.

uptake. However, the relationship is not always straightforward. The impact of GPR can vary depending on the type of fossil fuel (for example, coal, oil, gas) and the specific renewable energy technology (wind, solar etc.). In addition, factors such as the degree of import dependency and prevailing electricity prices can strengthen or weaken the effect of GPR. Overall, while GPR is generally supportive of renewable energy diffusion in Europe, the interplay of different factors requires a nuanced understanding of this relationship to inform effective energy policies. However, an understanding of this issue should be at the forefront of policymakers' minds. Properly applied, this understanding can help to gain an advantage in the transition to renewables and in meeting the targets set by adopted packages and individual country targets.

However, there are also clear challenges in the way of transitioning which in turn are not ambiguous and not as favourable as GPRs could be. The decentralised nature of renewable energy generation makes it vulnerable to cyber-attacks. The EU's strong stance against Russia increases the risk of cyber threats to European infrastructure, as evidenced by recent attacks on German renewable energy companies by Russian hackers. In addition, the renewable energy sector's technological dependence on China poses another significant risk. China dominates the global production of key components for photovoltaic panels, wind turbines and lithium-ion batteries. [62] This reliance on a single, often politically volatile supplier, coupled with the need for critical raw materials such as nickel, lithium and cobalt, which are also largely imported from outside the EU, highlights the urgency for the EU to diversify its supply chains and increase its technological independence to ensure the stability and security of its renewable energy infrastructure. Transition touches directly not only on the sector of energy but also a wide range of economic ties both within Europe and far outside of it. Ambitious transition requires a very technical detailed and balanced approach, engaging specialists from different areas. All in all, it shows that renewable energy as a complex structure should be maintained not only by politicians but also by professionals from the field who would ensure that the processes happen on solid ground.

One of the aims of the REPowerEU plan outlined above is to increase the security of the European Union. The first and main objective is to reduce Russia's income from gas

[62] Zuzanna Nowak, "The EU and RES: From Fighting Climate Change to Fighting Russia," Pism.pl, August 31, 2022, https://www.pism.pl/publications/the-eu-and-res-from-fighting-climate-change-to-fighting-russia.

supplies. This idea is simple and hardly questioned. However, as F. Battaglini points out, money doesn't equal efficiency, and if we assume that European weapons are superior and more efficient, Europe could continue to buy cheap Russian energy and invest the savings in its military, thus maintaining an advantage over Russia. This presents a moral dilemma, which, in terms of ensuring one's own security, can be disregarded.

The author also put the Green Deal into a new light by examining the likely impact of the deal on the EU's military security in relation to Russia by analysing its effect on intra-elite competition in modern Russia. The author's political economy model examines the strategic interaction between the two groups as a contest. In this contest, each group exerts effort to win control of the energy revenues, and the probability of winning is determined by a contest success function (CSF). The group that wins the contest gains full control of the energy revenue, which can then be used to produce private and club goods. The model assumes that the smaller group 'S' (siloviki, the military) prefers private goods, while the larger group 'T' (tsiviliki, the civilians) prefers club goods. The model is solved by backward induction, first determining the optimal allocation of energy revenue between private and club goods for each group, and then determining the optimal level of effort for each group. The main result of the model is that a decrease in energy revenue would decrease the probability of the larger group 'T' winning the contest. This is because the larger group has a lower marginal utility of private consumption than the smaller group. As a result, a decrease in energy revenues would have a greater negative impact on the utility of the larger group, leading them to reduce their effort in the contest and thus group 'S', the military, making it more likely that the siloviki would win. [63]

Given Europe's political goal of energy independence from Russia, a political economy analysis of the situation is crucial, especially with the current implementation of the European Green Deal and the REPowerEU plan. All in all, the author concludes that The EGD doesn't make Europe safer from Russian aggression. It may weaken Russia's military funding, but it won't change Russia's motivation to arm itself or attack its neighbours. This is because the EU has limited leverage over the country's political elite – sanctions are not as effective as they should be. On the other hand, supporting the

[63] Fabian Battaglini, "Will the European Green Deal Enhance Europe's Security towards Russia? A Political Economy Perspective," *Energy Economics* 134 (June 1, 2024): 3–7, https://doi.org/10.1016/j.eneco.2024.107551.

opposition is also ineffective because it has no influence on political processes in a closed authoritarian system.

In addition to the indirect impact described, the discussions raise other important security and energy security development issues. At the European Sustainable Energy Week (EUSEW) in June 2024 in Brussels, a thematic panel about energy security was held. Experts and policy-makers participated in this panel, facilitated by Norela Constantinescu, Deputy Director of the International Renewable Energy Agency, who expressed many useful insights into the industry. With no surprise, the panel's overall message is one of shared optimism that the challenges can be addressed and that Europe can achieve its energy security goals. However, the EU truly needs to invest and update many aspects of its energy all over the continent. Interestingly, they expressed multiple attention to the European energy grid. The EU has set ambitious targets that will require significant investment in infrastructure modernisation and development, especially in a grid. They pointed out that to deliver on these targets, Europe needs to invest in increasing and doubling cross-border transmission capacity, smart grid solutions and energy storage technologies. Digital innovation is also needed to use weather data for advanced analytics and long-term forecasting. Cooperation between all actors involved in grid planning and implementation is crucial for successful grid modernisation and development. In addition, transparent data sharing is essential to improve decision-making. [64] This shows us the complexity of the question of European energy security. This issue is multilevel and extremely diverse, thus it requires the involvement of actors at different levels too. The same idea was expressed by Stulberg back in 2017, who emphasised the need for steps to enhance the integration of the internal energy market and boost energy efficiency. [65] An eloquent example is the fact that after the beginning of the war, a major difficulty in numerous countries was the inadequate infrastructure for ships transporting raw materials and the insufficient storage facilities.

[64] euenergyweek, "EUSEW2024 | Energy Security: The Need for a Climate Resilient and Modernised Grid," YouTube, June 12, 2024, https://www.youtube.com/watch?v=syNfLfDciOs&list=WL&index=18&t=305s.

[65] Adam N. Stulberg, "Natural Gas and the Russia-Ukraine Crisis: Strategic Restraint and the Emerging Europe-Eurasia Gas Network," *Energy Research & Social Science* 24 (February 2017): 71–85, https://doi.org/10.1016/j.erss.2016.12.017.

REPowerEU Plan – a blueprint of a change

The European Commission took early action, proposing a draft plan on March 8, 2022, and finally adopted in February 2023, to completely stop importing Russian gas by 2030. This goal is designed to be achieved by replacing 155 bcm of natural gas in the 2021 volumes with renewable energy. To be exact, 45% of gross energy consumed has to be produced as green energy. This plan was called REPowerEU and had to serve 'for increasing the EU's energy autonomy and boosting clean energy.' It lay in the framework of the European Green Deal and specifically had to boost European resilience in the short term with a key emphasis on mandatory gas storage in sufficient quantities. The REPowerEU plan is expected to unlock €210 billion by 2027 for clean energy investment. The EU's Fit for 55 package remains the main tool they plan to use to achieve this independence from Russian fossil fuels.[66] In fact, 85% per cent of Europeans think that the EU should swiftly reduce its reliance on Russian gas and oil to aid Ukraine. [67] This showed a strong consensus among Europeans for the EU to prioritise reducing its energy dependence. The question remains open as to the role of securitisation and whether this was a deliberate or a natural reaction to the events that posed a direct threat to the Union and Member States.

The plan also foresees action in two directions:

- to expand and diversify gas supplies by increasing imports of LNG, doubling production of sustainable bio-methane and increasing production and imports of renewable hydrogen and
- to speed up the transition to clean energy by encouraging the installation of solar panels on residential and commercial buildings and doubling the rate of heat pump installations.

In addition, the plan consists of the next four main actions:

1. Save energy – by reducing gas and oil consumption,
2. Diversify supply – by intensifying LNG terminals and developing methane supplies as well as hydrogen market,

[66] Agata Łoskot-Strachota, "The EU Gas Market and Policy and the War in Ukraine," Centre for Eastern Studies, March 11, 2022, https://www.osw.waw.pl/en/publikacje/osw-commentary/2022-03-11/eu-gas-market-and-policy-and-war-ukraine.
[67] European Commission, "Eurobarometer: Europeans Approve EU's Response to the War in Ukraine," European Commission, May 5, 2022, https://ec.europa.eu/commission/presscorner/detail/en/ip_22_2784.

3. Substitute fossil fuels – to fast-track the transition to renewable energy,
4. Speed up innovation – to support the development and implementation of new technologies and grow the effectiveness.

Under the REPowerEU plan, the European Commission has directed 17 European nations, including Spain, Italy, and Poland to adopt a technical package aimed at helping them transition away from Russian fossil fuels by improving energy efficiency and implementing renewable energy sources. [68]

Preliminary calculations already show some clear positive steps towards the target. The share of electricity generated from variable renewable energy sources (RES), including hydro, solar and wind, is projected to increase significantly from 17% to 71% of total consumption by 2030. This shift away from fossil fuels, particularly natural gas, will significantly reduce natural gas-based electricity generation. [69] The reduction in natural gas consumption resulting from this transition is estimated to be equivalent to the elimination of 97 bcm of natural gas, an amount that is more than two-thirds of the natural gas imported from Russia in 2021. In contrast, if the European Union continues to install solar and wind power at the same rate as in 2022 until 2030, it would only achieve 80% of the targeted solar capacity and 62% of the targeted wind capacity by that year.

It is noteworthy that this plan does not include nuclear power, although this has been discussed, for example, in the European Parliament. The EC also plans to increase the production of biomethane in the EU and speed up the production and import of green hydrogen, although the effects of these measures will not be felt for several years but more.

However, the plan is not left without criticism. The nature in which this document created, this 'green growth' narrative, can be questioned itself. Being presented as an undoubted public benefit, sometimes the reality behind this idea misleading. For example, the specificity of this narrative lies in its critique of methodological metric calculations used in drafting the document, which assumes that national systems are isolated and ignore the

[68] M. Kravchenko et al., "Changes in the Energy Supply Strategy of the EU Countries amid the Full-Scale Russian Invasion," *IOP Conference Series: Earth and Environmental Science* 1126, no. 1 (January 1, 2023): 7–8, https://doi.org/10.1088/1755-1315/1126/1/012035.
[69] David Ah-Voun, Chi Kong Chyong, and Carmen Li, "Europe's Energy Security: From Russian Dependence to Renewable Reliance," *Energy Policy* 184 (January 1, 2024): 3–6, https://doi.org/10.1016/j.enpol.2023.113856.

interconnectedness of global environmental issues. Hence, the desired better result in statistics is achieved.

Questions arise about its feasibility. The feasibility of achieving planned gas usage reductions amidst rising EU energy consumption was questioned. In other words, it was not enough elaborated and thus not clear how the EU was going to secure 60 bcm of non-Russian gas, including 50 bcm of LNG, by the end of the year on the background of high costs and competition with Asian markets. This is one example of a direct question related to the numbers. There are also multiple concerns from a strategic perspective.

For example, the EU is readily signing new agreements with countries such as Qatar, Egypt or Azerbaijan, which would normally be condemned as illiberal and authoritarian. Next, the EU is increasing its cooperation and dependence on China, especially in the production of solar panels and other related products. In particular, solar panel production in China has been in turmoil due to atypical phenomena of overproduction. The market has experienced a rapid decline as prices have also fallen sharply – by 42% in 2023. [70] So far cheap and massive production filled European storages with all-possible types of goods, including strategic ones. Using the Herfindahl-Hirschman-Index (HHI), it was found that alternative scenarios of trade without China show much lower levels of import concentration, highlighting its significant impact. [71] Moreover, China has major deposits of rare minerals such as lithium and does not hesitate to use them as a foreign policy tool to exert pressure.

Green growth itself as the idea that economic growth can be decoupled from resource use and environmental impact was questioned by R. Vezzoni. The author argues that this concept is flawed and that the pursuit of economic growth, even if it is 'green', will inevitably lead to increased resource use and environmental degradation. [72] The author also criticises the EU's reliance on single metrics, such as greenhouse gas emissions, to measure progress, arguing that this approach ignores the broader planetary processes involved in climate change. Instead, the author calls for a more holistic analysis that

[70] Andrew Hayley, "China Solar Industry Faces Shakeout, but Rock-Bottom Prices to Persist," *Reuters*, April 3, 2024, https://www.reuters.com/business/energy/china-solar-industry-faces-shakeout-rock-bottom-prices-persist-2024-04-03/.
[71] Lennard Welslau and Georg Zachmann, "Is Europe Failing on Import Diversification?," Bruegel, February 20, 2023, https://www.bruegel.org/blog-post/europe-failing-import-diversification.
[72] Rubén Vezzoni, "Green Growth for Whom, How and Why? The REPowerEU Plan and the Inconsistencies of European Union Energy Policy," *Energy Research & Social Science* 101 (July 1, 2023): 2–12, https://doi.org/10.1016/j.erss.2023.103134.

considers the complex articulation of multiple ecological crises and the political economy of energy transitions. In the conclusions, the author summarises the paper's main findings, emphasising that the EU's energy transition is not a true transformation, but rather a superficial change that maintains existing economic structures.

Revised Fit for 55 package

The European Commission's above-described REPowerEU plan also included a targeted amendment to the Energy Efficiency Directive (EED) to accelerate energy saving as a part of a broader legislation proposal, of Fit for 55. [73] This amendment, together with the Fit for 55 package, aims to significantly reduce energy consumption, with heating demand expected to fall by around 2 bcm by 2030.

The European Commission proposed that by significantly increasing photovoltaic and wind energy capacity, as outlined in the Package, the EU could substantially reduce its reliance on natural gas. This would require streamlining approval processes for new projects and accelerating the adoption of heat pumps and improved building insulation. Additionally, the EC emphasizes energy efficiency measures, both at the industrial level and through behavioural changes in households, such as lowering thermostats by one degree less.

The EU Council has adopted new regulations to facilitate the transition from fossil fuels to renewable and low-carbon gases, particularly hydrogen. The legislative initiative aims to modernise the 2009 gas regulation and directive and update the 2017 regulation on the security of gas supply. The regulation establishes a framework for the development of the hydrogen market over the next 10 years and promotes the integration of renewable gases into the energy system. It also aims to protect vulnerable customers and those experiencing energy poverty through measures such as protection from disconnection and ensuring continuity of supply. Member States had two years to adapt their national legislation. [74]

[73] Alex Wilson and Nicola Danti, "Revising the Energy Efficiency Directive: 'Fit for 55' Package," *European Parliament*, November 2023, https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698045/EPRS_BRI(2021)698045_EN.pdf.
[74] Council of the EU, "Fit for 55: Council Signs off on Gas and Hydrogen Market Package," May 21, 2024, https://www.consilium.europa.eu/en/press/press-releases/2024/05/21/fit-for-55-council-signs-off-on-gas-and-hydrogen-market-package/.

Diversification and Russian Gas

Multiple researches prove that the index of energy security is unevenly distributed. Western and Eastern European countries have better positions due to multiple factors. Among these are facts of more developed energy infrastructure and a richer and already diversified energy mix. Especially these two regions perform better than the Southern one. Moderate Central Europe's region represented by Germany and France holds a relatively good state due to the diversified energy mix and comparatively well-developed nuclear power sector in France. [75] It is not surprising that diversification as an approach to energy became a core objective of the EU's energy policies. At the same time, it continues to be the biggest practical goal in terms of the Union's security.

Diversification became one of the central approaches to securing its energy, however, despite all efforts in some countries dependence increased. This highlights that many more other approaches should be deployed. In the EU, developing clean energy production, including solar, wind, hydrogen, and biomethane, is recommended as a method to diversify the energy supply. It was projected that by the end of 2022, renewable energy sources could replace approximately 20 bcm of imported gas in the EU.

Right after the beginning of the war various researchers tried to answer the question of what the consequences could be of abandoning Russian gas as well as other sources. This could help to find out what would be the most optimal tactics. In their May 2022 article, Chepeliev et al. divided the analysis into short-term and long-term perspectives. Their analysis of the short-term consequences highlighted that such restrictions would likely lead to higher energy prices in importing regions, negatively affecting net energy importers such as the EU, while benefiting exporters in Central Asia, the Middle East and North Africa. The EU could face energy price increases of 8-11%. In the long term, however, the negative impact is much more modest, accounting for only about 0.04% of annual growth in 2030. In addition, there could be environmental benefits from reduced CO_2 emissions. Noting uneven regional economic development and dependence on

[75] Dalia Streimikiene, Indre Siksnelyte-Butkiene, and Vidas Lekavicius, "Energy Diversification and Security in the EU: Comparative Assessment in Different EU Regions," *Economies* 11, no. 3 (March 1, 2023): 13–14, https://doi.org/10.3390/economies11030083.

Russian gas, the authors point to the greater vulnerability of Eastern Europe due to its already higher household energy bills. [76]

Possible ways of development

While most of the European Member States are reforming their energy policies in such a way as to minimise their dependence on Russian raw materials. Many scientists and analysts agree that the best way to increase their independence and get rid of energy shortages will be to increase the share of renewable sources in the energy sector. It is important to remember, however, that these measures require considerable time and investment. Thus, we can see that there is no universal answer on how to overcome existing problems with energy supply and secure it for upcoming decades. Events are not settling down and it is not known what the configuration of European politics will be in the near future. The European Parliament elections in 2024 bring additional uncertainty. This is why a number of scholars are trying to predict the most likely solutions in politics, energy and international relations. They proposed a simple framework of three possible ways in which the development of EU's policies can go:

1. Return to the traditional liberal market model. The essence of this approach is prioritising price and competition but leaving the EU vulnerable to future energy weaponisation and high-cost crises. It may not be economically worthwhile for many companies due to existing long-term and high-priced LNG contracts.
2. Building a more robust regime. Focuses on resilience in the political and environmental costs of a liberal market. This includes improving storage, LNG import facilities and market interconnections, as well as accelerating the faster transition to renewables. It combines market competition with risk management (in the form of intervention) but contrarly results in higher energy prices for consumers and the industry as a cost of transition.
3. A stronger role for government. Prioritises energy security and a rapid, government-led green transition. This includes promoting national or European energy champions, adopting a more protectionist approach to trade and potentially reducing the role of market competition in setting prices. Both the short-term costs and the long-term benefits are higher in this scenario. Bearing in mind the political

[76] Maksym Chepeliev, Thomas Hertel, and Dominique van der Mensbrugghe, "Cutting Russia's Fossil Fuel Exports: Short-Term Economic Pain for Long-Term Environmental Gain," *The World Economy* 45, no. 11 (June 3, 2022): 3321–26, https://doi.org/10.1111/twec.13301.

mainstream of the EU leadership this scenario can gain even more commitment. Largely it will depend on the results of the ongoing war. [77]

There are three major channels through which market-mediated responses to higher energy prices could soften the transition away from Russian energy imports: reduction in energy demand, stimulation of domestic fossil fuel production, and a shift towards carbon-free energy sources. As we can see, the EU has been trying to deploy three of them at the same time. However, it can be understood not as chaotic actions but use of multiple methods as the instrument which the EU can simply afford.

Germany as a Leader of Change

Germany is the undisputed economic and political leader of Europe. The German economy has always been strong and requires a lot of energy to maintain. This country and its leaders set the tone for the whole EU and provide an example for action. Its initiatives are at the top of the EU agenda, but Germany itself is sometimes bulky when it comes to rapid change. The recent crisis put the country in an awkward position when it was called upon to act robustly and quickly, to take decisions and to explore know-how. The example of how Germany faced the crisis and how it acted is important to consider in order to see how the EU, on behalf of its leader, saw the politics and perceived its own energy security. The example of Germany is eloquent and illustrative for many reasons, but the most important is that Germany has tried many different approaches to its energy supply. Analysing them will help us to see which solutions have worked and which have been a mistake or even lobbying.

The response of Germany and the EU was twofold: reduction of gas supply and diversification of energy sources. The latter mainly involves the rapid development of renewable energies and the search for new energy sources, such as hydrogen and biomethane. For a long time, Germany did not want to build facilities to import liquefied natural gas because it could get cheaper gas directly from Russia through pipelines. Only with the beginning of the full-scale invasion of Ukraine, Germany met a decision to immediately reduce its gas demand by almost 15%, freeing up more volumes for its economy, and then began to rapidly develop LNG. [78] Germany moved quickly to establish

[77] Goldthau and Sitter, "Whither the Liberal European Union Energy Model?," 4–7.
[78] Michał Kędzierski, "Commentary Germany: How the Gas Sector Changed in the Crisis Year of 2022," *Centre for Eastern Studies*, January 12, 2023, https://www.osw.waw.pl/en/publikacje/osw-commentary/2023-01-12/germany-how-gas-sector-changed-crisis-year-2022.

itself as a European energy hub by accelerating the construction of natural gas terminals. Within a year, Germany implemented special legislation to streamline the permitting process, enabling the rapid development of seven floating and three land-based terminals. This initiative positions Germany to become a major supplier of natural gas to its neighbours and reinforces the country's commitment to using natural gas as a transitional fuel during its transition to renewable energy sources. [79] In this regard, Germany has ambitious plans to almost triple its wind and solar energy capacity by 2030, increasing production from 440 GWh/day in 2021 to around 1,200 GWh/day. [80] Altogether these actions led Germany to the point when in March 2024, two years later, minister of finances, Robert Habeck, finally announced that the energy crisis was over.

By the end of 2022 German government nationalised Uniper, the largest European gas importer from Russia, for a total price of more than €50 billion. [81] Later, another one distinctive and unprecedented event in the history of the EU is that German energy concern Uniper won a lawsuit dated back to 2022 against Russian gas company Gazprom Export in the Stockholm Arbitration Court. After the win, German concern immediately cancelled all formally remaining valid long-term contracts with the Russian company. Some of them were supposed to be terminated only in the mid-2030s. [82] This means that Russia, represented by Gazprom, will no longer be able to use the courts to gain income from take-or-pay contracts.

According to Electricity Maps, only three countries in Europe have very low CO^2 emissions – around 50 grams per kWh and less. These are Sweden, Norway and France. Such positive figures can be explained by their balanced energy mix. It includes intensive use of renewable energy sources and nuclear power, or heavy reliance on one of them. Conversely, Germany, which has long promoted green energy and other environmental initiatives, has one of the highest carbon emissions in the EU. Specifically, 431 g/kWh in

[79] Michał Kędzierski, "At All Costs. Germany Shifts to LNG," osw.waw.pl, April 28, 2023, https://www.osw.waw.pl/en/publikacje/osw-commentary/2023-04-28/all-costs-germany-shifts-to-lng.

[80] Alexandra Gritz and Guntram Wolff, "Gas and Energy Security in Germany and Central and Eastern Europe," *Energy Policy* 184 (January 1, 2024): 4–6, https://doi.org/10.1016/j.enpol.2023.113885.

[81] Reuters, "Gas Giant Snipers Rapid Road to German Nationalisation ," reuters.com, December 19, 2022, https://www.reuters.com/business/energy/gas-giant-unipers-rapid-road-german-nationalisation-2022-12-19/.

[82] Uniper, "Uniper Terminates Russian Gas Supply Contracts," uniper.energy, June 12, 2024, https://www.uniper.energy/news/uniper-terminates-russian-gas-supply-contracts.

2023. [83] This is eight times more than France and more than ten times more than Sweden. This can be explained by Germany's decision to phase out nuclear power in the midst of the energy crisis. Belgium, in the same situation, decided to postpone its decision by ten years in order to have a smoother energy transition. [84]

The future of Germany's NPPs was decided back in 2011 when 'Chancellor Angela Merkel decided to pivot 180 degrees and abandon nuclear following the Fukushima accident'. This can be called a strategic mistake result of which we can witness only a decade later. Almost certainly Germany will miss the decarbonisation goals in 2030. [85] Before the phase-out of nuclear power plants, nuclear energetics in Germany constituted 44% of the general production. This can be compared to the top producers in Europe, such as France and Slovakia. [86] It is also noteworthy that Germany has rejected the use of NPPs on ecological grounds, yet continues to purchase electricity from France, which generates the majority of its electricity from nuclear power. This creates a paradoxical situation in which the declared actions do not match the actual actions. Most likely, existing German NPP capacities would save expenditures for the creation of LNG ports and reduce emissions. While it is not a definitive solution, it could have exerted a beneficial influence for a period of several decades.

The episodes of Germany's decisions described above show how ambiguous the policy of the EU leader is. The results of some decisions become clear to us only with the passage of time, sometimes several decades. At the moment, we can see that Germany has firmly decided to move away from Russian gas in pipes and switch to LNG, as well as to develop and increase the share of renewable energy sources. The stubborn disregard for nuclear energy, as we have seen, is sometimes at odds with the goals set, even if they initially seem to coincide. Germany, like the EU, is building a decarbonised future using different methods. Only time will tell which of these will be effective and which will not.

[83] Giacomo Luciani, "Nuclear Energy in Europe: It's Time to Consider Outcomes," *The Oxford Energy Forum*, no. 139 (February 2024): 41–43, https://www.oxfordenergy.org/wpcms/wp-content/uploads/2024/02/OEF-139-.pdf.
[84] Politico, "Belgium Delays Nuclear Phaseout amid War Worries," POLITICO, March 19, 2022, https://www.politico.eu/article/belgium-delays-nuclear-phase-out-amid-war-worries/.
[85] Luciani, "Nuclear Energy in Europe: It's Time to Consider Outcomes," 42
[86] Szymon Kardaś, "Striking a Balance: Assessing the Role of Nuclear Energy in the European Union's Energy Transition," *The Oxford Energy Forum*, no. 139 (February 2024): 53, https://www.oxfordenergy.org/wpcms/wp-content/uploads/2024/02/OEF-139-.pdf.

Chapter 3: Nuclear Power's Role in Energy Security

As the European Union moves towards a decarbonised future, the role of nuclear power in its energy mix presents a complex and multi-faceted challenge and opportunity. On the one hand, nuclear energy has a low carbon footprint, a significant advantage over traditional fossil fuels, which remain the world's main source of energy. And it seems more than obvious and logical to use this opportunity both to solve the problem of decarbonising economics and to strengthen energy security. On the other hand, concerns about nuclear waste disposal, safety risks and past accidents such as Chernobyl-1986 and Fukushima-2011 cast a long shadow over public and political opinion. Only a small number of countries continue to invest in the sector, demonstrating its long-term benefits. This chapter explores the current position of nuclear power within the EU's transition to renewable energy sources. It explores the arguments for and against the continued use of nuclear power and examines the potential future prospects for this controversial energy source and future scenarios: complete phase-out or advancement in technology and safety protocols to pave the way for a more sustainable role in the EU's energy landscape.

Within the EU the question of using nuclear energy is more than contentious. Some countries, such as Austria, fiercely and consistently oppose the idea of developing and even maintaining existing power plants. Due to the strength of the 'green energy' trend, some of the EU's nuclear capacity will be lost due to the closure of nuclear plants at the end of their life or even due to political intervention, as happened in Germany. By April 2023, all thirty-three NPPs were permanently closed, and Germany's so-called 'Atomausstieg' had been finished. [87] Their decision was primarily motivated by safety concerns. The key issues were possible radioactive irradiation and highly toxic waste. [88] Finally, the construction of new power plants is not progressing at the necessary pace.

Contrary to the recent decisions of Germany, the European Nuclear Society is concerned that, despite the EU's commitment to combating climate change, some EU Member States are prioritising reducing the contribution of nuclear power, for example by replacing its

[87] Benjamin Wehrmann , "Q&A - Germany's Nuclear Exit: One Year After," Clean Energy Wire, March 26, 2024, https://www.cleanenergywire.org/factsheets/qa-germanys-nuclear-exit-one-year-after#:~:text=The%20three%20last%20remaining%20nuclear.

[88] The Federal Office for the Safety of Nuclear Waste Management, "The Nuclear Phase-out in Germany," April 19, 2023, https://www.base.bund.de/EN/ns/nuclear-phase-out/nuclear-phase-out_node.html#:~:text=The%20last%20three%20nuclear%20power%20plants%20in%20Germany%20were%20shut.

capacity with coal. They argue that the risks associated with nuclear power are manageable and outweighed by its benefits. In addition, they point out that achieving full decarbonisation in any scenario requires the participation of nuclear power. [89] While this organisation's position could be accused of bias and self-interest, their commentary provides relevant commentary to the general discussion.

One of the bright examples of the EU's collective attitude to nuclear power can be seen back in 2004 when Lithuania joined the EU. At that time nuclear power was highly unpopular. One of the key requirements that Vilnius had to meet in order to become an EU member was the closure of the Ignalina Nuclear Power Plant. This NPP produced almost 80% of the electricity consumed in Lithuania. Between 2010 and 2020, the EU allocated €450.8 million for the closure of the plant, and a total of €3.4 billion will be spent by 2038. After the closure of the Ignalina NPP in 2009, Lithuania went from an energy surplus state to an energy deficit state, and the government had to look for new sources of energy supply, including purchases from Russia. [90] These resulted in multiple negative consequences for the country. Besides considerable money investments, it influenced negatively not only the security of the country but of the whole microregion. Additionally, the prices for consumers country-wide significantly increased. Retrospectively, we can conclude that this decision only hurt the country, turning the country into an importer of electricity, and not an exporter as it was before.

Knowing this, we can reveal a connection between the pro-active position of most of the Eastern European countries and their more vulnerable geographical and geopolitical position which has been already discussed. In more general terms, we can see a broader camp of those who support the idea of nuclear energetics. A recent example of this is a call of France for stronger EU policies on nuclear energy. Besides France, the undisputed leader of nuclear energy in Europe, Bulgaria, Croatia, the Czech Republic, Finland, France, Hungary, the Netherlands, Poland, Romania, Slovakia, Slovenia and Sweden supported its ambitions in the more robust development of the nuclear sector in the EU. Thus, we can designate two opposing camps, one under the leadership of France and the

[89] European Nuclear Society, "The Important Role of Nuclear in a Low-Carbon World: The Position of the European Nuclear Society's High Scientific Council ," *Euronuclear.org*, October 2019, https://www.euronuclear.org/scientific-resources/position-papers/#.
[90] Ivan Yakoviyk and Maksym Tsvelikh, "Energy Security of the European Union in the Context of Russian Aggression against Ukraine," *Problems of Legality*, no. 160 (March 30, 2023): 178–79, https://doi.org/10.21564/2414-990x.160.274518.

second led together by Austria and Germany. [91] This divide is confirmed by the 2008 Eurobarometer report, which shows that almost the same groups are positive or rather positive (44%) and negative or rather negative (45%) towards the production of nuclear energy. [92]

Advantages and Challenges of Nuclear-Powered Energetics

Nuclear power offers the advantages of both renewable sources and standard fossil fuels. This can be regarded as a good starting point for considering future prospects of the development of this type of energy. Nuclear power plants can provide uninterrupted electricity supply around the clock, regardless of weather conditions, temperature, wind strength or season. To put this in perspective, the world's nuclear fleet in 2021 could have powered the entire economy of India for two years, while the total electricity lost at nuclear plants due to weather is equivalent to about 88 minutes of consumption in Dubai. [93] This demonstrates the resilience of nuclear power plants to extreme weather conditions, with a negligible effect on overall electricity generation.

As it is a low-carbon energy source, this is fully compliant with the main EU policy documents, including the European Green Deal and the REPowerEU plan. A study by the UN's Economic Commission for Europe (UNECE) in March 2022 found that nuclear power has the lowest CO_2 emissions among low-carbon technologies, ranging from 5.1 to 6.4 grams of CO_2 equivalent per kilowatt-hour. Over its lifetime, nuclear power produces about the same amount of CO_2 emissions per unit of electricity as wind power and about a third less than solar power. [94] In fact, this is 30 times less than burning gas and 65 times less than burning coal. The prospects of nuclear power in meeting climate targets were also recently recognised by the G7 summit in Italy. The ministers also noted the growing role of small modular reactors, which 'could bring in the future additional benefits such as improved safety and sustainability, reduced cost of production, reduced

[91] Kate Abnett and Julia Payne, "EU Countries Split over Support for Nuclear Energy," *Reuters*, March 4, 2024, https://www.reuters.com/sustainability/climate-energy/eu-countries-split-over-support-nuclear-energy-2024-03-04/.

[92] Eurobarometer, "Attitudes towards Radioactive Waste," *Europa.eu*, June 2008, https://europa.eu/eurobarometer/api/deliverable/download/file?deliverableId=38074.

[93] International Atomic Energy Agency, "Nuclear Energy in Climate Resilient Power Systems," *Www-Pub.iaea.org*, November 2023, https://doi.org/10.61092/iaea.47gr-efvv.

[94] World Nuclear Association, "Carbon Dioxide Emissions from Electricity," world-nuclear.org, April 30, 2024, https://world-nuclear.org/Information-Library/Energy-and-the-Environment/Carbon-Dioxide-Emissions-From-Electricity#:~:text=Life%2Dcycle%20emissions%20of%20electricity%20options&text=In%20March%202022%20the%20UN%27s.

project risk, waste management improvement, better social acceptance, opportunities for industry by providing at the same time energy, high temperature heat, hydrogen'. [95] Besides that, they also recognise that nuclear power as a source can enhance global energy security. [96]

On the background of the EU's economic strive to secure and decarbonise energy supply, the best solution seems to be a sensible combination of nuclear and renewable energy. This idea is proved also by another article where in the example of wind power plants is shown that NPPs can be also accident-free with the introduction of modern smart technologies. [97] At this point, a question arises: although nuclear power looks like a saviour, it has its drawbacks, therefore what can prevent its wider use in the EU?

At first glance, nuclear energy appears to be almost a dream solution: profitable and environmentally friendly, but it has its own unique problems that reveal the complexity and difficulty of its application. The main disadvantages of nuclear power are the inherent risks associated with radioactive waste, nuclear fuel and the possibility of accidents. Incidents such as Chornobyl and Fukushima have highlighted the devastating effects of nuclear meltdowns, which can cause widespread radioactive contamination and long-term health problems for people living in the affected areas. It is important to note that the human factor, as in the case of Chornobyl, has been virtually eliminated thanks to significant technological advances. However, objective causes such as a typhoon in Japan and the Fukushima-1 accident still pose a threat and therefore remain unpredictable.

Many reactors were installed during the period of its boom by the 1980s. Thus, by 2050, almost 90% of the EU's nuclear power capacity will need to be replaced. This will require an investment of around €350-450 billion in the construction of new NPPs to produce electricity until the end of the 21st century (the lifetime of new NPPs is at least 60 years).[98]

---

[95] World Nuclear News, "Nuclear's Role in Reaching Climate Targets Recognised by G7 : Nuclear Policies - World Nuclear News," world-nuclear-news.org, April 30, 2024, https://world-nuclear-news.org/Articles/Nuclear-s-role-in-reaching-climate-targets-recogni.

[96] G7, "Climate, Energy and Environment Ministers' Meeting Communiqué," *G7 Italia*, April 2024, https://www.g7italy.it/wp-content/uploads/G7-Climate-Energy-Environment-Ministerial-Communique_Final.pdf.

[97] Mykola Tarasenko, Kateryna Kozak, and Ahmed Omeiza Lukman, "Energy Efficiency and Environmental Friendliness of Nuclear Power Plants and Wind Power Plants," *Bulletin of the National Technical University KhPI Series Energy Reliability and Energy Efficiency* 6, no. 1 (July 9, 2023): 90–91, https://doi.org/10.20998/2224-0349.2023.01.06.

[98] S. Kaltyhina et al., "Nuclear Power Industry in the Context of the European Union Energy Policy," *Nuclear and Radiation Safety* 1, no. 77 (February 19, 2018): 6–8, https://doi.org/10.32918/nrs.2018.1(77).01.

The world market for nuclear ore slightly exceeds 50,000 tonnes, with Kazakhstan dominating exports at 55%. Other sources report, though, that in 2023 exports of Kazakhstan accounted for 37.3% or 20,100 tonnes of global demand. [99] Canada follows closely with 33%, while the US contributes 7%. [100] Interestingly, Russia, a leading supplier of processed uranium to a majority of countries worldwide, also relies on Kazakhstan for its own uranium ore imports. Moreover, Russia controls a fuel cycle and still keeps a strong influence on Kazakhstan. This highlights the potential vulnerability of the nuclear energy sector if reliance on Russia for processed material continues or the new reactors will be further created on their basis. Need to note that the EU itself does not produce fuel for the reactors but imports from Canada (33% share), Russia (23.5%), and Kazakhstan (21%) as of 2024. [101] Niger also ranks high in exporting to the EU.

[99] Mining.com Editor , "Global Uranium Production to Increase 11.7% in 2024 — Report," Mining.com, February 25, 2024, https://www.mining.com/global-uranium-production-to-increase-11-7-in-2024-report/.
[100] Jingbo Louise Liu et al., "Energy Security and Sustainability for the European Union After/during the Ukraine Crisis: A Perspective," *Energy Fuels* 37, no. 5 (2023): 3319–20, https://doi.org/10.1021/acs.energyfuels.2c02556.
[101] Supply Agency of the European Atomic Energy Community, "Market Observatory," euratom-supply.ec.europa.eu, 2024, https://euratom-supply.ec.europa.eu/activities/market-observatory_en.

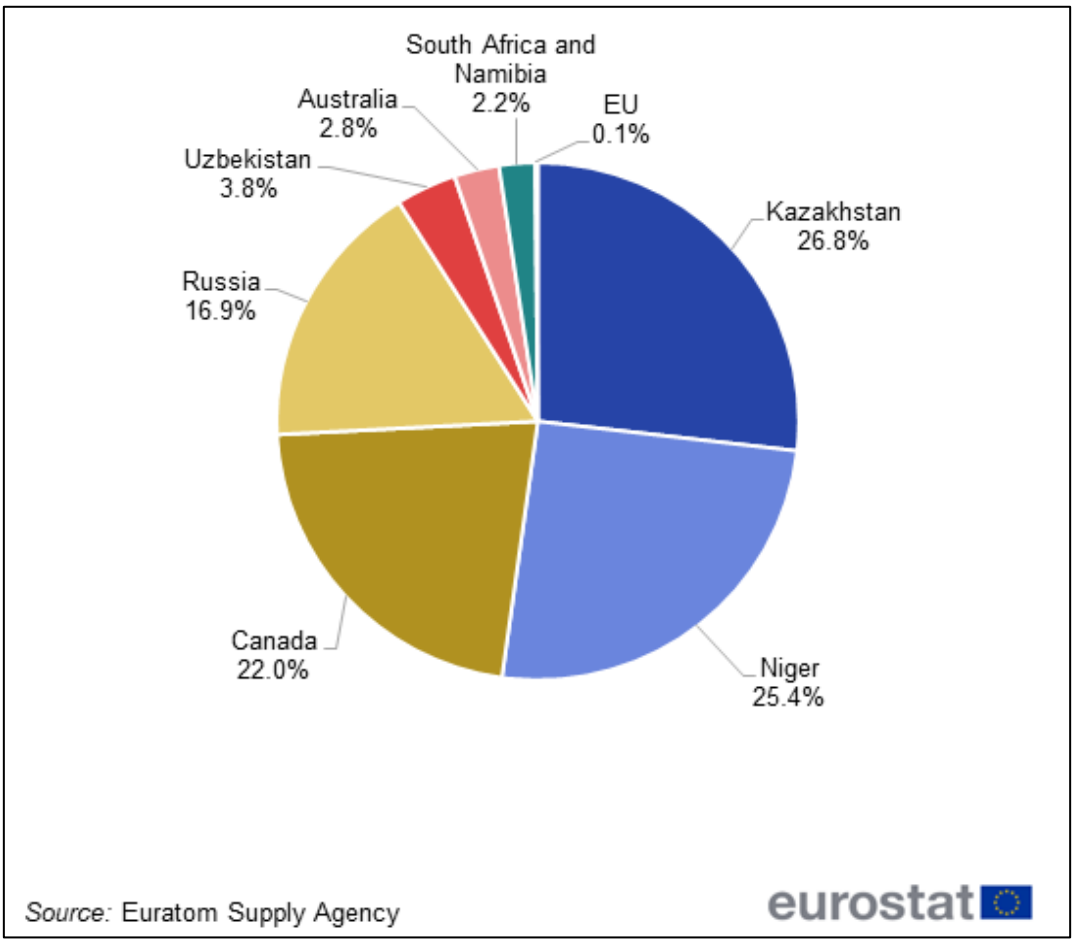

Figure 4. EU uranium supply sources in 2022

It is only at the beginning of 2026 that Finland plans to produce about 200 tonnes of uranium per year. [102] Alternative sources of uranium fuel, such as Canada or the US, would be crucial for the continued development of nuclear power. It is also important to note that current reactor designs especially in Eastern Europe require the use of Russian-made fuel rods, which presents an additional challenge for the European states seeking to diversify away from dependence on Russian nuclear resources. Especially this is relatable to the Czech Republic and Slovakia with six reactors each and Hungary with four. The latter one signed a contract to build two more. On top of that, Russia is trying to sell the installation and maintenance of the reactors as a package deal, which simply makes further cooperation and dependence inevitable.

Moreover, uranium, the most common fuel for nuclear reactors, is a finite resource and its reserves are not unlimited. In addition, the enrichment process used to produce reactor-

[102] World Nuclear News, "Terrafame to Begin Producing Uranium in 2024," world-nuclear-news.org, December 21, 2022, https://world-nuclear-news.org/Articles/Terrafame-to-begin-producing-uranium-in-2024.

grade fuel is fraught with proliferation risks, as enriched uranium can be used in nuclear weapons. This elevates the problem of nuclear reactors to a geopolitical issue where uranium is a special advantage available to only a few. The world community unequivocally sees it as a threat, and even a peaceful atom is subject to close scrutiny and control by international organisations, NGOs, and states.

The question of the storage of used nuclear waste is a problem and even a social issue of a different order. It involves environmental, technological and political difficulties. The most widespread method is deep geological disposal, but near-surface disposal is still widely used in EU countries, Japan, the UK and the USA. The main threat posed by spent nuclear fuel is its very nature – it remains radioactive for thousands of years. Thus, improper disposal can lead to contact with soil and water, which can have long-lasting harmful effects on nature and people.

The Climate Action Network Europe is also making a rich contribution to the debate on the disadvantages and risks associated with nuclear power. In their position paper, they draw attention to many aspects that the EU has, intentionally or not, overlooked or neglected and criticise them. They use such wording as 'significant hurdle', 'dirty trade-offs', 'derailing' towards the nuclear power and general European debate on this matter. They argue that nuclear power has drawbacks such as safety concerns, waste management, weapons proliferation, uranium dependence, operation in war zones and impacts on biodiversity. [103] CAN Europe also points out that nuclear power is too expensive compared to renewables (namely, four times more than an onshore wind) and that it undermines the integration of renewables into the electricity grid and thus hinders the desired reach of climate neutrality. Greenpeace France concludes that for the same cost of €52 billion to build two reactors by 2050, wind and solar could reduce emissions four times more than new nuclear reactors while tripling electricity production.

Nuclear Energy in the EU: Development and Nowadays

The history of nuclear energy in Europe is the same long as the history of the creation of the European Union itself. To be precise, it would be fair to consider the creation of the European Atomic Energy Community (EAEC, Euratom) as a starting point which was a culmination of intensive research of atoms started after the Second World War. The treaty

[103] Climate Action Network Europe, "Position Paper: The Nuclear Hurdle to a Renewable Future and Fossil Fuel Phase-Out," caneurope.org, March 18, 2024, https://caneurope.org/position-paper-nuclear-energy/.

on establishing EURATOM was signed back on March 25, 1957. Euratom embodied a common European strategy for the promotion of peaceful use of nuclear energy. Its objectives were to achieve energy self-sufficiency, to promote technological progress and to stimulate economic development through the use of nuclear energy. It also created conditions and sufficient safety measures to guarantee the stable use of this delicate technology and the disposal of its waste. This was the beginning of the subsequent nuclear boom in Europe (until 1980), which was replaced by a realisation of the dangers after the Chornobyl accident and the rise of scepticism and fear of the atom in general. This was a turning point in European public opinion. The above-mentioned Austria later became a voice of the green agenda and has been blocking the Czech Republic's accession to the EU because of the construction of the Temelín NPP about 80 kilometres from the Austrian border. What we can conclude is that 'this was interpreted as extreme pressure or blackmail by most Czechs. Austrian opposition to Temelín was also perceived as outside interference threatening sovereignty.' [104]

A decade in the 2000s represented a return of interest to nuclear energy. This phenomenon was conventionally called the 'nuclear renaissance.' There are a number of reasons for this, including the ageing of nuclear power plants, new concerns about climate change and the increasing demand for electricity to power growing economies. Nevertheless, it is not accurate to suggest that this process was in any way analogous to the construction boom in power plants that occurred a few decades earlier.

The ongoing energy crisis in the EU has prompted a global rethink on nuclear power and its role in securing energy supply. The narrative of global threat was doubted. The most significant shift in approach of recent decades was the European Commission's recognition of nuclear energy as a green transitional source of energy in February 2022. [105] This was immediately denounced as 'greenwashing' by some politicians and environmental organisations. Just two years later the Council of the EU and the European Parliament had declared it a 'strategic' one for decarbonisation. This was a result of month-long debates on the Net-Zero Industry Act (NZIA). [106] This paved the way for a

[104] Regina Axelrod, "Nuclear Power and EU Enlargement: The Case of Temelín," *Environmental Politics* 13, no. 1 (March 1, 2004): 155–56, https://doi.org/10.1080/0964401041000168518 2.
[105] Marina Strauss, "European Commission Declares Nuclear and Gas to Be Green," Deutsche Welle, February 2, 2022, https://www.dw.com/en/european-commission-declares-nuclear-and-gas-to-be-green/a-60614990.
[106] Paul Messad, "Nuclear Power Officially Labelled as 'Strategic' for EU's Decarbonisation," euractiv.com (EURACTIV, February 7, 2024), https://www.euractiv.com/section/energy-environment/news/nuclear-power-officially-labelled-as-strategic-for-eus-decarbonisation/.

new reconsideration of nuclear energy as a sustainable and viable option for achieving climate neutrality. Nonetheless, this intense debate ended with the concession that nuclear power should only be a temporary tool to achieve climate neutrality. Only the most technically advanced and most compliant with recent ecological standards Generation III+ were excluded from this time-limit regulation. [107] As a result, the seemingly conditional recognition of nuclear power as green energy and its inclusion in the EU taxonomy has played an important role in its future maintenance and development. This recognition allows EU member states to invest in nuclear energy under a simplified regime and to use the money they receive from the EU for this purpose. In this way, countries have 'free money' for further investment. As a result, the EU's decision strengthens the Union's energy security and creates an additional method for achieving climate neutrality. The latter goal, as has been described many times in this paper, is the most important goal of the EU, not only in the field of energy but also in the field of environment, ecology and security.

Furthermore, the NZIA acknowledged the classification of small modular reactors (SMRs) as zero-net technology. This recently developed technology has the potential to make a significant contribution to the European transition, as well as to enhance energy security. The main advantages of this technology lie in the name itself - they are small and modular. The capacity of these facilities is approximately one-third that of traditional, fixed nuclear power plants. However, they are mobile and can be dismantled and relocated if necessary. Furthermore, they can be produced on a large scale and easily incorporated into other energy systems. [108] [109] At the same time, questions arise about the implementation of this new technology. When and to what extent these reactors can help the EU meet its environmental goals remains an open question. In many ways, this project continues to be a promising idea, thus it is too early to rely on it as a possible solution.

Nowadays there are one hundred operating reactors and only two are being under construction in twelve countries. Most of them are in France – more than a half.

[107] Zuzanna Nowak, "New Perspectives for Nuclear Energy in the EU," *Pism.pl*, March 29, 2022, https://www.pism.pl/publications/new-perspectives-for-nuclear-energy-in-the-eu.
[108] European Commission, "Small Modular Reactors Explained," energy.ec.europa.eu, 2024, https://energy.ec.europa.eu/topics/nuclear-energy/small-modular-reactors/small-modular-reactors-explained_en.
[109] Joanne Liou, "What Are Small Modular Reactors (SMRs)?," International Atomic Energy Agency, November 4, 2021, https://www.iaea.org/newscenter/news/what-are-small-modular-reactors-smrs.

Country	In Operation	Under Construction
Belgium	5	
Bulgaria	2	
Czech Republic	6	
Finland	5	
France	56	1
Hungary	4	
Netherlands	1	
Romania	2	
Slovakia	5	1
Slovenia	1	
Spain	7	
Sweden	6	
Total	100	2

Table 1. Nuclear power reactors in the EU to July 2024 [110]

However, mainly Eastern European countries express a desire to build first or expand existing nuclear capacity. Thus, Bulgaria and Romania plan to build two reactors, while Finland and the Czech Republic plan to build one each. Moreover, in accordance with the Energy Policy of Poland until 2040, the construction of a first power plant with three reactors has been approved to be launched in 2033. This decision is motivated by reasons of energy security and climate neutrality. [111]

Nuclear power production in the European Union has seen a significant decline in recent years. In 2022, it reached an all-time low of 609,255 gigawatt-hours (GWh), a decrease of approximately 17% compared to 2021, the lowest volume since the year 1990 when such statistics started to be collected. [112] However, this has resulted from a long-lasting trend in the EU over the last three decades. This downward trend can be divided into two

[110] European Nuclear Society, "Nuclear Power Plants in Europe," euronuclear.org, July 4, 2024, https://www.euronuclear.org/glossary/nuclear-power-plants-in-europe/.
[111] International Atomic Energy Agency, "IAEA Reviews Poland's Nuclear Power Infrastructure Development," iaea.org, April 25, 2024, https://www.iaea.org/newscenter/pressreleases/iaea-reviews-polands-nuclear-power-infrastructure-development#:~:text=In%202022%2C%20the%20Polish%20Government.
[112] Eurostat, "Drop in Nuclear Power Production in 2022," ec.europa.eu, January 12, 2024, https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20240112-1.

distinct phases. From 1990 to 2004, nuclear generation increased steadily, peaking in 2004. This was followed by a period of stabilisation and then a steady decline since 2006.[113] Despite this decline, nuclear power still accounts for a significant share of EU electricity generation, around 25% in 2021, almost 22% in 2022 and 23% in 2023. Nevertheless, it remains the largest single source of electricity in the EU, although it is only represented in less than half of the Member States. France, the leading proponent of nuclear energy in the EU, generates around 70% of its electricity from nuclear power. Slovakia and Belgium also rely on nuclear power for half of their electricity production. Notably, France alone accounts for 52% of the EU's total nuclear electricity generation. [114]

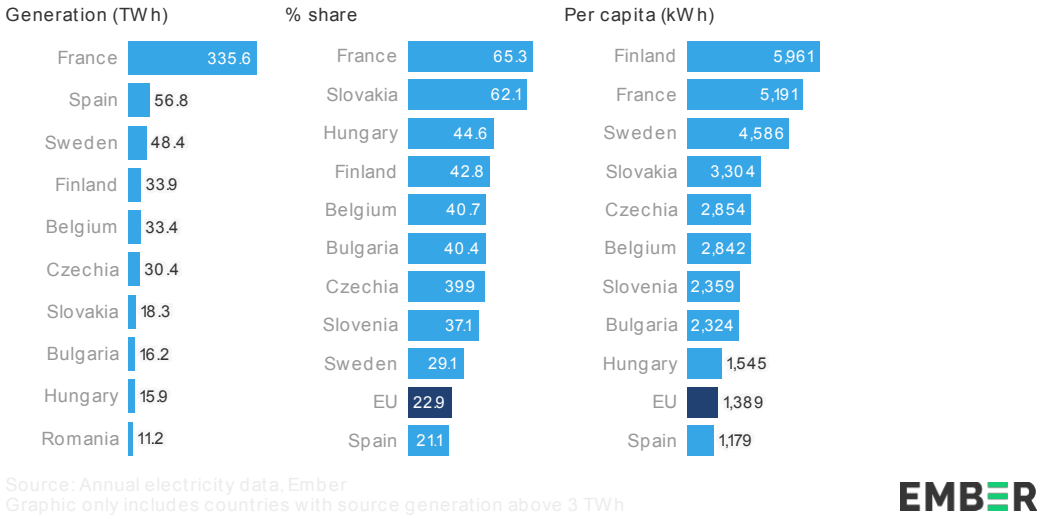

Figure 5. EU Nuclear ranking in 2023 [115]

The data reveals a clear decline trend in nuclear power generation in the European Union. However, despite this downward tendency, nuclear energy still makes a significant contribution to the EU's electricity mix. The dominance of France in nuclear power generation highlights the different approach towards the opportunity of nuclear energy but also raises the question of whether this energy source can be introduced in other

[113] Eurostat, "Nuclear Energy Statistics," ec.europa.eu, December 2023, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Nuclear_energy_statistics#Uranium_supply_security.
[114] European Parliamentary Research Service, "Nuclear Energy in the European Union," *Epthinktank*, September 2023, https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/751456/EPRS_BRI(2023)751456_EN.pdf.
[115] Sarah Brown and Dave Jones, "European Electricity Review 2024," *Ember-Climate.org*, February 7, 2024, https://ember-climate.org/app/uploads/2024/02/European-Electricity-Review-2024.pdf.

countries on the same level, what the prospects are and what the future holds for this type of energy source.

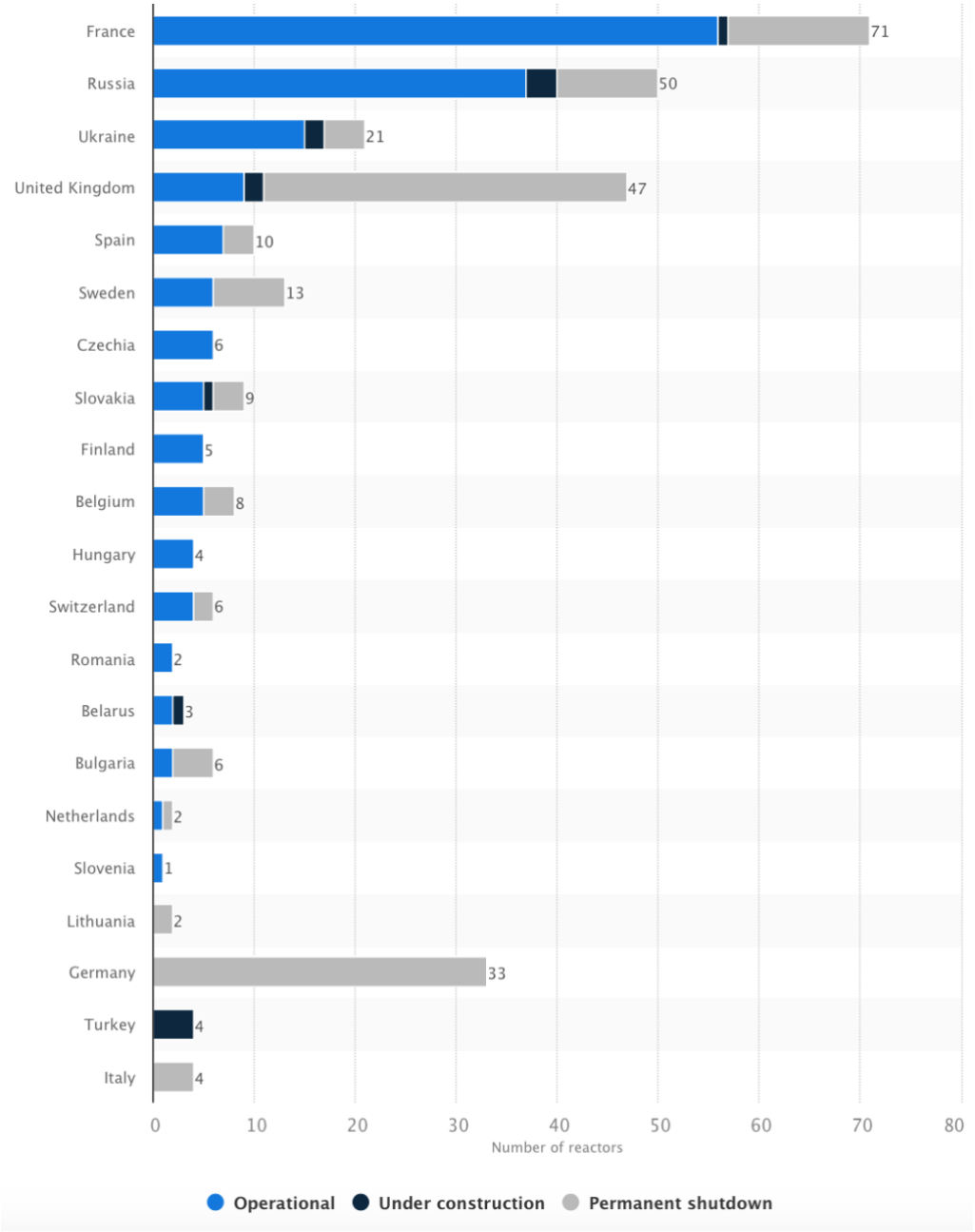

Figure 5. Number of operational, shutdown, and planned nuclear reactors in European countries as of August 2023, Statista

France's Nuclear Advocacy

The best example of the development of nuclear energy, with all its problems, is France, as we can see from the graph above. But how did France come to be so cautious about this type of energy and yet not willing to start phasing it out?

The history of nuclear power in France begins at the same point as in the EU. Driven by geopolitical and economic considerations, France was influenced by the market situation. The most important events that made France a staunch supporter of nuclear power took place in the 1970s. The oil crises of 1973 and 1979 exposed the country's vulnerability to geopolitical fluctuations and highlighted the need for a more secure and stable energy supply.

These crises led the country to rethink its energy policy and invest heavily in nuclear energy, which can even be called an 'aggressive' pro-nuclear policy. This was the turning point for the next twenty years. In 1980, France had already commissioned seven new reactors, and 1981 was the year with the highest number of reactors – eight new reactors were commissioned that year. 1999 was the last year in which only one new and last nuclear reactor was connected to the grid. In 2022, France had a total of 56 active nuclear reactors. It makes France, which gets around 70% of its power from nuclear power, nuclear energy's main champion in Europe.

Nonetheless, France has also had some problems in recent years. Partly as a result of regulated electricity prices during the recent crisis, the French nuclear industry has operated at a small loss despite very high wholesale electricity prices. This large consumer subsidy has contributed to the financial difficulties of EDF (national energy company – Electricite de France), which the French government wanted to nationalise in order to manage its huge debts. In fact, EDF recorded a record net loss of €17.9 billion in 2022. [116] The same was done with German Uniper which had to be nationalised to avoid bankruptcy.

From the technical side of the issue, many reactors are nearing the end of their operating lives. And even the newest ones are in the middle of their life cycle. This puts France in a situation where both the nuclear energy programme and renewables require significant investment and government support. For the government, this is a question of priorities and methods to achieve climate neutrality. Caught between European regulations and ambitious targets, and public opinion actively opposed by young people, France will have to try to convince politicians and citizens to continue investing more aggressively in one form of energy.

[116] World Nuclear Association, "Nuclear Power in France," world-nuclear.org, May 21, 2024, https://world-nuclear.org/information-library/country-profiles/countries-a-f/france#nuclear-outages-in-2022.

Although France suffered clear financial losses during the energy crisis and market panic, a developed nuclear energy sector helped the country considerably in this situation. A constant and reliable supply of electricity prevented the volatile market from affecting end-user prices, and businesses were also able to rely on stable electricity. In this example, nuclear power has shown its merits and demonstrated its reliability. However, it should be borne in mind that the needs of the state are not limited to electricity alone, and even in the example of France, almost a third of it remains generated by other sources.

Prospects of the Peaceful Atom in the EU

The European Union remains the only region in the world that rejects the use of nuclear power for energy generation. Despite some positive decisions taken recently at the EU level, nuclear power is seen primarily as an ecological threat and as an unworthy and insufficiently responsible direction for investment. While Greenpeace criticises the government, pointing out that for the price of installing two reactors, wind and solar power plants can deliver four times as much energy for the same money, the European Commission estimates that the EU will need to invest €350-450 billion in new nuclear power plants by 2050 to maintain generation capacity between 95 and 105 GWe. [117] Nowadays production, in fact, is 97 GWe. [118] It has been estimated that the total investment needed for the transformation will be around €3.2 to €4.2 trillion between 2015 and 2050, with investment in the nuclear sector representing a very small part of this total. Moreover, most of the investments in this sphere are safety investments striving to increase technological safety in alignment with the newest highest standards. European Commission concludes that nuclear power will remain part of the energy mix until the 2050 horizon. Replacement of old NPPs needs considerable investments (bearing in mind that these investments will also go in part to new ones) and constitutes €670 to 760€ billion between 2015 and 2050. [119]

[117] Tomasz Młynarski, "Nuclear Energy and Its Contribution to the Energy and Climate Security of European Union," *Humanities and Social Sciences* 22, no. 24 (2017): 208–10, https://doi.org/10.7862/rz.2017.hss.53.
[118] World Nuclear Association, "Nuclear Power in the European Union," world-nuclear.org, February 1, 2024, https://world-nuclear.org/information-library/country-profiles/others/european-union#:~:text=EU%20nuclear%20generation%20capacity.
[119] European Commission, Directorate-General for Energy, "Nuclear Illustrative Programme Presented under Article 40 of the Euratom Treaty - Final (after Opinion of EESC)," eur-lex.europa.eu, May 12, 2017, https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM:2017:237:FIN.

Nuclear power seems to fully open its potential middle-term distance. The investments and time for construction of around ten years make it impossible to profit from cheap electricity immediately. SMRs are being called upon to fill this gap, but they too remain a work in progress, with unproven efficiency and a limited capacity of around 10% of a standard NPP.

Europe is witnessing intense intellectual debates on nuclear energy. While some are calling for action to invest in the peaceful atom at the first Nuclear Energy Summit in Brussels in 2024, proposing it as an effective solution and a safe source for both man and nature, others prefer to emphasise potential and theoretical threats. [120] In addition, the European Nuclear Society points out that nuclear energy is a logical long-term strategic choice for Europe, embedded in an articulated supply chain and historically based on European technological and industrial leadership.

Opponents of this point of view claim that the role of nuclear power is quite limited and predict the inevitable future decommissioning and abandonment of this source in the European grid. In the EU, nuclear power's contribution to electricity generation is substantial in some countries, but its overall impact on the bloc's energy consumption remains limited (4.7%). They say that today the input of nuclear power plants is low and can be replaced without significant financial and energy losses. The starting and main point is that this type of energy cannot be accepted as green and should not be perceived as renewable. [121] The most common approaches which European Environmental Bureau proposes are (1) renewable uptake and (2) a decrease in energy demand. The fallacy of this view is that these scenarios imply a preference for one method over another. No single energy resource has proven to be universal; all have their own nuances and challenges, as well as dependencies on specific states or contexts. Thus, we conclude that only their use in reasonable proportions will be able to meet energy demand.

Summarising the facts, we can conclude some key points on the future of nuclear power in the EU:

The EU needs a single approach framework for nuclear energy and its role in the modern EU to ensure safety, efficiency and development. At least, a wide pro-nuclear coalition

[120] European Nuclear Society, "On the Urgent Need of a Nuclear Energy Strategy for Europe," euronuclear.org , June 2024, https://www.euronuclear.org/scientific-resources/position-papers/#.
[121] European Environmental Bureau, "Nuclear Phase-Out: How Renewables, Energy Savings and Flexibility Can Replace Nuclear in Europe," *Eeb.org*, March 21, 2024, https://eeb.org/library/nuclear-phase-out-how-renewables-energy-savings-and-flexibility-can-replace-nuclear-in-europe/.

should be at the forefront of the agenda in the EU to set the direction. To the point, there is a debate with clearly opposite views.

From this comes a common classification and agreement on nuclear power as a green energy source. This would unlock financial encouragement and investment, accelerating its development and integration into the EU's energy mix.

Nuclear power should be seen as a strategic asset for energy security, reducing dependence on fossil fuels and volatile energy markets. While it can complement renewables, full replacement of other sources may not be feasible in the short term and should be considered and recognised.

The rising costs of renewable energy infrastructure and maintenance highlight the economic viability of nuclear power, particularly in large economies. Governments should carefully consider long-term cost-benefit analysis when making energy policy decisions. They should carefully consider the potential benefits and costs of RES parks and NPPs that would produce different amounts of energy under different conditions.

Conclusions

The Russian invasion of Ukraine in February 2022 has played the most significant role in the European political awakening in the twentieth century. This event served as a catalyst for historical changes in the EU's approach and perception of energy security and resilience, its geopolitical role and its own political interests. The invasion exposed also the vulnerability of the EU's energy supply, its one-sidedness, in particular in dependence on Russian gas, and highlighted the need for a more diversified, self-sufficient, and secured energy system. Prior to the invasion, the EU has been diversifying its energy sources by promoting renewable energy and setting higher standards in decarbonising its economies and energy production. Also, the stubbornness of some countries such as Germany which was nearly hooked by cheap sources coming by a direct pipe bothered the real chances of happening. As a result, these measures were not sufficient to address the risks associated with its dependence on Russian fossil fuels. The invasion disrupted supplies from Russia, especially gas, and led to a reassessment of the EU's energy security strategy, its priorities and mistakes.

In response to the immediate effects of the invasion, the EU quickly realised the seriousness of the situation it could get in and undertook unprecedented measures to reduce its dependence on Russian gas and increase its energy resilience. Nord Streams pipelines were closed, and some national companies were nationalised, LNG contracts were signed and finally, a price cup was posed. The EU also recognised the importance of energy diversification as a key strategy to improve its security. This included increasing the share of renewable energy sources, such as wind, solar, and water, and parallel reducing dependence on fossil fuels. The EU started to invest vastly in energy storage technologies and was legally required to fill it up in advance.

The EU also sought to increase cooperation with other energy-producing countries to diversify its energy imports. By forging partnerships with countries such as Norway and Algeria, the EU aimed to reduce its dependence on a single energy supplier and increase its energy security. These efforts were aimed at creating a more robust and resilient energy system that could withstand geopolitical tensions and external disruptions.

By gradually reducing its dependence, the EU has been increasing its ability to withstand geopolitical shockwaves and secure its energy supply. The political and secure considerations have prompted the application of the European commitment and political

mainstream to renewable energy sources. The shift to bolder and higher targets has pointed to the inevitable turn towards renewable energy. This has become a major energy target for the future. These commitments have also resulted in a clear economic impact. By investing in renewable energy technologies and energy storages, LNGs, the EU has created a new sustainable reality where the former biggest supplier does not have a place anymore. The green transition to a more sustainable and secure energy system and grid has the potential to attract investment and finally close the EU to its independence by 2050.

In this regard, the potential capabilities of nuclear power are assessed too. The opportunities and challenges associated with using nuclear power reveal a possible important role in securing the region's energy landscape, specifically in France and some Eastern European countries. However, the competition between the Germany-Austria and France-led alliance slows down the broader introduction of nuclear power. The perspectives on the role of nuclear power in enhancing energy security seem to be complex and ambiguous. Environmental considerations are at the forefront of public and political perception. On the other hand, if we recognise and consider nuclear power as a source of cheap, reliable and low-carbon energy, it looks more attractive and widely perceptible.

During the 2021-2022 crisis, Europe found itself in a complex position of its needs, wants and opportunities. Public pressure and commitment to values forced political leadership to make unique and bold decisions that were not possible before the war. Global market turmoil has introduced a share of chaos into the EU's political reality. Nevertheless, with regulations and documents already in place to set the direction, the EU set about decarbonisation with redoubled fierceness. The need to diversify energy sources has forced the EU to turn to cooperation with authoritarian regimes that the EU had previously condemned and avoided. Overall, the EU has realised its geopolitical role and seen itself as a real actor, becoming bolder in its goals and methods of achieving them. It can be said that this crisis helped the EU to gain confidence in its actions in its desire to ensure the sustainable development of its continent and its countries.

Bibliography

Abnett, Kate, and Julia Payne. "EU Countries Split over Support for Nuclear Energy." *Reuters*, March 4, 2024. https://www.reuters.com/sustainability/climate-energy/eu-countries-split-over-support-nuclear-energy-2024-03-04/.

Ah-Voun, David, Chi Kong Chyong, and Carmen Li. "Europe's Energy Security: From Russian Dependence to Renewable Reliance." *Energy Policy* 184 (January 1, 2024): 3–6. https://doi.org/10.1016/j.enpol.2023.113856.

Ang, B.W., W.L. Choong, and T.S. Ng. "Energy Security: Definitions, Dimensions and Indexes." *Renewable and Sustainable Energy Reviews* 42 (February 2015): 1077–93.

Axelrod, Regina. "Nuclear Power and EU Enlargement: The Case of Temelín." *Environmental Politics* 13, no. 1 (March 1, 2004): 155–56. https://doi.org/10.1080/0964401041000168518 2.

Balzer, Harley. "The Putin Thesis and Russian Energy Policy." *Post-Soviet Affairs* 21, no. 3 (January 2005): 221–22. https://doi.org/10.2747/1060-586x.21.3.210.

Barnes, Alex. "Nord Stream 2 Friend or Enemy of Energy Security in Europe?" CEPS Policy Insights , December 2017.

Battaglini, Fabian. "Will the European Green Deal Enhance Europe's Security towards Russia? A Political Economy Perspective." *Energy Economics* 134 (June 1, 2024): 3–7. https://doi.org/10.1016/j.eneco.2024.107551.

Boltz, W., K.D. Borchardt, T. Deschuyteneer, J. Pisani-Ferry, L. Hancher, F. Lévêque, B. McWilliams, A Ockenfels, S. Tagliapietra and G. Zachmann. "How to Make the EU Energy Platform an Effective Emergency Tool." Bruegel, June 12, 2022. https://www.bruegel.org/policy-brief/how-make-eu-energy-platform-effective-emergency-tool.

Brown, Sarah, and Dave Jones. "European Electricity Review 2024." *Ember-Climate.org*, February 7, 2024. https://ember-climate.org/app/uploads/2024/02/European-Electricity-Review-2024.pdf.

Chepeliev, Maksym, Thomas Hertel, and Dominique van der Mensbrugghe. "Cutting Russia's Fossil Fuel Exports: Short-Term Economic Pain for Long-Term Environmental Gain." *The World Economy* 45, no. 11 (June 3, 2022): 3321–26. https://doi.org/10.1111/twec.13301.

Cherp, Aleh, and Jessica Jewell. "The Concept of Energy Security: Beyond the Four As." *Energy Policy* 75 (December 2014): 415–21. https://doi.org/10.1016/j.enpol.2014.09.005.

Climate Action Network Europe. "Position Paper: The Nuclear Hurdle to a Renewable Future and Fossil Fuel Phase-Out." caneurope.org, March 18, 2024. https://caneurope.org/position-paper-nuclear-energy/.

Connolly, Daniel, and Jae-Seung Lee. “Pipeline Politics between Europe and Russia: A Historical Review from the Cold War to the Post-Cold War.” *The Korean Journal of International Studies* 14 (April 2016): 105. https://doi.org/10.14731/kjis.2016.4.14.1.105.

Cordina, Corinna . “Nuclear Energy.” Fact Sheets on the European Union, May 2024. https://www.europarl.europa.eu/factsheets/en/sheet/62/nuclear-energy.

Council of the EU. “Fit for 55: Council Signs off on Gas and Hydrogen Market Package,” May 21, 2024. https://www.consilium.europa.eu/en/press/press-releases/2024/05/21/fit-for-55-council-signs-off-on-gas-and-hydrogen-market-package/.

Council of the EU, and European Council. “Liquefied Natural Gas Infrastructure in the EU.” *Consilium.europa.eu*, 2023. https://www.consilium.europa.eu/en/infographics/lng-infrastructure-in-the-eu/#0.

———. “Where Does the EU’s Gas Come From?” *Consilium.europa.eu*, 2023. https://www.consilium.europa.eu/en/infographics/eu-gas-supply/#0.

De Rosa, Mattia, Kenneth Gainsford, Fabiano Pallonetto, and Donal P. Finn. “Diversification, Concentration and Renewability of the Energy Supply in the European Union.” *Energy* 253 (August 15, 2022): 8–12. https://doi.org/10.1016/j.energy.2022.124097.

Deloitte. “„Fit for 55” Package.” delitte.com, August 24, 2021. https://www.deloitte.com/ce/en/issues/climate/ce-fit-for-55-package.html.

Directorate-General for Neighbourhood and Enlargement Negotiations. “The EU and Morocco Launch the First Green Partnership on Energy, Climate and the Environment ahead of COP 27 - European Commission.” neighbourhood-enlargement.ec.europa.eu, October 18, 2022. https://neighbourhood-enlargement.ec.europa.eu/news/eu-and-morocco-launch-first-green-partnership-energy-climate-and-environment-ahead-cop-27-2022-10-18_en#:~:text=The%20EU%2DMorocco%20Green%20Partnership.

Dubský, Zbyněk, and Lukáš Tichý. “The Role of Narratives in the Discourse on Energy Security of the European Commission: The EU’s Transition in Energy Relations with Russia.” *The Extractive Industries and Society* 17 (March 2024): 6. https://doi.org/10.1016/j.exis.2023.101392.

Energy Charter Secretariat. The Energy Charter Treaty and Related Documents: A Legal Framework for International Energy Cooperation. (2015). https://www.energycharter.org/fileadmin/DocumentsMedia/Legal/ECTC-en.pdf.

euenergyweek. “EUSEW2024 | Energy Security: The Need for a Climate Resilient and Modernised Grid.” YouTube, June 12, 2024. https://www.youtube.com/watch?v=syNfLfDciOs&list=WL&index=18&t=305s.

Eurobarometer. “Attitudes towards Radioactive Waste.” *Europa.eu*, June 2008. https://europa.eu/eurobarometer/api/deliverable/download/file?deliverableId=38074.

European Commission. “Commission Welcomes Completion of Key ‘Fit for 55’ Legislation, Putting EU on Track to Exceed 2030 Targets.” European Commission, October 9, 2023. https://ec.europa.eu/commission/presscorner/detail/en/ip_23_4754.

———. “EU Energy Platform.” European Commission. Accessed July 7, 2024. https://energy.ec.europa.eu/topics/energy-security/eu-energy-platform_en.

———. “EU-US LNG Trade,” February 2022. https://energy.ec.europa.eu/system/files/2022-02/EU-US_LNG_2022_2.pdf.

———. “Eurobarometer: Europeans Approve EU’s Response to the War in Ukraine.” European Commission, May 5, 2022. https://ec.europa.eu/commission/presscorner/detail/en/ip_22_2784.

———. “Small Modular Reactors Explained .” energy.ec.europa.eu, 2024. https://energy.ec.europa.eu/topics/nuclear-energy/small-modular-reactors/small-modular-reactors-explained_en.

———. “The European Green Deal Sets out How to Make Europe the First Climate-Neutral Continent by 2050, Boosting the Economy, Improving People’s Health and Quality of Life, Caring for Nature, and Leaving No One Behind.” European Commission, December 11, 2019. https://ec.europa.eu/commission/presscorner/detail/en/IP_19_6691.

European Commission, Directorate-General for Energy. “Nuclear Illustrative Programme Presented under Article 40 of the Euratom Treaty - Final (after Opinion of EESC).” eur-lex.europa.eu, May 12, 2017. https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM:2017:237:FIN.

European Environmental Bureau. “Nuclear Phase-Out: How Renewables, Energy Savings and Flexibility Can Replace Nuclear in Europe.” *Eeb.org*, March 21, 2024. https://eeb.org/library/nuclear-phase-out-how-renewables-energy-savings-and-flexibility-can-replace-nuclear-in-europe/.

European Investment Bank. “How Bad Is the Ukraine War for the European Recovery?,” June 2000. https://www.eib.org/attachments/publications/how_bad_is_the_ukraine_war_for_the_european_recovery_en.pdf.

European Nuclear Society. “Nuclear Power Plants in Europe.” euronuclear.org, July 4, 2024. https://www.euronuclear.org/glossary/nuclear-power-plants-in-europe/.

———. “On the Urgent Need of a Nuclear Energy Strategy for Europe.” euronuclear.org , June 2024. https://www.euronuclear.org/scientific-resources/position-papers/#.

———. “The Important Role of Nuclear in a Low-Carbon World: The Position of the European Nuclear Society’s High Scientific Council .” *Euronuclear.org*, October 2019. https://www.euronuclear.org/scientific-resources/position-papers/#.

European Parliamentary Research Service. “Emergency Intervention to Address High Energy Prices in the EU,” October 2022.

https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/733687/EPRS_BRI(2022)733687_EN.pdf.

———. “Energy Transition in the EU.” Epthinktank, November 30, 2023. https://epthinktank.eu/2023/11/30/energy-transition-in-the-eu/.

———. “EU Energy Infrastructure: Boosting Energy Security.” epthinktank, October 4, 2023. https://epthinktank.eu/2023/10/04/eu-energy-infrastructure-boosting-energy-security/.

———. “Nuclear Energy in the European Union.” *Epthinktank*, September 2023. https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/751456/EPRS_BRI(2023)751456_EN.pdf.

———. “Preparing for ‘RepowerEU’: Action for More Secure, More Affordable and Cleaner Energy,” May 2022. https://www.europarl.europa.eu/RegData/etudes/ATAG/2022/729421/EPRS_ATA(2022)729421_EN.pdf.

———. “Renewable Energy in the EU.” Epthinktank, March 30, 2023. https://epthinktank.eu/2023/03/30/renewable-energy-in-the-eu/.

Eurostat. “Drop in Nuclear Power Production in 2022.” ec.europa.eu, January 12, 2024. https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20240112-1.

———. “Nuclear Energy Statistics.” ec.europa.eu, December 2023. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Nuclear_energy_statistics#Uranium_supply_security.

Eurostat . “Energy Prices on the Rise in the Euro Area in 2021.” ec.europa.eu, February 2022. https://ec.europa.eu/eurostat/web/products-eurostat-news/-/edn-20220210-2.

Finon, Dominique, and Catherine Locatelli. “Russian and European Gas Interdependence. Can Market Forces Balance out Geopolitics?,” February 2008.

G7. “Climate, Energy and Environment Ministers’ Meeting Communiqué.” *G7 Italia*, April 2024. https://www.g7italy.it/wp-content/uploads/G7-Climate-Energy-Environment-Ministerial-Communique_Final.pdf.

Gholizadeh, Younes, and Müslüme Narin. “Energy Policy of European Union: An Evaluation with Regard to the Energy Supply Security,” August 8, 2018. https://www.researchgate.net/publication/341030383_Energy_Policy_of_European_Union_An_Evaluation_with_regard_to_the_Energy_Supply_Security.

Giuli, Marco, and Sebastian Oberthür. “Third Time Lucky? Reconciling EU Climate and External Energy Policy during Energy Security Crises.” *Journal of European Integration* 45, no. 3 (April 3, 2023): 395–412. https://doi.org/10.1080/07036337.2023.2190588.

Goldthau, Andreas C., and Richard Youngs. “The EU Energy Crisis and a New Geopolitics of Climate Transition.” *JCMS: Journal of Common Market Studies* 61, no. S1 (August 29, 2023): 117–19. https://doi.org/10.1111/jcms.13539.

Goldthau, Andreas, and Nick Sitter. “Whither the Liberal European Union Energy Model? The Public Policy Consequences of Russia’s Weaponization of Energy.” *EconPol Forum* 23, no. 6 (November 2022): 4–7.

Gritz, Alexandra, and Guntram Wolff. “Gas and Energy Security in Germany and Central and Eastern Europe.” *Energy Policy*184 (January 1, 2024): 4–6. https://doi.org/10.1016/j.enpol.2023.113885.

Gyimesi, Balázs. “EU Strategic Communications to Support Sanctions against Russia.” *RUSI*, June 4, 2024. https://static.rusi.org/eu-strategic-communications-to-support-sanctions-v-russia.pdf.

Hayley, Andrew. “China Solar Industry Faces Shakeout, but Rock-Bottom Prices to Persist.” *Reuters*, April 3, 2024. https://www.reuters.com/business/energy/china-solar-industry-faces-shakeout-rock-bottom-prices-persist-2024-04-03/.

Helsinki Collegium. “Public Lecture by Jane and Aatos Erkko Professor Ole Wæver: Climate Change as a Security Issue.” www.youtube.com, May 12, 2022. https://www.youtube.com/watch?v=QE52mGzHsU8.

Hille, Erik. “Europe’s Energy Crisis: Are Geopolitical Risks in Source Countries of Fossil Fuels Accelerating the Transition to Renewable Energy?” *Energy Economics* 127 (November 1, 2023): 5–6. https://doi.org/10.1016/j.eneco.2023.107061.

International Atomic Energy Agency. “IAEA Reviews Poland’s Nuclear Power Infrastructure Development.” iaea.org, April 25, 2024. https://www.iaea.org/newscenter/pressreleases/iaea-reviews-polands-nuclear-power-infrastructure-development#:~:text=In%202022%2C%20the%20Polish%20Government.

———. “Nuclear Energy in Climate Resilient Power Systems.” *Www-Pub.iaea.org*, November 2023. https://doi.org/10.61092/iaea.47gr-efvv.

J. Anderson, Richard. “Europe’s Dependence on Russian Natural Gas: Perspectives and Recommendations for a Long-Term Strategy.” *Marshall Center Occasional Paper*, no. 19 (September 2008). https://www.marshallcenter.org/en/publications/occasional-papers/europes-dependence-russian-natural-gas-perspectives-and-recommendations-long-term-strategy-0#Author_Blurb.

Kaltyhina, S., A. Shanchuk, Yu. Yesypenko, and O. Pecherytsia. “Nuclear Power Industry in the Context of the European Union Energy Policy.” *Nuclear and Radiation Safety* 1, no. 77 (February 19, 2018): 6–8. https://doi.org/10.32918/nrs.2018.1(77).01.

Kardaś, Szymon. “Striking a Balance: Assessing the Role of Nuclear Energy in the European Union’s Energy Transition.” *The Oxford Energy Forum*, no. 139 (February 2024): 53. https://www.oxfordenergy.org/wpcms/wp-content/uploads/2024/02/OEF-139-.pdf.

Kędzierski, Michał. “At All Costs. Germany Shifts to LNG.” osw.waw.pl, April 28, 2023. https://www.osw.waw.pl/en/publikacje/osw-commentary/2023-04-28/all-costs-germany-shifts-to-lng.

———. “Commentary Germany: How the Gas Sector Changed in the Crisis Year of 2022.” *Centre for Eastern Studies*, January 12, 2023. https://www.osw.waw.pl/en/publikacje/osw-commentary/2023-01-12/germany-how-gas-sector-changed-crisis-year-2022.

Kopytin, Ivan, Alexander Maslennikov, and Stanislav Zhukov. “Europe in World Natural Gas Market: International Transmission of European Price Shocks.” *International Journal of Energy Economics and Policy* 12, no. 3 (May 18, 2022): 14. https://doi.org/10.32479/ijeep.12941.

Kramer, Katherine. “Just Energy Transition Partnerships: An Opportunity to Leapfrog from Coal to Clean Energy.” International Institute for Sustainable Development, December 7, 2022. https://www.iisd.org/articles/insight/just-energy-transition-partnerships.

Kravchenko, M., O. Ilyash, L. Smoliar, K. Boiarynova, and O. Trofymenko. “Changes in the Energy Supply Strategy of the EU Countries amid the Full-Scale Russian Invasion.” *IOP Conference Series: Earth and Environmental Science* 1126, no. 1 (January 1, 2023): 7–8. https://doi.org/10.1088/1755-1315/1126/1/012035.

Kuzemko, Caroline, Mathieu Blondeel, Claire Dupont, and Marie Claire Brisbois. “Russia’s War on Ukraine, European Energy Policy Responses & Implications for Sustainable Transformations.” *Energy Research & Social Science* 93, no. 102842 (November 1, 2022): 2–5. https://doi.org/10.1016/j.erss.2022.102842.

Laprévote, François-Charles, and Thomas Harbor. “Article 122 TFEU as a Legal Basis for Energy Emergency Measures.” Cleary Gottlieb, November 9, 2022. https://www.clearygottlieb.com/news-and-insights/publication-listing/article-122-tfeu-as-a-legal-basis-for-energy-emergency-measures.

Liou, Joanne. “What Are Small Modular Reactors (SMRs)?” International Atomic Energy Agency, November 4, 2021. https://www.iaea.org/newscenter/news/what-are-small-modular-reactors-smrs.

Losch, Ruth. “EU ‘Fit for 55’: Scaling up Ambitions in the Renewable Energy Directive (RED II).” Linklaters.com, September 21, 2021. https://sustainablefutures.linklaters.com/post/102h54x/eu-fit-for-55-scaling-up-ambitions-in-the-renewable-energy-directive-red-ii.

Łoskot-Strachota, Agata. “The EU Gas Market and Policy and the War in Ukraine.” Centre for Eastern Studies, March 11, 2022. https://www.osw.waw.pl/en/publikacje/osw-commentary/2022-03-11/eu-gas-market-and-policy-and-war-ukraine.

Luciani, Giacomo. “Nuclear Energy in Europe: It’s Time to Consider Outcomes.” *The Oxford Energy Forum*, no. 139 (February 2024): 41–43. https://www.oxfordenergy.org/wpcms/wp-content/uploads/2024/02/OEF-139-.pdf.

Ma, Richie Ruchuan, Tao Xiong, and Yukun Bao. “The Russia–Saudi Arabia Oil Price War during the COVID-19 Pandemic.” *Energy Economics* 102 (August 2021): 1–3. https://doi.org/10.1016/j.eneco.2021.105517.

Martínez-García, Miguel Á., Carmen Ramos-Carvajal, and Ángeles Cámara. "Consequences of the Energy Measures Derived from the War in Ukraine on the Level of Prices of EU Countries." *Resources Policy* 86 (October 2023): 104114. https://doi.org/10.1016/j.resourpol.2023.104114.

Messad, Paul. "Nuclear Power Officially Labelled as 'Strategic' for EU's Decarbonisation." euractiv.com. EURACTIV, February 7, 2024. https://www.euractiv.com/section/energy-environment/news/nuclear-power-officially-labelled-as-strategic-for-eus-decarbonisation/.

Mining.com Editor . "Global Uranium Production to Increase 11.7% in 2024 — Report." Mining.com, February 25, 2024. https://www.mining.com/global-uranium-production-to-increase-11-7-in-2024-report/.

Mitrova, Tatiana, Tim Boersma, and Anna Galkina. "Some Future Scenarios of Russian Natural Gas in Europe." *Energy Strategy Reviews* 11-12 (June 2016): 28. https://doi.org/10.1016/j.esr.2016.06.001.

Młynarski, Tomasz. "Nuclear Energy and Its Contribution to the Energy and Climate Security of European Union." *Humanities and Social Sciences* 22, no. 24 (2017): 208–10. https://doi.org/10.7862/rz.2017.hss.53.

Nowak, Zuzanna. "New Perspectives for Nuclear Energy in the EU." *Pism.pl*, March 29, 2022. https://www.pism.pl/publications/new-perspectives-for-nuclear-energy-in-the-eu.

———. "The EU and RES: From Fighting Climate Change to Fighting Russia." Pism.pl, August 31, 2022. https://www.pism.pl/publications/the-eu-and-res-from-fighting-climate-change-to-fighting-russia.

Nowak, Zuzanna, and Maciej Zaniewicz. "Russia's Role in the European Gas Crisis." *Pism.pl*, November 5, 2021. https://pism.pl/publications/russias-role-in-the-european-gas-crisis.

OpenLearn from The Open University. "Securitisation Theory - International Relations (3/7)." YouTube Video. *YouTube*, October 3, 2014. https://www.youtube.com/watch?v=wQ07tWOzE_c.

Pancevski, Bojan. "How a Russian Gas Pipeline Is Driving a Wedge between the U.S. And Its Allies." *WSJ*, March 19, 2019. https://www.wsj.com/articles/how-a-russian-gas-pipeline-is-driving-a-wedge-between-the-u-s-and-its-allies-11552254955.

Politico. "Belgium Delays Nuclear Phaseout amid War Worries." POLITICO, March 19, 2022. https://www.politico.eu/article/belgium-delays-nuclear-phase-out-amid-war-worries/.

Reuters. "Gas Giant Snipers Rapid Road to German Nationalisation ." reuters.com, December 19, 2022. https://www.reuters.com/business/energy/gas-giant-unipers-rapid-road-german-nationalisation-2022-12-19/.

Rodríguez-Fernández, Laura, Ana Belén Fernández Carvajal, and Luis Manuel Ruiz-Gómez. "Evolution of European Union's Energy Security in Gas Supply during Russia–

Ukraine Gas Crises (2006–2009).” *Energy Strategy Reviews* 30 (July 2020): 1–2. https://doi.org/10.1016/j.esr.2020.100518.

Rokicki, Tomasz, Piotr Bórawski, and András Szeberényi. “The Impact of the 2020–2022 Crises on EU Countries’ Independence from Energy Imports, Particularly from Russia.” *Energies* 16, no. 18 (September 15, 2023): 3–4. https://doi.org/10.3390/en16186629.

Rudnik, Filip. “The Effect of the Sanctions: The Russian LNG Sector’s Problems.” Centre for Eastern Studies, March 7, 2024. https://www.osw.waw.pl/en/publikacje/osw-commentary/2024-03-07/effect-sanctions-russian-lng-sectors-problems.

Schlacke, Sabine, Helen Wentzien, Eva-Maria Thierjung, and Miriam Köster. “Implementing the EU Climate Law via the ‘Fit for 55’ Package.” *Oxford Open Energy* 1 (January 1, 2022). https://doi.org/10.1093/ooenergy/oiab002.

Sgaravatti, Giovanni, Simone Tagliapietra, and Georg Zachmann. “National Policies to Shield Consumers from Rising Energy Prices.” Bruegel, October 21, 2022. https://www.bruegel.org/dataset/national-policies-shield-consumers-rising-energy-prices.

Stern, Jonathan. “Natural Gas Security Problems in Europe: The Russian–Ukrainian Crisis of 2006.” *Asia-Pacific Review* 13, no. 1 (May 2006): 51–52. https://doi.org/10.1080/13439000600697522.

Strauss, Marina. “European Commission Declares Nuclear and Gas to Be Green.” Deutsche Welle, February 2, 2022. https://www.dw.com/en/european-commission-declares-nuclear-and-gas-to-be-green/a-60614990.

Streimikiene, Dalia, Indre Siksnelyte-Butkiene, and Vidas Lekavicius. “Energy Diversification and Security in the EU: Comparative Assessment in Different EU Regions.” *Economies* 11, no. 3 (March 1, 2023): 13–14. https://doi.org/10.3390/economies11030083.

Stulberg, Adam N. “Natural Gas and the Russia-Ukraine Crisis: Strategic Restraint and the Emerging Europe-Eurasia Gas Network.” *Energy Research & Social Science* 24 (February 2017): 71–85. https://doi.org/10.1016/j.erss.2016.12.017.

Supply Agency of the European Atomic Energy Community. “Market Observatory.” euratom-supply.ec.europa.eu, 2024. https://euratom-supply.ec.europa.eu/activities/market-observatory_en.

Tarasenko, Mykola, Kateryna Kozak, and Ahmed Omeiza Lukman . “Energy Efficiency and Environmental Friendliness of Nuclear Power Plants and Wind Power Plants.” *Bulletin of the National Technical University KhPI Series Energy Reliability and Energy Efficiency* 6, no. 1 (July 9, 2023): 90–91. https://doi.org/10.20998/2224-0349.2023.01.06.

The European Parliament And Of The Council. Directive 2009/28/EC (2009). https://faolex.fao.org/docs/pdf/eur88009.pdf.

The European Parliament And The Council. " Directive (EU) 2018/2001," December 21, 2018. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001.

The Federal Office for the Safety of Nuclear Waste Management. "The Nuclear Phase-out in Germany," April 19, 2023. https://www.base.bund.de/EN/ns/nuclear-phase-out/nuclear-phase-out_node.html#:~:text=The%20last%20three%20nuclear%20power%20plants%20in%20Germany%20were%20shut.

Tichý, Lukáš, and Zbyněk Dubský. "The EU Energy Security Relations with Russia until the Ukraine War." *Energy Strategy Reviews* 52 (March 1, 2024): 7–8. https://doi.org/10.1016/j.esr.2024.101313.

Todd, Jim, Urszula Gumińska-Kurek, and Agata Łoskot-Strachota. "The EU Gas Market: Revolutionary Changes and the Spectre of Another Winter." *Centre for Eastern Studies*, May 25, 2023. https://www.osw.waw.pl/en/publikacje/osw-commentary/2023-05-25/eu-gas-market-revolutionary-changes-and-spectre-another-winter.

Traynor, Ian. "Poland Recalls Hitler-Stalin Pact amid Fears over Pipeline." *The Guardian*, April 30, 2006, sec. World news. https://www.theguardian.com/world/2006/may/01/eu.poland.

Uniper. "Uniper Terminates Russian Gas Supply Contracts." uniper.energy, June 12, 2024. https://www.uniper.energy/news/uniper-terminates-russian-gas-supply-contracts.

Vezzoni, Rubén. "Green Growth for Whom, How and Why? The REPowerEU Plan and the Inconsistencies of European Union Energy Policy." *Energy Research & Social Science* 101 (July 1, 2023): 2–12. https://doi.org/10.1016/j.erss.2023.103134.

Wehrmann , Benjamin. "Q&a - Germany's Nuclear Exit: One Year After." Clean Energy Wire, March 26, 2024. https://www.cleanenergywire.org/factsheets/qa-germanys-nuclear-exit-one-year-after#:~:text=The%20three%20last%20remaining%20nuclear.

Welslau, Lennard, and Georg Zachmann. "Is Europe Failing on Import Diversification?" Bruegel, February 20, 2023. https://www.bruegel.org/blog-post/europe-failing-import-diversification.

Wilson, Alex, and Nicola Danti. "Revising the Energy Efficiency Directive: 'Fit for 55' Package." *European Parliament*, November 2023. https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698045/EPRS_BRI(2021)698045_EN.pdf.

World Nuclear Association. "Carbon Dioxide Emissions from Electricity." world-nuclear.org, April 30, 2024. https://world-nuclear.org/Information-Library/Energy-and-the-Environment/Carbon-Dioxide-Emissions-From-Electricity#:~:text=Life%2Dcycle%20emissions%20of%20electricity%20options&text=In%20March%202022%20the%20UN%27s.

———. "Nuclear Power in France ." world-nuclear.org, May 21, 2024. https://world-nuclear.org/information-library/country-profiles/countries-a-f/france#nuclear-outages-in-2022.

World Nuclear Association . “Nuclear Power in the European Union.” world-nuclear.org, February 1, 2024. https://world-nuclear.org/information-library/country-profiles/others/european-union#:~:text=EU%20nuclear%20generation%20capacity.

World Nuclear News. “Nuclear’s Role in Reaching Climate Targets Recognised by G7 : Nuclear Policies - World Nuclear News.” world-nuclear-news.org, April 30, 2024. https://world-nuclear-news.org/Articles/Nuclear-s-role-in-reaching-climate-targets-recogni.

———. “Terrafame to Begin Producing Uranium in 2024.” world-nuclear-news.org, December 21, 2022. https://world-nuclear-news.org/Articles/Terrafame-to-begin-producing-uranium-in-2024.

Yakoviyk, Ivan, and Maksym Tsvelikh. “Energy Security of the European Union in the Context of Russian Aggression against Ukraine.” *Problems of Legality*, no. 160 (March 30, 2023): 178–79. https://doi.org/10.21564/2414-990x.160.274518.

Zhukov, S. V., and I. A. Kopytin. “Crisis in the EU Gas Market: Genesis, Dynamics and Prospects.” *Studies on Russian Economic Development* 34, no. 6 (November 21, 2023): 830–41. https://doi.org/10.1134/s1075700723060187.