EU Energy Security Strategy: The Impact Of The Russia-Ukraine War On The Energy Sector (2022-2024)

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Abstract.

The Russia-Ukraine War of 2022 has prioritized energy security on the European policy agenda. This research aims to answer two critical questions in the aftermath of the 2022 Russian-Ukrainian War, such as what concrete steps were taken by the EU in response to the energy crisis triggered by the conflict, especially regarding reducing dependence on energy imports from Russia and how the EU's new energy policy after the 2022 Russian-Ukrainian War affected their efforts to reduce dependence on energy sources from Russia and stabilize energy supply in Europe. The analysis covers 2022 - 2024, using data from various sources such as official reports, literature reviews, and previous research. The research method includes a literature study using Barry Buzan's Regional Security Complexity Theory and Energy Security Concept, descriptive analysis to understand the EU's concrete steps in responding to the energy crisis, and comparative analysis to evaluate the impact of EU policies in reducing dependence on Russian energy. The analysis shows that the EU has taken strategic steps in dealing with the impact of the Russia-Ukraine war on energy security. In the context of gas supplies from Russia, although gas supplies will likely remain via pipeline and LNG to some EU Member States that do not apply strict sanctions even after 2027, the volume of these supplies is expected to decrease significantly.

Keywords: *EU, Russia-Ukraine War, energy crisis, energy dependency and energy supply.*

I. INTRODUCTION

Energy plays a pivotal role in the functioning of countries today, affecting various aspects of life ranging from individuals to economics and politics. Disruptions in energy supply can paralyze economies and citizens without access to basic amenities such as electricity. Therefore, the energy sector is considered strategic for the country's survival. A country's energy policy aims to ensure it has access to energy supplies - referred to as energy security. Resource availability limitations represent a significant external peril to energy security for nations reliant on energy imports. Russia holds a crucial position within the global energy market, exporting over half of its primary energy production, amounting to approximately 1,470 million tons (Mtoe), and facilitating 16% of worldwide interregional energy commerce, establishing Russia as a paramount energy exporter (Skolkovo Energy Centre, 2019).In 2021, Russia, the second-largest natural gas producer globally, following the United States, generated 762 billion cubic meters (bcm) of natural gas. Russia is the largest gas exporter, with around 210 bcm of natural gas exported via pipelines. Moreover, Russia stands as one of the top three crude oil producers globally, competing with Saudi Arabia and the United States while also asserting itself as a critical player in coal exports, rivalling Indonesia and Australia (EIA, 2022).

Nonetheless, the substantial reliance on oil and gas revenues, constituting about 45% of Russian government income in 2021, necessitates attention (International Energy Agency, 2022). The primary recipients of Russia's crude oil exports are the Organization for Economic Cooperation and Development (OECD) European countries, receiving nearly half of Russia's total exports. At the national level, China emerged as the most substantial importer of Russian crude oil in 2021. Meanwhile, the Netherlands and Germany collectively absorb around a quarter of 1.1 million b/d of Russia's crude oil and condensate exports (EIA, 2022). Russia further exports 8.9 trillion cubic feet (Tcf) of liquefied and piped natural gas, representing 36% of the total 24.8 Tcf of natural gas production. Most of Russia's natural gas exports, amounting to 84% in 2021, reach destination countries through pipelines, with the remaining portion delivered as liquefied natural gas (LNG). Similar to crude oil exports, OECD Europe emerges as the primary importer of Russian natural gas, accounting for nearly 75% of total exports, with Germany, Turkey, Italy,

Belarus, and France among the vital recipient countries. Additionally, China and Japan are among the top 10 destinations, collectively representing about 10% of Russia's natural gas exports or 882 billion cubic feet (EIA, 2022).

The commencement of a military offensive by Russia against Ukraine on 24 February 2022 triggered a robust reaction, particularly from the European Union and the United States. European leaders and the European Parliament swiftly condemned the assault, citing violations of international law and the jeopardy posed to European and global security (European Parliament, 2022).History records that a similar situation occurred in 2014 when Russia tried to annex Crimea and claim parts of Ukraine as its territory. The conflict shows that what is happening now is nothing new in the geopolitical dynamics between Russia and Ukraine. The EU's response to Russia's aggression in 2014 was not only verbal condemnation but also attempts to impose stricter sanctions. However, it is paradoxical that most of the EU's energy supply is still heavily dependent on Russia. This creates a complex dilemma in the EU's foreign policy, where the sanctions are at odds with its lingering dependence on Russia for energy.Following the 2022 war, the EU also implemented sanctions in response to the war, intending to reduce Russia's ability to fund the war and put economic and political pressure on Russian political elites deemed responsible for the war. These sanctions consisted of individual/political sanctions and economic (European Council, 2022). These include sanctions on the financial, transport, defense, raw materials, and other goods, services, and energy sectors. As of 2024, countries such as the United States, the United Kingdom, the European Union, Canada, Australia, and Japan have implemented over 16,500 sanctions against Russia (Castellum, 2024).

II. LITERATURE REVIEW

The Russian-Ukrainian war has exposed the world economy to a fragile state, with the energy industry as its focal point. The absence of interconnections among member states within the EU has made it resort to buying energy from Russia, making it vulnerable to regional geopolitical tensions (Ilie et al., 2023). A new version of the big power rivalry between America and Russia that is reminiscent of the “Great Game” that occurred in the late nineteenth century between Britain and Russia has been brought about by the Ukraine crisis. This war in Ukraine demonstrates this rivalry where Russia fights for its core interests that are seen as aggressive by the West, which is afraid of revisionist power (Trenin, 2014). One of the major components of the EU’s energy security strategy, which has been impacted greatly by Russian importation of energy is the importation of natural gas. The war between Russia and Ukraine disrupted this interdependence, hence making the EU seek other energy sources and has taken practical approaches toward reducing the level of importation from Russia. Actions that have been undertaken include moving towards the EU’s energy mix, more focus on renewable energy and cross border construction of energy infrastructure of the bloc. The EU also implemented economic sanctions against Russia, thus creating additional instability of the global monetary system and the global trade and investments (Ilie et al., 2023) The new EU energy policy post-2022 Russian-Ukrainian War is intended to address this crisis that has occurred in the area owing to the vulnerability that comes with relying heavily on imports from Russia (Kersan-Škabić, 2023).

Nevertheless, energy independence for the EU is not easily won, among other things, because Russia still plays a significant role in the EU’s oil imports (Kersan-Škabić, 2023).In addition, Barry Buzan argues that the events in Ukraine have affected the EU Energy Security Strategy. Regional security complex theory (RSCT) by Barry can be applied to how the war in Russia-Ukraine has affected the EU Energy Security Strategy. This theory states that states' position arising from attempts to exercise power, perceived threats, and level of mutual dependence characterizes the regional security system (Kusa, 2022). By employing Barry Buzan’s RSCT, it will be examined that the EU can be analysed better if the energy security definition encompassing geopolitics and relations is considered in wider. The more that is done to integrate Barry Buzan’s RSCT with other conceptualizations of energy security also assists in expounding more in the geopolitics and relational characteristics that stand to be of bearing on Europe’s approach.Barry Buzan’s RSCT regarding the security aspect of a region explains that security entwinement links those states or actors within a definite geographical area. Exploring the identified research question about RSCT and the energy security strategy of the EU reveals several critical factors. Thus, the war between Russia and Ukraine is

revealed to have exposed the EU's vulnerability stemming from its reliance on Russian energy (Sadowska, 2022). This reliance shows the RSCT, which states that regional security connections are secondary to and dependent on one another.

Thus, the EU is at risk of interrupting its supply chain.Additionally, Otilia Rica Man et al. (2024) pointed out the significance of regional cooperation on the policy level (Otilia Rica Man, 2024), which also echoes the idea of RSCT as far as security is concerned calling for collective regional effort. The deployment of renewable energy generation and interconnections within the EU indicates measures to overcome related challenges and strengthen the TOs' energy resilience. The second topic which Paul Stronski and Richard Sokolsky (2020) consider includes the matter of Russia and regional institutions and help influence European energy (Stronski & Sokolsky, 2020). This reflects RSCT's assertion that regional security complexes are influenced by external powers, such as Russia's strategic maneuvers impacting the EU's energy security.The energy security idea covers the aspects of availability, affordability and resilience of supplies. This paper synthesizes these aspects, as the reviewed literature also calls for applying the holistic approach as the foundation for sound energy security. Writing in 2022, Sadowska emphasizes on the importance of increasing the levels of the energy sources' diversification in response to the war between Russia and Ukraine. Thus, the efforts of the European Union to obtain new sources of energy and enhance the existing capacities of renewable energy, cover the aspect of the availability of energy security, which guarantees constant and reliable supply of energy resources (Sadowska, 2022).

To deal with the market dynamics and affordability issue, one could turn to Morena Skalamera's (2016) analysis of the reasons for the failure of the Nabucco pipeline project. EMU thus seeks to avoid some of the previous failures in projects by focusing on the effectiveness of projects and supply security and diversification, all in a cost-effective manner (Skalamera, 2016). Also, the climate goals have been raised as a questionable endeavour regarding energy security, an essential dimension of sustainable energy policy (Giuli & Oberthür, 2023). According to Otilia Rica Man et al. (2024), the emphasis on sustainable energy in the EU relates to sustainability, especially in attaining long-standing resilience and low emissions (Otilia Rica Man, 2024).The exploration by Otilia Rica Man, Riana Iren Radu, Iuliana Oana Mihai and others (2024) is for a new regional energy security index that fits into the EU Green Deal. They pointed out the need to embrace renewable energy sources and develop interconnectivity structures across the region to enhance energy security (Otilia Rica Man, 2024). This strategy aligns with RSCT by emphasizing regional cooperation and policy coherence in addressing vulnerabilities exposed by the Russia-Ukraine war. Practical regional collaboration and the integration of renewables are essential for achieving sustainable energy security. In this context, it proposes concrete policy measures to improve the integration of stocks and infrastructure across regions.Marco Giuli and Sebastian Oberthur (2023) explain the EU's challenges in aligning climate goals with external energy policy during security crises.

The article describes the challenges of applying climate politics to climate and energy security, considering that an appropriate approach should be more balanced and sensitive to the existing geopolitical context. The authors highlight the importance and focus on the orientation of two key factors – meeting urgent energy needs for the near future and pursuing sustainable goals. The paper's findings provide an imperative for incremental modification of the current EU's climate change goals to accommodate the elasticity policies that would rationalize the EU's CO2 emission targets with its energy security requirements. Therefore, it is fundamental to boost the use of renewable energy sources for electricity generation and ensure the reliability of other alternative energy sources (Giuli & Oberthür, 2023).The critical consequences of the Russian-Ukrainian war and the energy crisis in the European Union are examined by Ewelina Sadowska (2022). Due to the war, there are significant supply disruptions, thus making the EU look for other energy sources and embracing renewable energy sources. This corresponds well with the general goals of energy security as it concerns the sources of energy supply and the issue of sources' diversification because of the existing tendencies of geopolitical tensions around the world. From this perspective, the study stresses the urgent need to diversify energy sources and increase the pace of renewable energy projects to formulate tactical changes focused on the insulation of challenges and improvement in energy security (Sadowska, 2022).

The article by Paul Stronski and Richard Sokolsky, published in 2020, describes Russia's peculiar approach to its engagement with regional institutions and the consequences for European energy security. This research paper emphasizes how Russia's geopolitical manoeuvres affect the region's energy relationships and how understanding such relations can be adequately done under the RSCT lens. It can be stated that Russia is a significant threat to Europe's energy security. According to the research, the European Union needs to find ways of managing or mitigating these geopolitical threats with more 'integration' of the region's power and development projects and 'diversification' of Europe's energy sources (Stronski & Sokolsky, 2020).Magdalena Zajączkowska, in her work of 2018, studies the EU Energy Union as a project to create a more robust shared marketplace for energy. The Energy Union addresses energy security through five key aspects: This is in terms of energy supply security, solidarity, and trust; the internal energy market is fully integrated; energy efficiency is promoted; the low carbon economy is embedded; and research, innovation, and competitiveness are encouraged. The conclusions drawn in the course of the present research stress the crucial role of the Energy Union as a framework for the development of the new European market of energy. Proposals for improving the energy situation include harmonized policies and regional integration to strengthen energy security and sustainability (Zajaczkowska, 2018).

Morena Skalamera(2016) examines the Nabucco gas pipeline project; the author does not entirely blame the absence of support for the project on Russian geopolitical strategies. The topic explores the geopolitical and market challenges that caused the project's failure. The paper also analyses the experience acquired and prospects of further European initiatives in energy. The authors identify key aspects that led to the failure of the Nabucco project, such as political risks and market forces. The research admits that similar elements that characterised the projects should be accorded meticulous focus in future exercises in order not to experience such hitches (Skalamera, 2016).The literature discusses the interrelation between energy security and geopolitical and cooperative themes for countries with an RSCT affiliation and the energy security idea. The war between Russia and Ukraine means the EU has had to reconsider its energy security policies and focus on diversification, sustainability, and operational reserves. Recalling the EU's quest for preparing effective solutions to present-day geopolitical situations while constructing a long-term and sustainable energy system and integrating policy proposals with regional cooperative principles and sources, renewable energy sources.

III. THEORETICAL FRAMEWORK

The RSCT framework encompasses security cooperation between countries, degrees of amity or enmity, the nature and/or depth of the relationship, and other associations that could be geographic, political-strategic, historical, economic, or even cultural. It constructs geographically rational patterns of security entailing relationships and is impacted by history, such as long-term warfare or culture. Shifting the balance of power between the states, new membership in regional security and structural alterations in patterns of amity and enmity can alter the structure of this regional security complex.On the other hand, the energy security concept is knowledge about how energy resources can be secured for economic profitability and national security. It is rooted in a technical and geopolitical outlook focusing on the safe and reliable operation of energy technologies and resource supply security. Since the 1973 oil embargo, the importance of energy security has been a significant concern of governments worldwide. Energy security includes not only availability of supply but also price stability and adaptability to global market fluctuations. Diversification of energy sources is considered a key strategy to reduce the risk of supply uncertainty. Various definitions of energy security have been put forward, focusing on the availability, accessibility, acceptability, and affordability of energy.

These aspects are known as 'the four A's of energy security' (Asia Pacific Energy Research Centre, 2007). In this case, energy security depends not only on supply but also on the ability of the energy system to adapt to unforeseen changes and challenges.The interaction between RSCT theory and the concept of energy security is becoming increasingly relevant in the modern geopolitical context, where energy dependence can be a source of threat if not managed properly. For example, Europe's dependence on gas imports from Russia demonstrates how energy interactions can affect regional economic and political

security. Therefore, the distribution of energy resources and regional energy dependence in the energy security complex can be analogous to the distribution of military power in the political and military complex. Understanding these dynamics enables countries to formulate more comprehensive and sustainable security strategies in response to global energy challenges.

IV. METHODS

This article is an attempt to find answers to the following questions: (1) What does the European Union take concrete steps in response to the energy crisis triggered by the Russia-Ukraine War in 2022, in particular about reducing dependence on energy imports from Russia?; (2) How will the EU's new energy policy, following the Russia-Ukraine war in 2022, affect their efforts to overcome dependence on Russian energy sources and stabilize energy supplies in Europe?The analysis is divided into several parts to achieve the objectives of this article. Firstly, a preliminary description of the energy resource picture in the European Union. The second section outlines the concrete steps the EU has taken to respond to the energy crisis, with a particular focus on reducing dependence on energy imports from Russia. The following section analyses the impact of the EU's new energy policies in the aftermath of the Russia-Ukraine War in 2022, including how these policies affect their efforts to reduce dependence on energy sources from Russia and stabilize energy supply across the European region.

The analysis covers the period from 2022 (when the Russia-Ukraine war started on 24 February 2022) to 2024. However, the data used is not limited to 2022-2024. This is to compare data before and after the war in 2022. The data used in this research comes from various sources such as official reports, literature reviews, and previous research results accessed through international digital libraries such as Taylor & Francis, Sage Journals, JSTOR, ScienceDirect, and Springer. In addition, data was also obtained from the official website of the European Union and experts competent in the field of European energy.The research tools used in this article include a literature study with the approach of Barry Buzan's Regional Security Complexity Theory and the Energy Security Concept to answer theoretical questions, descriptive analysis to find out the concrete steps taken by the European Union in responding to the energy crisis triggered by the Russia-Ukraine War in 2022, and comparative analysis to answer questions about the influence of the European Union in implementing policies to reduce dependence on energy from Russia.

V. RESULT AND DISCUSSION

A. Portrait of Energy Resources in the European Union

1) Heterogeneity of the EU Energy Sector

The European Union, as one of the major world's economic giants, includes approximately 448. 4 million people living in 27 countries across Europe (European Union, 2023), which is the European Union, by the year 2023. This entails a massive community of individuals, roughly 5% of the global total 6%. Also, the EU has a Gross Domestic Product (GDP) of €16, which is a higher figure than that of the USA. To compare, this number is six trillion international dollars, which is about 20 per cent of the global GDP. For instance, the USA, with a population of 331 million, occupies approximately 4% of the world's population, and the US GDP is $ 18.3 trillion (22%). China, with a population of 1.4 billion people, represents approximately 19% of the world's population and has a GDP of $11.5 trillion (14%) (European Union, 2023). According to this data, one can conclude that the European Union has a crucial position in the global economy and the critical influence of this region on the general tendencies in the world economy.Of its 27 member states, there are certainly differences in the population, economy, and energy resources of the EU countries, creating significant heterogeneity in its energy landscape. This heterogeneity is also reflected in each country's energy systems, policies, and resources. This affects each country's energy demand, infrastructure needs, and energy policies. Developed countries like Germany and France have strong economies and high energy consumption levels.

Germany, for example, is the largest energy consumer in Europe, with primary energy consumption reaching 11,769 Petajoules in 2022. More than 75 % of its energy consumption comes from fossil sources, while about 17.2 % comes from renewable energy (International Trade Administration, 2023) (Clear Energy

Wire, 2024).Countries with developing economies like Romania and Bulgaria tend to use smaller amounts of energy. For example, Bulgaria consumed about 1,678 Petajoules of primary energy in 2020, much lower than more developed Western European countries (Lontay, 2024). This fact shows the difference in energy consumption levels between countries with different levels of economic development. Countries with more developed economies usually have higher energy demand due to the scale of industry and higher living standards.This energy heterogeneity can also be seen in gross available energy, the overall energy supply for all activities in the country's territory (Eurostat, 2022). The disparity in the type and amount of energy used in each country can provide a comprehensive picture of energy diversity in the EU, which influences energy policy and energy security strategies at the regional level.In 2021, the EU faces significant variations in the composition of energy sources between its member states. Only four countries, Estonia, Sweden, Finland, and France, have energy shares from solid fossil fuels, crude oil, petroleum products, and gas below 50%. France and Sweden stand out in the use of nuclear energy, contributing 40.7% and 24.7% of total gross available energy, respectively.

On the other hand, Poland and the Czech Republic have the highest share of solid fossil fuels, while the EU average stands at 11.1%. Oil shale and oil sands dominate Estonia, while peat products are significant in Finland and Ireland. Countries such as Cyprus, Malta, and Luxembourg tend to rely on oil and petroleum products, which reflects their geographical characteristics and fuel tourism. Sweden, Finland, and Denmark are highly committed to renewable energy, while the Netherlands and Ireland rely on natural gas as an essential source. France leads in the use of nuclear energy among the 13 member states with nuclear power plants. Significant variation is also seen in gross available energy per capita, reflecting factors such as industrial structure and weather conditions, with Luxembourg and Finland recording the highest levels, while Romania is at a lower level (Eurostat, 2024).It can be seen that fossil fuels will still dominate the energy system in the EU in 2021, but there will be significant diversity across regions. Countries like Germany, Poland, and the Czech Republic possess a substantial proportion of solid fossil fuels like coal, while nations like Portugal, Luxembourg, and Malta have a minimal share. Estonia relies significantly on oil shale and oil sands for its energy supply, whereas Italy predominantly utilizes natural gas. Renewable energy is gaining prominence in Sweden, Finland, and Denmark, while France, Sweden, and other countries rely primarily on nuclear energy. The energy composition of each country is influenced by factors such as industrial structure, geography, and energy policies.Within the EU, member states form a regional security complex characterized by interdependence on energy resources.

This interdependence creates both opportunities and vulnerabilities. Countries like Germany and France have high energy consumption and significant economic power and play pivotal roles in shaping the EU's energy policies. Their strategies for energy security influence the broader regional security dynamics, necessitating coordinated efforts to address potential supply disruptions and ensure stable energy flows across the region. RSCT highlights that such security relationships and interdependencies can shape regional security complexes, where energy security in one country can have ripple effects across the EU.

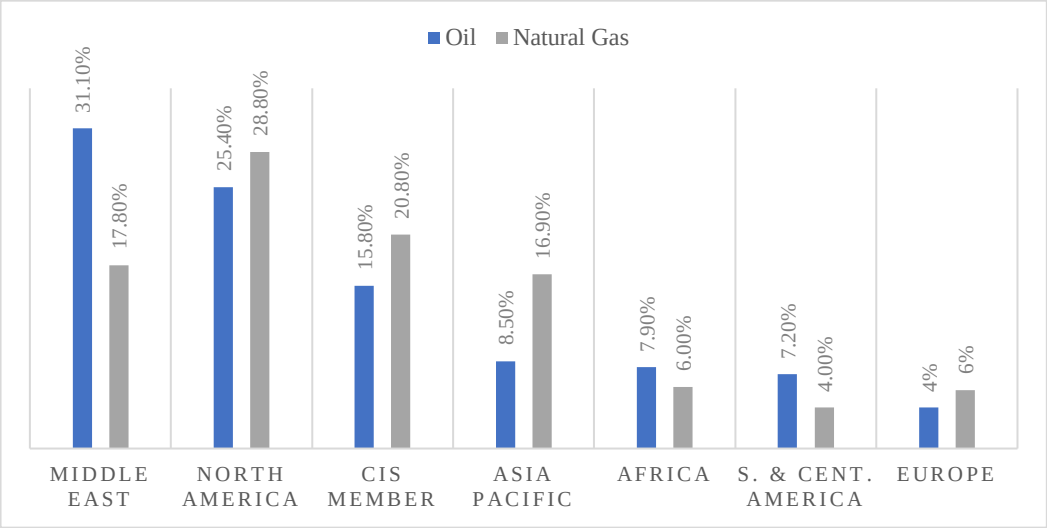
2) Low EU Contribution to Global Reserves and Global Production

Although the European Union is one of the largest economic blocs in the world, according to the BP Statistical Review of World Energy (2021), by the end of 2020, in terms of natural gas reserves, the European Union contributed only 15.6 TCF or equivalent to 0.2 %. This compares to 1320.5 TCF (19.9 %) from Russia, 871.1 TCF (13.1 %) from Qatar, and 445.6 TCF (6.7 %) from the United States in terms of global natural gas reserves (British Petroleum, 2021, p. 36), the share of natural gas in the global natural gas reserves is still very low.The European Union's crude oil reserves only reached 0.3 thousand million tonnes or equivalent to (0.1 %), compared to Venezuela (17.5 %), Saudi Arabia (17.2 %), Canada (9.7 %), Iran (9.1 %), Iraq (8.4 %), Russia (6.2 %), Kuwait (5.9 %) and the United States (4 %) of the total world reserves (British Petroleum, 2021, p. 16).

Energy production from the European Union also shows significant disproportionality on a global scale, with the continent contributing the least of all world regions in terms of global energy production. In 2020, Europe's petroleum production was only 167.1 million tonnes (4 %), compared to the Middle East at 1297.3 million tonnes (31.1 %), followed by North America at 1060 million tonnes (25.4 %), Russia and

Central Asia (CIS Members) at 660.1 million tonnes (15.8 %), Asia Pacific at 353.2 million tonnes (8.5 %), and Africa and Latin America at 327.3 million tonnes (7.9 %) and 300.3 million tonnes (7.2 %), respectively (British Petroleum, 2021, p. 19). In terms of natural gas production, Europe ranked sixth among world regions with 218.6 billion cubic metres (bcm) (5.7 %), after North America (Canada, Mexico & the USA) with a total production of 1109.9 bcm (28.8 %), Russia and Central Asia (CIS Members) with 802.4 bcm (20.8 %), Middle East 686.6 bcm (17.8 %), Asia Pacific 652.1 bcm (16.9 %), Africa 231.3 bcm (6 %), and Latin America with a total production of 152.9 bcm (4 %) (British Petroleum, 2021, p. 36).

Fig 1. World Energy Production in 2020



Source: Reinterpreted by researcher from BP Statistical Review of World Energy (2021)

Based on energy production data, the EU shows significant limitations. Europe's oil and natural gas production is far below that of other major regions, such as the Middle East, North America, and Russia. This signals a considerable reliance on energy imports to fulfil domestic requirements, heightening vulnerability to supply disruptions and international price fluctuations.The data illustrates the significant challenges that the EU encounters in achieving sustainable and self-sufficient energy security. Despite its economic prowess, the EU holds a small portion of global natural gas and crude oil reserves, significantly less than Russia, Qatar, and the United States.

This situation exposes the EU to elevated risks of supply interruptions and price fluctuations driven by volatile global markets.The energy security concept, which encompasses the availability, accessibility, acceptability, and affordability of energy (the four As), underscores the need for the EU to secure stable and affordable energy supplies to support economic viability and national security. This challenge is compounded by the EU's minimal domestic oil and natural gas production, highlighting its reliance on imports and the associated geopolitical risks.

3) The gap between Domestic Production and Consumption

The gap between domestic energy production and consumption in the EU in 2020 shows a significant disparity. The EU was only able to produce around 394 thousand barrels per day of various types of oil, such as crude oil, shale oil, oil sands, condensates, and NGLs (British Petroleum, 2021, p. 18); however, its consumption reaches around 9774 thousand barrels per day (British Petroleum, 2021, p. 23). Domestic production can only meet about 4 % of the total oil consumption needs in the European Union. Natural gas production within the EU stands at 47.8 bcm (British Petroleum, 2021, p. 36), but its consumption reached 379.9 bcm (British Petroleum, 2021, p. 38). This means that domestic natural gas production only covers about 12.5 % of the EU's natural gas consumption needs. Nevertheless, energy and economic growth have a positive relationship, i.e., income and energy consumption are closely correlated on every continent and in every period for which data is available.

No rich countries in the world consume little energy, and no poor countries consume a lot of energy (Moss & Kincer, 2023).The EU requires energy imported from third countries to fulfill its energy consumption needs. In 2021, the primary energy products imported were petroleum products, which account

for almost two-thirds of energy imports to the EU (64%), followed by natural gas (25%) and solid fossil fuels (6%) (European Commission, 2023).The data shows that in 2021 most of the EU's extra crude oil imports come from five central countries, namely Russia (28%), the United States (9%), Norway (9%), Libya (6%) and Kazakhstan (6%). As for the natural gas sector, almost three-quarters of the EU's natural gas imports come from Russia (44%), Norway (16%) and Algeria (12%). Then imports of solid fossil fuels, especially coal, come mainly from Russia (52%), followed by Australia (17%) and the United States (15%) (European Commission, 2023).

It can be concluded using the Regional Security Complex Theory that:

- Interconnected Energy Dependencies
  - EU Dependence on Russian Gas: The EU heavily depends on natural gas imports from Russia, with countries such as Germany, Italy, and Eastern Europe receiving most of their gas supplies from Russia. This dependence makes the EU vulnerable to supply disruptions caused by geopolitical tensions.
  - Russia's Economy Depends on Energy Exports: In contrast, the Russian economy heavily depends on revenues from energy exports, especially natural gas and oil, to the EU. This creates a strong interdependence between Russia and the EU in the energy sphere, which can result in complex dynamics in energy policy and diplomacy between the two parties.
- Security Dynamics and Threats
  - Security of Energy Supply: Energy security is a significant concern for the EU, especially as political tensions with Russia could lead to gas supply disruptions, as happened during the Russia-Ukraine gas crisis in 2006 and 2009.
  - The Use of Energy as a Geopolitical Tool: Russia has used energy as a geopolitical tool to pressure countries that depend on its gas, such as Ukraine and the Baltic states. This has raised concerns in the EU regarding the stability of energy supplies and overall regional security.

B. EU Response to the Russia-Ukraine War in the Context of Energy Security

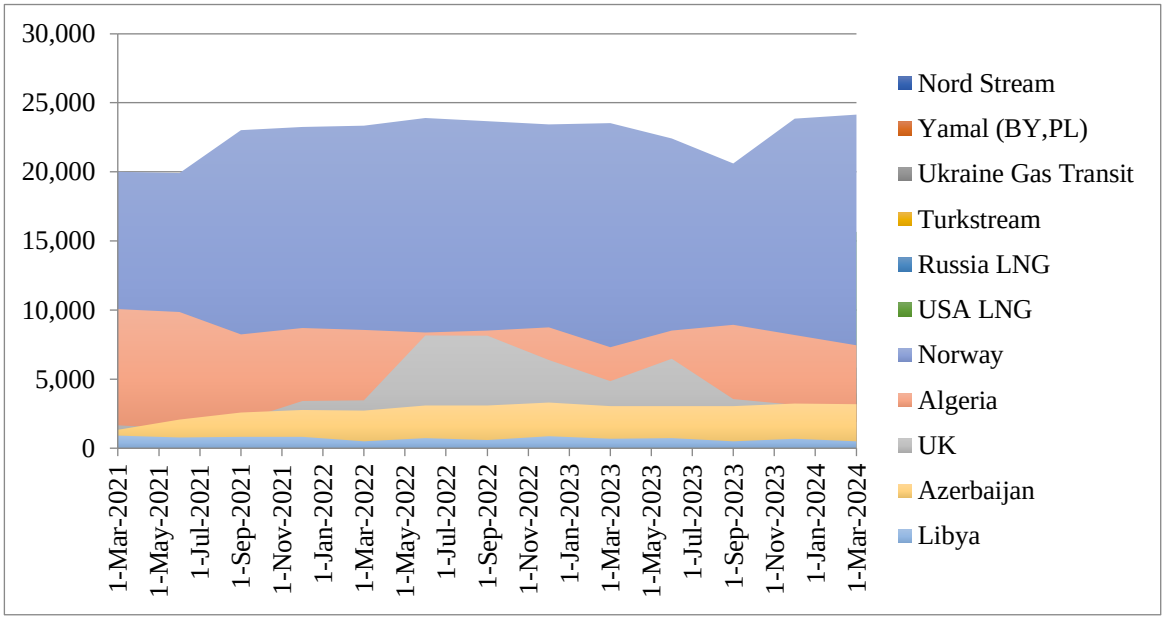
1) Political and Economic Sanctions

Economic and political sanctions are implemented to pressure the factions engaged in the war and enhance the European Union's stance in global diplomacy. These sanctions encompass a variety of forms, starting with individual (political) measures such as freezing assets and imposing travel restrictions on notable figures, including Russian President Vladimir Putin, Sergei Lavrov, Roman Abramovich, Victor and Oleksandr Yanukovych, members of the Russian State Duma, members of the National Security Council, military personnel and senior officials, in addition to individuals involved in business promotion and oligarchs (European Council, 2022). Secondly, economic sanctions encompass a variety of measures targeting the financial, transportation, defence, raw materials, and other sectors. In the energy domain, the European Union enforces sanctions that include prohibitions on the import of oil and coal from Russia, price constraints on sea transportation of Russian oil, restrictions on exporting goods and technology to Russia in the oil refining industry, and a moratorium on new investments in the Russian energy sector (European Council, 2022) By 2024, Russia has acquired over 16,500 sanctions from various nations, including the United States, the United Kingdom, the European Union, Australia, Canada, and Japan (Castellum, 2024).The emerging challenges are particularly significant when examining the European Union's dependence on Russia within the energy sector. As a result of this reliance, the EU opts not to ban the importation of Russian natural gas altogether.

Instead, it chooses to impose sanctions, such as prohibiting most Russian crude oil and petroleum product imports, affecting roughly 90% of Russian oil imports, with some exceptions for crude oil transported via pipelines (European Commission, 2022);The EU prohibits its companies from providing oil transportation services, except for Russian crude oil and petroleum products sold to non-EU nations at or below an agreed-upon price cap set in conjunction with the Group of Seven (G7) price cap coalition. This measure aims to reduce Russian oil revenues while maintaining stability in global energy markets, as outlined by the European Commission in 2022 (European Council, 2022). The European Council also prohibits exporting oil refining technology to the EU and halts the import of Russian coal, both actions taken

in 2022 (European Council, 2022). Additionally, the EU has enhanced its anti-circumvention mechanisms to address sanctions evasion in other countries and reinforced the enforcement of the oil price cap, as emphasized by the European Commission in 2023 (European Commission, 2023).In reaction to the sanctions levied by the European Union against Russia, which had direct and indirect impacts on the oil and natural gas trading sector, energy providers have chosen to strengthen their diversification strategies. The EU's restriction on Russian crude oil imports via sea became effective on December 5, 2022, followed by the prohibition of refined oil products starting from February 5, 2023, leading to consequences in the initial and subsequent quarters of 2023.

Fig 2. EU Gas Supply Flows from Various Sources



Source: Reinterpreted by researcher from Bruegel Dataset by McWilliams, Sgaravatti, & Zachmann (2024))

During the second quarter of 2022, Russia held a prominent position as the primary supplier of petroleum and natural gas to the EU, boasting shares of 15.9% and 28.3%, respectively. However, in the second quarter of 2023, Russia witnessed substantial declines in both sectors. The share of petroleum imports from Russia plummeted to 2.7%, while its natural gas share decreased to 13.8%. Conversely, Norway, the United States, and Algeria observed an uptick in their shares of petroleum imports, with Norway emerging as the top supplier, boasting a 44.3% share. Despite the decline, the United States maintained its dominance in the liquefied natural gas sector, commanding a share of 46.4%. Algeria and Nigeria saw a rise in their shares of liquefied natural gas imports (Eurostat, 2023).

The EU's energy demand for Russian energy continued to decline in 2023 due to energy efficiency measures, energy source substitution (including renewables), and the collapse of industrial and household demand (Honoré, 2023). The EU did this to phase out all fossil fuel imports from Russia by 2027, and although sanctions on gas have not been imposed as they were on oil and coal, the EU's dependence on Russia has been significantly reduced. By 2023, Russian pipeline gas deliveries to the EU had fallen by 80%, although this may have been offset by a temporary increase in LNG imports from Yamal. The overall impact is a reduction in Russia's share of gas imports from Europe, from more than 40% in the pre-war years to 14% in 2023 (McWilliams, Sgaravatti, & Zachmann, 2024).

2) REPower *EU Plan*

In March 2022, the European Commission put forward the REPower EU plan, a comprehensive set of initiatives comprising new legislative and financial backing for the implementation of solar, wind, and hydrogen technologies, the establishment of a new hydrogen pilot collaboration, and an expansion of the European Union's manufacturing capabilities in environmentally friendly technologies (European Commission, 2022).This proposal includes a revision to the 2030 renewable energy target, marking the fourth adjustment since 2014, elevating the target to 45%, more than doubling the 20% milestone reached in 2020. Nonetheless, persistent disputes among and within Member States persist concerning this ambitious

objective. Debates surrounding the necessity of gas constraints and adjustments in energy pricing to facilitate the realization of REPower EU's strategies are highly contentious, given the energy crisis's significant economic and societal implications.The REPowerEU Regulation was adopted in February 2023. It covers short and medium term measures, such as investing €210 billion until 2027 to stop fossil fuel imports from Russia. The aim is to focus on national recovery and resilience plans to achieve faster energy independence, tackle energy poverty, and decarbonize the European economy (European Parliament, 2024).Since the publication of REPowerEU, the EU has significantly increased imports from other suppliers, mainly in LNG, and new terminals and interconnections have been built. Through REPowerEU, the EU conducts several multilateral cooperations such as:

a. MoU on Trilateral Cooperation with Egypt and Israel

On 15 June 2022, a trilateral Memorandum of Understanding was signed between the European Union, Israel, and Egypt to export natural gas to Europe. This initiative is designed to lessen the reliance on Russian gas and expedite the implementation of the REPowerEU plan. Within the framework of this agreement, the European Union is committed to promoting investments by European companies in the exploration and production of natural gas in Israel and Egypt. This includes their involvement in competitive bids for exploration licenses that align with EU climate policies and the REPowerEU strategy. The involved parties are urging both public and private entities to collaborate on achieving the green energy objectives set by the EU and individual nations and combat climate change through initiatives related to hydrogen, green energy, and energy efficiency. This collaboration will transport natural gas from Israel and Egypt to Europe utilizing LNG infrastructure (EC Directorate-General for Energy , 2022).

b. Establishment of an 'Energy Pathway' to the Global Methane Pledge Energy Pathway

In June 2022, a coalition of countries, including the United States, European Union, Canada, Argentina, Denmark, Germany, Egypt, Italy, Japan, Mexico, Nigeria, Norway, and Oman, launched the Global Methane Pledge Energy Pathway. This initiative aims to reduce methane emissions within the oil and gas industry, contributing to climate goals and energy security (International Energy Agency, 2024).The Energy Pathway represents a crucial component of the Global Methane Pledge (GMP), facilitating the swift adoption of effective and affordable strategies for mitigating methane emissions. The primary objectives of the GMP Energy Pathway are to fully exploit the potential for cost-effective methane reduction in the oil and gas sector and to phase out routine combustion practices no later than 2030 (International Energy Agency, 2024).

Participating nations are dedicated to supporting these endeavours by offering fresh technical and financial resources and reinforcing domestic initiatives and policies. Nearly $60 million has been committed by countries and supporting organizations to back the implementation of this pathway through various programs like the World Bank Global Gas Flaring Reduction Partnership, the Global Methane Initiative, the International Methane Emissions Observatory, and the Global Methane Hub, which recently disclosed funding. Furthermore, the International Methane Emissions Observatory under UNEP will collaborate with partners to establish a system for detecting and responding to methane emissions identified via satellite (International Energy Agency, 2024).Following the events in February 2022, specifically in March 2022, the European Union introduced a collaborative strategy with G7, G20, OPEC, and IEA member states to address challenges in the oil market triggered by disruptions in Russian gas supplies (European Commission, 2022).

3) External Cooperation

Externally, the Russia-Ukraine war has hastened the ratification of fresh international pacts and alliances within the European Union. A prime illustration is the inking of a memorandum of understanding relating to sustainable energy, specifically hydrogen, among the EU, Kazakhstan, Egypt, and Namibia. During the COP-27 Climate Conference held in Egypt, European Commission President Ursula von der Leyen and Kazakhstan Prime Minister Alikhan Smailov formalized a memorandum of understanding that set the groundwork for a strategic partnership. This partnership is geared towards fostering closer integration of economies and industries within the sectors of raw materials, batteries, and green hydrogen. The primary focus is identifying collaborative projects, harmonizing environmental and social standards, and modernizing mining and refining processes (Euractive, 2022).Moreover, the EU also entered into a memorandum of

understanding with Egypt during COP-27, establishing a framework for collaboration in sustainable energy. This includes a goal to import 10 million tonnes of hydrogen by 2030 and achieve equivalent domestic production (European Commission, 2022). In the case of Namibia, the EU has committed to crafting an Operational Roadmap from 2023 to 2024, with a specific emphasis on collaboration in sustainable raw materials and renewable hydrogen. The European Investment Bank is set to support investments amounting to €500 million (European Commission, 2022).

In addition to cooperation on hydrogen, the EU has bolstered its ties with Morocco and Azerbaijan in green energy production. The EU-Morocco Green Partnership represents the initial EU initiative with a partner nation under the external dimension of the European Green Deal. This pact envisions collaboration in three core areas: climate and energy, environment (including marine and ocean matters), and the green economy (European Commission, 2022).The Memorandum of Understanding with Azerbaijan sets the stage for expanding natural gas and green energy export capacities from Azerbaijan. According to the agreement, Azerbaijan is poised to boost its natural gas exports to Europe by at least 20 billion cubic meters annually by 2027. Furthermore, the memorandum paves the way for new prospects in green energy development to facilitate electricity exports between the EU and Azerbaijan (Europorter, 2022).The EU-Morocco Green Partnership initiative and the Memorandum of Understanding with Azerbaijan regarding energy signify strategic maneuvers by the EU to realise shared objectives in climate change, environmental preservation, and the green economy (European Commission, 2022). Collaboration between the EU and nations like Canada, Norway, and Argentina on critical raw materials is crucial in enhancing diversity and fortifying supply chain resilience. These strategic alliances, such as the EU-Canada Critical Raw Materials Partnership and the EU-Norway Green Alliance, are designed to ensure the provision of essential minerals for the green energy sector in Europe (Burgstaller & Macpherson, 2023).

The EU's efforts to secure sustainable and resilient value chains for raw materials in the European market are of substantial importance to Norway. Norway possesses abundant critical raw materials and significant potential for increasing mineral production (Prestvik, 2024). These initiatives and partnerships underscore the EU's commitment to expediting the shift towards an environmentally sustainable economy while solidifying its position in global energy geopolitics.The EU's integration into a broader security framework through external partnerships showcases the interconnected nature of regional and global security dynamics. RSCT elucidates how regional historical, political, and economic elements influence security frameworks. The EU's new energy partnerships with countries like Egypt, Israel, Kazakhstan, and Namibia reflect these dynamics, as they aim to create a more stable and secure energy landscape.

C. Evaluating the Effectiveness of the EU Strategy to Reduce Energy Dependence on Russia

1) The Impact of the Russia-Ukraine War in 2022 on Global Oil Prices

The Russia-Ukraine war in 2022 significantly impacted global oil prices, which is evident in the price figures for Brent oil and various Russian oil grades (Urals, ESPO, Sokol) from early 2022 to early 2024 (Centre for Research on Energy and Clean Air, 2024). Brent, Urals, ESPO, and Sokol refer to different types of crude oil on the global market. Brent oil comes from fields in the North Sea and is often used as a benchmark for world oil prices. Urals is crude oil produced in Russia, while ESPO comes from the Eastern region of Siberia and is exported to the East Asian market. On the other hand, Sokol is a type of crude oil produced near the Sakhalin Islands in Russia, which is also exported to the Asia Pacific market. Each oil type has different chemical characteristics, designated uses, and prices influenced by quality, market demand, and global economic conditions. According to the Center for Research on Energy and Clean Air Based, when the Russia-Ukraine War started in early 2022, there was a sharp spike in oil prices due to fears of global supply disruption, given that Russia is one of the world's largest oil producers. Brent oil and Russian oil prices rose dramatically during this period (Centre for Research on Energy and Clean Air, 2024)

In late 2022 and early 2023, the implementation of crude oil price caps by Western countries as part of sanctions against Russia led to a significant drop in Urals oil prices, aimed at limiting Russia's revenues from oil exports while maintaining the stability of global oil supplies (Centre for Research on Energy and Clean Air, 2024).After implementing this policy, there is also a sharp drop in Urals oil prices. At the end of

2023, the imposition of sanctions by the Office of Foreign Assets Control (OFAC) on vessels transporting Russian oil added pressure on Russian oil prices, evident from the further price drop in the figure. The war has also created a consistent divergence between Brent and Russian oil prices, with Brent prices tending to be higher and more stable than the more volatile Russian oil prices. In May, the Urals average spot price saw a 5% decline every month but remained above the crude oil price cap, trading at USD 73.13 per barrel. The price of East Siberia Pacific Ocean (ESPO) and Sokol blended crude oil, which is mainly sold to Asian markets, fell by 6% (Centre for Research on Energy and Clean Air, 2024). These international geopolitical and policy events affected the oil market significantly during the period.

2) Energy Price Dynamics in the European Union

The Russia-Ukraine war in 2022 notably impacted the fluctuations of energy prices within the European Union. Preceding the war, energy costs had risen due to a combination of factors, including the heightened energy demand resulting from the post-COVID-19 economic recovery. However, the Russia-Ukraine war in 2022 further exacerbated the situation, leading to a more pronounced price surge during the latter part of the year. Specifically, the average cost of household electricity in the first half of 2023 escalated to €28.9 per 100 kilowatt-hours (kWh), up from €25.3 per 100 kWh in the corresponding period of 2022 (World Economic Forum 2023). In contrast, the average household electricity price across the European Union stood at €21.1 per 100 kWh in 2018. During that year, electricity costs in EU member states ranged from €10 per 100 kWh in Bulgaria to approximately €30 per 100 kWh in countries like Denmark, Germany, and Belgium (European Commission, 2019).The average gas price also increased to €11.9 per 100 kWh from €8.6 per 100 kWh in 2022. By 2023, the highest natural gas prices were registered in Sweden (€0.2070 per kWh), Ireland, and the Netherlands, while the lowest prices were observed in Hungary (€0.0335 per kWh), Croatia, and Romania. In Sweden, household natural gas prices are over six times higher than those in Hungary and stand 84% above the EU average price of €0.1125 per kWh.

This EU average price is calculated as a weighted mean utilizing the most recent data (second half of 2023) for household natural gas prices, amounting to €0.1125 per kWh (Eurostat, 2024).Throughout the EU, there is a noticeable upward trajectory in total natural gas prices during the initial half of each year, starting from a minimum of €0.0562 per kWh in the first half of 2010 and reaching a local peak of €0.0692 per kWh in the first half of 2013. Subsequently, prices experienced a decline until 2017 before surging in 2018, followed by a reduction in 2020. There was a sharp price spike between the latter half of 2021 and 2022. By the second half of 2023, the cost of natural gas for household consumers dropped to €0.1125 per kWh from €0.1137 per kWh the previous year after reaching a historic peak in the initial half of 2023 (Eurostat, 2024).Efforts have been made within the EU to diminish its reliance on Russian energy supplies. Nonetheless, these strategies necessitate reassessment in diversifying energy sources and establishing the necessary infrastructure to facilitate the transition to alternative energy sources. Energy prices within the EU rose considerably considerably compared to the previous year.

3) EU Member State Policy

Several EU member states, such as Italy, France, and Germany, issued national policies to secure energy security. Italy swiftly reduced its dependence on Russian gas by constructing a new LNG terminal. Implementing this strategy required close cooperation between the government and national companies such as *Ente Nazionale Idrocarburi*/National Hydrocarbons Board (ENI) and Snam. It also entered into direct negotiations with significant gas producers such as Algeria and Qatar, demonstrating a flexible and strategic response to the crisis (MEED, 2022). France, with the nationalization of *Électricité de France* (EDF) and the construction of a new LNG infrastructure at Le Havre (Enerdata, 2022), emphasized control over critical infrastructure and diversification of energy sources to ensure supply stability. Germany nationalized Uniper and RWE, two major energy companies that are crucial to the country's energy infrastructure. Germany also accelerated the development of LNG infrastructure through the LNG Acceleration Act, demonstrating a strong commitment to energy security and close collaboration between the government and the private sector (Bird&Bird, 2024). It demonstrates that energy security depends on supply diversification, strategic management, and effective collaboration in facing global energy challenges.

However, as per S&P Global, Russia is projected to supply 4.89 million metric tonnes of LNG to Europe by 2024, constituting over 16% of the total LNG supply of 33.65 million metric tonnes on the continent. This is an increase from the 12.74% share in the first four months of 2023. The primary recipients of Russian LNG in Europe in 2024 are France, Spain, and Belgium. Spain has received 32% of its total 1.56 million metric tonnes of imported LNG from Russia this year (S&P Global, 2024).While LNG imports have risen in Belgium, they have declined in France, where Russian LNG makes up 49% and 27% of total imports, respectively. Spain cannot terminate contracts without government involvement, and the government has affirmed its stance of non-interference in agreements between private entities (S&P Global, 2024).David Lewis, an LNG expert at S&P Global, has suggested that unless the European Union formally enforces a ban on Russian fuel imports by 2027, Spain could continue to receive LNG from Russia. This is particularly significant given Spain's efforts to boost imports amidst restrictions in the Suez Canal (S&P Global, 2024). Spain benefits from LNG carriers seeking European ports during crises. In contrast, countries like the UK and the Netherlands have prohibited transhipment services in their ports, leading to a notable decrease in LNG imports.Data from S&P Global reveals that from October 2023 to March 2024, Russian LNG deliveries to Spain amounted to 2.57 million metric tonnes, compared to 2.28 million metric tonnes during the same period in the prior year. Market observers in France argue that the market still requires LNG imports from Russia to meet its supply demands, and a complete cessation of this source is seen as improbable in the near term (S&P Global, 2024).

The political structure of the EU, where unanimous agreement among Member States is difficult to achieve, poses a challenge in developing standard policies and achieving the goal set in REPowerEU of ending hydrocarbon imports from Russia by 2027. Member States are forced to design and implement their strategies for energy diversification and reducing dependence on Russia. This could lead to fragmentation and hinder a complete gas phase-out in practice. Russian gas will likely continue to be supplied by pipeline and LNG to some EU Member States that choose not to implement strict measures, even after 2027. However, the volume of these supplies is projected to decrease significantly compared to levels before the war. Russia faces competition from alternative providers, such as LNG from North America and Qatar, as well as European decarbonization efforts and an expected decline in demand. The impact of global oil price fluctuations on energy security and regional stability can be utilized to assess the effectiveness of the European Union's strategy to reduce dependence on Russia for energy. The EU aims to establish a more secure and robust energy landscape by following the RSCT and security guidelines. The overarching goals of enhancing regional security, diversifying energy sources, and investing in renewable energy support a steady and sustainable energy future for the EU despite encountering short-term challenges and price variations during the transition.

VI. CONCLUSION

In light of the energy crisis stemming from the Russia-Ukraine war in 2022, the European Union has implemented a comprehensive strategy to reduce its reliance on Russian energy imports and safeguard the stability of its energy reservoirs. The unabated part of this strategy was initiating the REPowerEU plan in March 2022; it called for an investment of €210 billion by 2027. This plan aims to diversify energy sources; it will raise the share of renewable energy sources to 45 % by 2030 and increase the efficiency of low-carbon technologies. Thus, the EU has used contractual relations and memorandums of understanding with countries like Egypt, Israel, Kazakhstan, Namibia, Morocco, and Azerbaijan to ensure that the EU gets the needed supplies of alternate energy and, at the same time, promote the expansion of renewable energy systems. Furthermore, the EU affected Russian energy by banning its imports of crude and aircraft fuel and pure solar oil. Decreasing the importation of Russian oil and gas was evident in the middle of 2023, having a negative impact on multiple countries.

In order to compensate for this decline, the EU boosted imports of LNG from America and natural gas from Norway and Algeria. Externally, participation in curbing methane emissions and fostering partnerships for clean energy was started.To a great extent, they have altered the energy environment in the EU. Thus, the EU seeks to enrich a more robust and safer energy environment by diversifying its energy

supply and increasing instrumental investments in renewable energy. This strategy reduces the area's exposure to geopolitical risks like those from Russia and increases the area's freedom in the international oil markets. Finally, EU actions correspond with the organization's objectives, such as reducing carbon emissions in its economy and reducing dependency on Russian energy by 2027 to achieve stability and energy security.

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