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Role of Energy Resources in Europe's Geopolitical Environment

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***Abstract*— Energy raw materials constitute the bedrock of contemporary economies and shape the global geopolitical landscape. In Europe, their role is particularly pronounced due to the growing reliance on external suppliers and the imperative to ensure energy stability under evolving politico-economic conditions. Energy crises—such as the interruptions in natural gas supplies in 2006 and 2009, as well as Russia's invasion of Ukraine in 2022—have underscored the strategic significance of energy resources for national security and macroeconomic resilience. This article examines the principal dimensions of energy security in Europe, focusing on the necessity of diversifying energy sources, the role of energy infrastructure, and the influence of energy commodities on international politics. It highlights the ongoing, dynamic transformation of the energy sector toward a higher share of renewable energy sources and the deployment of innovative technologies, including energy storage and hydrogen. The article also discusses the challenges associated with infrastructure modernization and the need to strike a balance between energy security objectives and the costs of the transition.**

Keywords— energy security, fuel, natural gas, oil

I. INTRODUCTION

Energy resources are pivotal in shaping the contemporary geopolitical environment of Europe, influencing political decision-making, economic strategies, and the broadly understood security of states. In the face of Europe's growing dependence on external energy suppliers and the dynamically changing politico-economic landscape, energy resources have become both a factor of cooperation and a source of rivalry among countries. Europe is therefore compelled to confront numerous challenges arising from limited domestic natural resources and the necessity of ensuring energy security amid ongoing geopolitical tensions. Energy security may be defined as a state of economic functioning that enables the provision of stable and uninterrupted supplies of key energy carriers, including diesel fuel, heating oil, natural gas, electricity, thermal energy, as well as primary resources such as coal. A fundamental prerequisite for achieving this security is maintaining energy prices at an economically justified level that is acceptable to both individual consumers and industrial users. At the same time, it is essential to take into account factors such as economic competitiveness, improvements in energy efficiency, environmental protection requirements, the assurance of ecological security, and the implementation of the principles of sustainable development (P. Ruczkowski, 2023, pp. 426-430). Limited domestic energy resources including crude oil, natural gas, and coal-compel European countries to seek alternative energy sources as well as external suppliers of these raw materials. This dependence on external providers, such as Russia and the states of the Persian Gulf region, has become one of the most significant geopolitical challenges facing Europe in the twenty-first century. Contemporary energy crises, including disruptions in natural gas supplies in 2006 and 2009, as well as Russia's full-scale aggression against Ukraine in 2022, have demonstrated the strategic importance of energy resources in shaping Europe's national security and economic stability. The significance of energy resources stems from their fundamental role in the functioning of European economies. The availability and reliability of natural gas, crude oil, and coal directly affect economic competitiveness, the continuity of

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industrial production, and overall socio-economic stability. Moreover, energy infrastructure such as gas pipelines, oil pipelines, LNG terminals, and gas storage facilities plays a strategic role in enhancing Europe's resilience to potential supply disruptions. However, the construction and operation of energy infrastructure projects, including Nord Stream 1 and 2 and the Southern Gas Corridor, have frequently generated controversy, revealing tensions between individual European states, their national interests, and the collective objectives pursued within the European Union.

One of the most significant challenges facing Europe in the context of energy resources is the growing pressure to undertake an energy transition, driven both by environmental protection requirements and the need to increase independence from external energy suppliers. The introduction of the European Green Deal and ambitious climate objectives such as reducing greenhouse gas emissions by at least 55% by 2030 (European Parliament, 2018, Art. 2) and achieving climate neutrality by 2050 clearly indicate the direction of Europe's energy policy. This transformation entails the expansion of renewable energy sources, including solar, wind, and hydropower, as well as substantial investments in hydrogen technologies and energy storage systems (European Parliament, 2018 Art. 2). Nevertheless, this process is not without challenges, as it requires substantial financial outlays for the modernization of existing energy infrastructure, the development of new technologies, and research into critical raw materials essential to produce energy technologies, including rare earth metals.

An important aspect in the geopolitical analysis of energy resources is their use as an instrument of political influence in international relations. Russia, as the largest supplier of natural gas to Europe, played a pivotal role prior to 2022 as a provider of energy commodities to European Union member states, accounting for approximately 45% of the EU's imported natural gas (ENTSO-G, 2022). Such a significant share in the EU energy market resulted from historical and infrastructural determinants, including a highly developed pipeline network and long-standing trade relations with the countries of Central and Eastern Europe, particularly those that had previously belonged to the Soviet Union. Among the states with the greatest demand for Russian energy resources were Poland, Slovakia, the Czech Republic, Hungary, Lithuania, and Bulgaria, where imported crude oil accounted for more than 70% of total national demand for this resource. In the case of natural gas, the situation within the European Union was even more complex than for crude oil. Russia, as one of the world's largest gas exporters, came to dominate the European market, while transmission infrastructure lmost notably pipelines such as Nord Stream enabled the direct delivery of gas to key consumers within the EU. Dependence on Russian energy resources was particularly evident in regions with limited access to alternative energy sources or insufficient infrastructure enabling supply diversification. The countries of Central and Eastern Europe, including Poland, Hungary, and the Czech Republic, were especially vulnerable to the consequences of potential supply disruptions due to their geographical location and historical ties. Moreover, the lack of adequately developed infrastructure for importing liquefied natural gas during that period significantly constrained the possibilities for diversifying energy sources. The Russian Federation repeatedly exploited its dominant position in the energy market to pursue political objectives. This was reflected not only in the construction of pipelines such as Nord Stream, but also in the use of energy pricing as a tool of pressure on Central and Eastern European states that had long remained heavily dependent on Russian supplies. These developments contributed to substantial shifts in the European Union's energy policy, including the adoption of strategies aimed at diversifying supply sources and increasing investment in renewable energy. Issues of energy security in Europe have gained particular importance in the context of global political and economic transformations, such as great-power competition and tensions in the Middle East region. European states face the necessity of closer cooperation within the European Union, which in recent years has assumed an increasingly prominent role in shaping regional energy policy. The Third Energy Package of 2009, aimed at creating an internal energy market, as well as initiatives such as REPowerEU, underscore the need to deepen cooperation among Member States in the diversification of energy supplies and in expanding the share of renewable energy within the overall energy mix (European Parliament, 2022, pp. 6-8).

II. ENERGY RESOURCES IN ENSURING EUROPE'S SECURITY

The energy policy of the European Union has undergone a profound and multifaceted transformation, beginning with the establishment of the European Coal and Steel Community (ECSC) in 1951, whose primary objective was economic integration through control over strategic raw materials such as coal and steel. The evolution of this policy led to the development of the contemporary model in which energy policy has become a shared competence between the Member States and the institutions of the European Union. The formal division of powers in this field is regulated by Article 194 of the Treaty on the Functioning of the European Union, which defines the legal framework for actions undertaken at the EU level, while simultaneously respecting the principle of subsidiarity and preserving the sovereignty of Member States in determining their national energy mix (European Parliament, 2012, Art. 194).

Pursuant to Article 194 of the Treaty on the Functioning of the European Union (TFEU), the common energy policy of the European Union focuses on four key objectives (European Parliament, 2012, Art. 194):

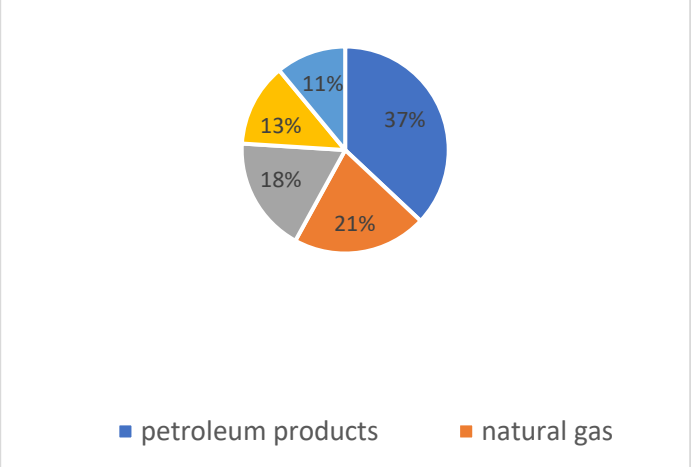
a. Ensuring the functioning of the internal energy market;
b. Enhancing the security of energy supply at the European Union;
c. Promoting energy efficiency and energy savings, as well as the development of new and renewable energy sources;
d. Promoting the interconnection of energy networks.

The common energy policy of the European Union must take into account the diverse interests of the Member States, resulting from differences in natural resource endowments, levels of technological development, economic structures, and degrees of dependence on external energy suppliers. Despite harmonization efforts and initiatives aimed at supporting the integration of the energy market, Member States retain the full right to determine their own energy structure, including both the choice of energy sources and the technologies employed. Since the 1970s, EU energy policy has gradually expanded to encompass an increasingly broad range of issues, including environmental protection and the mitigation of climate change. The introduction of provisions on environmental protection in Article 191 of the Treaty on the Functioning of the European Union (European Parliament, 2016, Art 191) including measures addressing global environmental challenges, established the legal foundations for integrating energy policy with climate objectives. These actions gained increasing importance in the context of global challenges such as climate change, as reflected in successive EU strategies and targets—from the 2020 climate and energy package to the commitment to achieving climate neutrality by 2050 (C. Strambo, M. Nilsson, A. Månsson, 2015, pp. 1-12).

However, this process was not without difficulties, particularly in the area of energy security, which became a central component of energy policy in response to the gas supply crises of 2006 and 2009 (K. Szulecki, 2018, pp. 177-202). In particular, disruptions in natural gas supplies from Russia via Ukraine exposed the extent of the Member States' dependence on external suppliers and the insufficient infrastructure enabling diversification of supply routes. As a result, the European Union undertook measures aimed at enhancing security of supply, including the adoption of the Regulation on the security of gas supply in 2010 and investments in strategic infrastructure such as LNG terminals and gas interconnectors between Member States. The Russian Federation's invasion of Ukraine in 2022 once again profoundly affected European decision-makers and destabilized energy security across Europe. Over the past two decades, EU energy policy has clearly shifted toward the implementation of sustainable development objectives, integrating environmental, social, and economic considerations. The introduction of binding targets for the reduction of greenhouse gas emissions, the increase in the share of renewable energy sources, and improvements in energy efficiency demonstrates the EU's ambitious approach to energy transition. In 2020, under the European Green Deal, the European Union committed to achieving climate neutrality by 2050, a goal that requires a substantial strengthening of cooperation and coordination at the EU level. These challenges underscore the necessity of further deepening integration in the field of energy policy, including reinforcing the competences of EU institutions and increasing the harmonization of actions undertaken by Member States. A key task will be reconciling national sovereignty with the need for a collective response to global challenges such as climate change, volatility in energy markets, and the requirement to ensure the long-term sustainability and efficiency of energy systems in the context of growing energy demand.

Given the high level of economic development of the European Union Member States and the intensive consumerism of their societies, a defining characteristic of these countries is a substantial demand for energy. According to available data presented in Chart 1, in 2022 the European Union produced approximately 37% of its energy from domestic sources, while the remaining 63% was covered by imports. In 2022, the energy structure of the European Union, encompassing a diverse range of energy sources, was primarily based on five key pillars. The largest share was held by crude oil and petroleum products, which accounted for 37% of total energy consumption. The second most significant source was natural gas, representing 21% of the energy mix. Renewable energy sources ranked third, with a share of 18%, while solid fossil fuels, such as coal, supplied 13% of total energy demand. The energy structure was complemented by nuclear energy, which constituted 11% of overall consumption.

CHART 1. THE SHARE OF ENERGY PRODUCTS IN THE TOTAL ENERGY AVAILABLE IN THE EU IN 2022

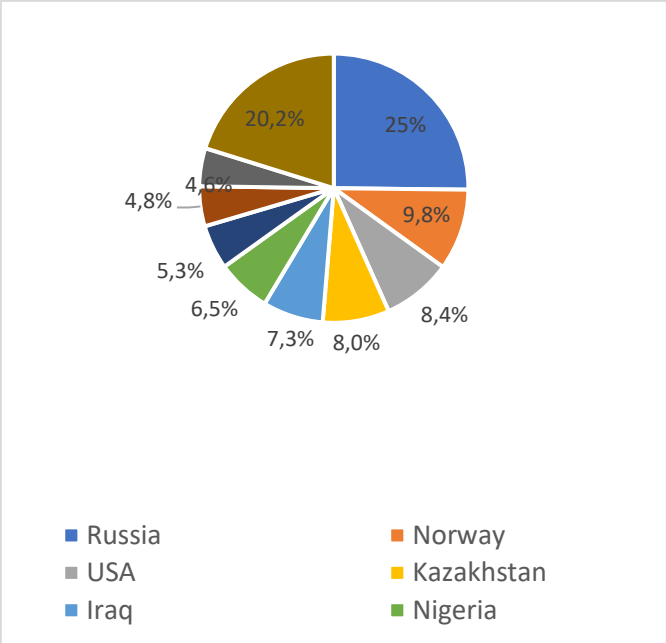


Source: Eurostat. Simplified Energy Balances.

Energy resources represent a fundamental component of energy demand, as they constitute the basis for the functioning of modern economies and ensure the stability of the energy sector. The most important among these resources are crude oil, natural gas, and hard coal. The significance of crude oil in the EU's energy policy derives from its versatile applications and the difficulty of its rapid and effective substitution by alternative energy carriers. It is essential for maintaining the continuity of critical infrastructure operations and ensuring industrial competitiveness. At the same time, the high concentration of crude oil supplies from a limited number of exporters entails the risk of destabilization in the event of geopolitical, economic, or technical disruptions. Crude oil imports to the European Union originate from a broad range of countries located across different continents. Such geographical diversification of suppliers constitutes one of the key elements of the EU's energy security strategy, as it reduces the risks associated with potential supply disruptions in any single region. An analysis of the data presented in Chart 1 indicates that Russia accounted for imports of 112,447.602 thousand

tonnes, representing approximately 25% of the total crude oil imports to the EU. It is worth noting that in 2021 as much as 4,466,453.434 thousand tonnes nearly 97% of crude oil consumed within the EU originated from imports. Russia's position as the largest supplier underscored its critical importance for Europe's energy stability, while the EU's dependence on external raw material supplies became a significant bargaining instrument in the context of the Russian Federation's invasion of Ukraine. In addition to Russia's dominance as the primary crude oil supplier to the European Union, other exporting countries also play a significant role in the EU's supply structure. Their shares range from 9.8% in the case of Norway, through 6.5% for Nigeria, to 4.8% for the United Kingdom, which despite leaving the EU continues to function as a stable supplier. The United States accounts for nearly 8.4% of imports and, following the Russian invasion of Ukraine in 2022, has increasingly assumed a portion of the market previously dominated by Russia. An important group of suppliers consists of other exporting countries which collectively account for 20.2% of EU crude oil imports. Their significance extends beyond the absolute volume of deliveries, as these states contribute to supply stability through geographical diversification, well-developed transportation infrastructure, and a relatively lower exposure to geopolitical tensions.

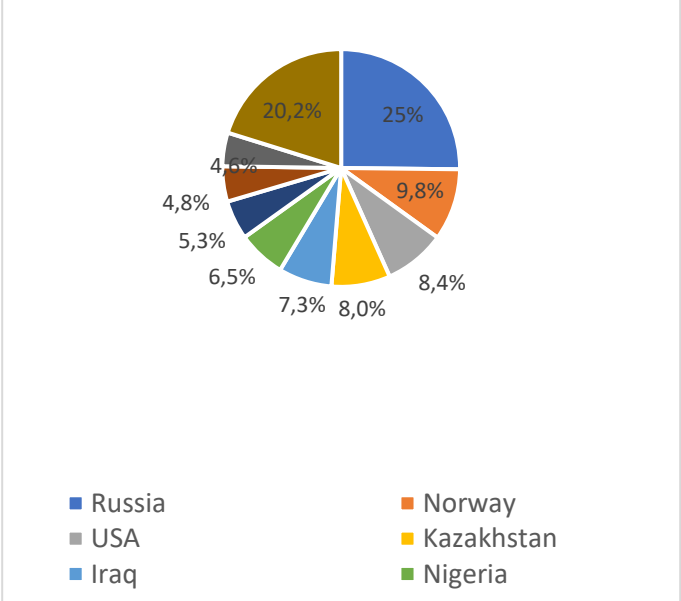
CHART 2. IMPORT OF CRUDE OIL SUPPLY TO THE EU IN 2021



Source: Eurostat. Imports of Crude Oil and Petroleum Products by Partner Country.

Natural gas, alongside crude oil, plays a crucial role in ensuring the energy security of the European Union, constituting one of the main pillars of its energy system. It is widely used in the power generation sector, heating, and industry. Its importance stems from its relatively low emissivity compared to other fossil fuels, which makes it a significant component of the energy transition process. According to data for individual countries and regions presented in Chart 3, the structure of natural gas imports to the European Union in 2021 was clearly dominated by Russia, which accounted for 45% of total imports of this resource. This situation resulted from many years of economic cooperation between the European Union and the Russian Federation, as well as from a well-developed transmission infrastructure, including pipeline systems such as Nord Stream (European Parliament, 2022 Art. 2-3) as well as from Russia's substantial natural gas reserves. Norway, the second-largest supplier of natural gas to the European Union with a share of 24%, plays a key role in the diversification of gas supply sources. As a stable and predictable trading partner, Norway constitutes an important complement to the EU's natural gas imports. Cooperation with Norway is based on long-term contracts and a well-developed transmission infrastructure, which enhances Europe's energy security by reducing excessive dependence on a single supplier. Other sources of natural gas imports included North Africa (13%), primarily via pipelines from Algeria, and the United States (6%), which supplied gas in the form of liquefied natural gas (LNG). Russia's dominance in natural gas imports was of fundamental importance to the functioning of the EU energy system; however, it was also associated with numerous challenges. A high level of dependence on a single supplier increased vulnerability to supply disruptions resulting from geopolitical tensions, political decisions, or infrastructure crises. Consequently, the European Union undertook numerous initiatives aimed at diversifying energy sources, including the development of LNG terminals, investments in transmission infrastructure, and an increased share of renewable energy sources.

CHART 3. STRUCTURE OF NATURAL GAS IMPORTS (PIPELINES AND LNG IN 2021)



Source: ENTSO-G.

III. ENERGY RESOURCES IN RELATIONS BETWEEN THE EUROPEAN UNION AND THE RUSSIAN FEDERATION

The availability of energy resources constitutes an important foundation for formulating diversified strategies that shape international relations. Countries possessing substantial

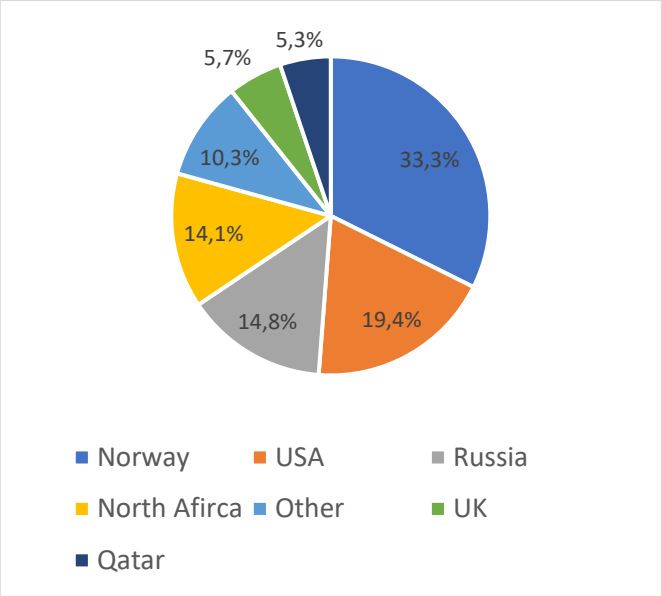
reserves of such resources may employ them as instruments to strengthen their position on the global stage. This enables them to pursue an active foreign policy, negotiate more favorable trade agreements, and develop more stable and durable diplomatic relations with other states. Consequently, the possession of abundant energy resources not only supports strong economic performance but also enhances a state's political and strategic influence in the international arena (J. Potulski, 2010, pp. 122). Dependence on Russian energy resources was particularly evident in regions with limited access to alternative energy sources or infrastructure enabling supply diversification. The countries of Central and Eastern Europe such as Poland, Hungary, and the Czech Republic were especially vulnerable to the potential consequences of supply disruptions due to their geographical location and historical ties. Moreover, the lack of sufficiently developed infrastructure for importing liquefied natural gas at that time significantly constrained opportunities for diversifying energy sources. At the same time, Eastern Europe including the Baltic States and Central European countries was particularly susceptible to political pressure from Russia, which repeatedly used exports of energy resources as an instrument of influence in international politics. The dependence of these states on Russian natural gas and crude oil had not only an economic dimension but also a strategic one, affecting foreign policy orientations and decisions related to energy security. It is also important to note that Russia's share in the European Union's energy market was not limited solely to quantitative aspects but also encompassed strong infrastructural interdependencies, such as gas pipelines transiting Ukraine and projects including Nord Stream 1 and Nord Stream 2, (C. Strambo, M. Nilsson, A. Månsson, 2015, pp. 1-12), which became the subject of intense political disputes within the EU. The escalation of geopolitical tensions, culminating in Russia's full-scale invasion of Ukraine in February 2022, led to profound destabilization of the European energy sector. These events highlighted Europe's significant dependence on supplies of natural gas and crude oil from Russia, making energy security one of the key political and economic challenges in the face of the new realities confronting Europe (D. Piękoś, P. Suduł, S. Augustyn, 2023, p. 14). In response to the Russian Federation's illegal aggression against Ukraine, the European Union undertook decisive actions aimed at weakening the aggressor's military and economic capabilities. A key element of this strategy was the imposition of comprehensive economic sanctions intended to undermine the foundations of the Russian economy, including the energy sector. Exports of energy resources to the European market had constituted one of Russia's principal sources of state revenue and a major means of financing military operations. The sanctions introduced by the European Union included the gradual restriction of imports of Russian energy commodities such as crude oil, natural gas, and coal, with the objective of reducing capital flows to the Russian state budget. In response to these economic measures, the Russian Federation adopted a retaliatory strategy by limiting energy exports to selected EU Member States. These actions were intended to exert pressure on Europe, intensify the energy crisis, and weaken the unity of EU countries in their continued support for Ukraine. One of the most significant steps taken by Russia was the progressive reduction of natural gas supplies to Europe through pipeline systems, particularly Nord Stream 1. In the summer of 2022, Russia's state-controlled company Gazprom substantially curtailed gas flows along this route, officially citing technical difficulties. In reality, however, these reductions were political in nature and served as an instrument of pressure on Europe, which at the time was struggling with record-high energy prices and the urgent necessity to rapidly diversify its energy supply sources (M. Sienkiewicz, R. Nowakowski, K. Tarnacka, P. Turowski, J. Bartoszewski, A. Mikulska, 2022, pp. 30-40). Ultimately, in September 2022, as a result of a series of explosions of unclear origin, the Nord Stream 1 and Nord Stream 2 pipelines were permanently damaged, which brought gas transmission along this route to a complete halt (https://www.osw.waw.pl/pl/publikacje/analizy/2022-06-17/rosja-kolejne-ograniczenie-dostaw-gazu-do-europy).

Russia also suspended gas supplies to countries that refused to settle payments in rubles, which constituted one of the conditions imposed by the Kremlin as part of an economic policy aimed at stabilizing the Russian currency following the introduction of Western sanctions. As a consequence of this process, a significant increase in the share of alternative suppliers occurred, with Norway emerging as the principal beneficiary. According to the data presented in Chart 3, Norway supplied 24% of imported natural gas in 2021, whereas the figures shown in Chart 4 indicate that its share rose to 33.3% in 2023, making Norway the EU's leading gas supplier.

A comparable increase was recorded for the United States, whose natural gas exports to the European Union rose from 6% in 2021 to 19.4% in 2023. This shift was primarily driven by the growing role of liquefied natural gas (LNG), which enables maritime deliveries and thereby reduces dependence on pipeline infrastructure. In contrast, imports of natural gas from the Russian Federation declined from 45% in 2021 to 14.8% in 2023, meaning that within two years the European Union reduced gas imports from Russia by as much as 66%. At the same time, the share of suppliers outside the major gas-exporting markets classified under the category "Other"—increased from 6% in 2021 to 10.3% in 2023. In addition, the United Kingdom and Qatar, which in 2021 supplied 2% and 4% respectively of the gas imported by the EU, recorded increases to 5.7% and 5.3% in 2023. The growing significance of these supply directions highlights the expanding role of LNG and reflects the measures undertaken by the European Union to reduce its dependence on pipeline-based gas supplies from Russia. Similar measures were also applied to the oil sector. In 2021, Russia was the dominant supplier of crude oil to the European Union, accounting for 25.19% of total imports. However, as a result of the imposed economic sanctions and restrictions on trade in energy commodities, Russia's share in EU crude oil imports declined dramatically to only 3.0% in 2023. In Russia's place, the importance of other suppliers increased significantly, particularly the United States and Norway. The share of U.S. imports rose from 8.4% in 2021 to 14.3% in 2023, reflecting the intensification of transatlantic

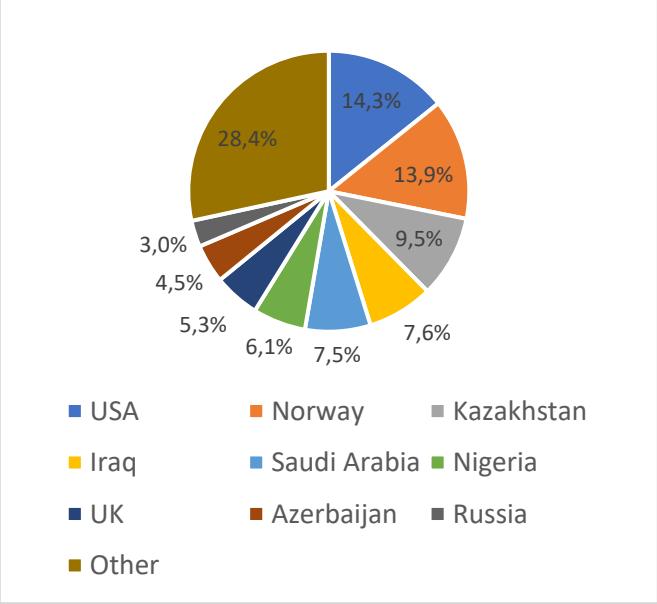
energy cooperation and the growing significance of American crude oil within Europe's supply structure. Similarly, Norway accounting for 9.8% of imports in 2021 increased its share to 13.9% in 2023, confirming its expanding role as a key energy partner of the European Union. Crude oil supplies from Kazakhstan, Iraq, and Nigeria have remained relatively stable. Imports from Kazakhstan increased from 8.0% in 2021 to 9.5% in 2023, indicating the growing importance of this country as a crude oil supplier to EU Member States. The role of Saudi Arabia also increased markedly, with its share rising from 5.3% in 2021 to 7.5% in 2023. The category "Other," encompassing supplies from less prominent sources, expanded from 20.2% in 2021 to 28.4% in 2023. This development underscores the growing importance of supply diversification and reflects the strategic efforts undertaken by the European Union to replace Russian crude oil with alternative sources.

CHART 4. STRUCTURE OF NATURAL GAS IMPORTS (PIPELINES AND LNG IN 2023)



Source: ENTSO-G.

CHART 5. IMPORT OF CRUDE OIL SUPPLY TO THE EU IN 2023



Source: Eurostat. Imports of Crude Oil and Petroleum Products into the EU by Partner Country.

IV. CONCLUSION

Energy resources play a fundamental role in the functioning of modern economies, serving not only as the primary source of energy for industry, transport, and households, but also as a key determinant of economic stability and national security. In light of dynamic geopolitical developments and global economic trends, the structure of energy resource supplies to the European Union has undergone significant transformation, affecting both the operation of the energy market and the economic policies of Member States. The transformation of energy imports observed in the period 2021–2023 has highlighted the growing necessity to diversify supply sources and reduce dependence on a single supplier. The decline in Russia's share of the EU's imports of natural gas and crude oil in favor of alternative suppliers such as Norway, the United States, Kazakhstan, and Saudi Arabia—reflects Europe's broader efforts to ensure energy stability and protect itself against potential disruptions arising from geopolitical tensions. The role of energy resources in the economy extends beyond their mere availability; it also affects industrial competitiveness, inflation levels, price stability, and the development of low-emission technologies. Energy costs determine production efficiency and the mobility of goods, while their fluctuations have a direct impact on financial markets and the macroeconomic situation of individual states. In particular, the growing importance of liquefied natural gas and renewable energy sources indicates a gradual evolution of the energy sector toward greater flexibility and resilience to global crises. In pursuing long-term stabilization of the energy market, the European Union has undertaken measures to reshape its energy structure through the implementation of strategies related to climate neutrality and enhanced energy efficiency. At the same time, a key challenge remains maintaining a balance between energy security and the costs of transformation, which require substantial financial investment and extensive infrastructure modernization. Energy resources not only determine the stability and development of economies but also constitute a strategic component of international politics. Their availability, origins, and costs influence global power structures and economic relations, while changes in import patterns reflect broad processes of market restructuring and adaptation to new geopolitical and economic realities. In the long-term perspective, the crucial objective remains the development of a model that ensures stable energy supplies for Europe while simultaneously supporting economic competitiveness and the achievement of sustainable development goals.

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