EU Energy Transformation and Diversification: Energy Security in the Context of Geopolitical Changes

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Abstract: The presented topic deals with the transformation and diversification of the EU energy sector. Energy security is examined in the context of geopolitical changes and viewed through the lens of the interdependence between the EU and Russia in the import and export of fossil fuels. The topic is studied on the demand side and on the supply side. The political element plays a fundamental role in the territorial structure of energy flows. The descriptive analysis employed two case studies, which illustrated the transformation of the EU energy mix as well as the extent of the EU's import dependence on Russian gas. It is possible to observe the (a)symmetry of mutual dependence in the context of energy transformation. The key theme of the article is the assessment of EU energy security based on changes in energy resource flows through the lens of geopolitical changes. The research has demonstrated the need for a dramatic change in the EU energy mix, one which will reduce reliance on fossil fuels and increase the role of renewable energy sources. This trend is positive for the diversification of fossil fuel imports to the EU. Additionally, proposals and recommendations are put forward to help strengthen the EU's energy security in the future.

Keywords: ***Energy transformation, diversification, energy security, geopolitical changes, European Union, Russia***

Introduction

Securing stable and safe supply of energy resources is currently one of the main tasks of state governments. The basis of the study is to clarify changes in

energy flows (with a focus on oil and natural gas) with implications for the EU based on economic and political-security analyses. As part of increasing energy security related to fossil fuels, the topic is implemented on two main levels: the demand side and the supply side. On the supply side, it is about ensuring long--term supplies of primary energy. Attention is also focused on the diversified structure of suppliers and oil and gas. On the demand side, there is an effort to reduce the consumption of certain types of energy, especially oil and natural gas, which continue to represent the main challenge for eliminating dependence on supplies from unstable regions, especially Russia.

An important localisation factor from an economic point of view is the energy intensity of countries. As a political element, the political and security situation in the supplier regions and current geopolitical developments in the world continue to play a significant role in the territorial structure of energy flows. Current developments and future predictions are key issues related to changes in the global economy, particularly as economic potential shifts to rapidly growing regions like Asia. In contrast, the concept of energy-saving economies in Europe, together with the diversification of suppliers of energy sources, appears to be competitively advantageous.

Energy resources have long been at the centre of the international situation. The dynamic development of the energy industry corresponds to the growing demand for primary energy in the world. The problems that have arisen with the exploitation and supply of resources to the regions have reached global dimensions, and the growth in the consumption of primary energy sources, especially oil and natural gas, has an important multiplier effect for the world economy. Many countries, as well as the EU, are trying to increase their competitiveness and make greater use of renewable energy sources.

There are still problems with ensuring stable supplies of energy sources in today's complicated geopolitical situation. In the context of current events, however, it is necessary to emphasise geopolitical factors, which have fundamentally influenced the flow of energy resources. This is especially so in the Eurasian area in connection with the sanctions on Russia, which is the main supplier of oil and natural gas. There have also been fundamental changes in these flows.

Energy is not only a basic industry, but also a strategic sector that plays a key role in geopolitical thinking and political decision-making. The European Union, as an important global player, faces many challenges in its energy policy, which is constantly reshaped by the dynamics of international events. Energy security and energy dependence are not only fundamental concepts, but also indicators of political and economic development and independence. Energy security is perceived as the ability of a state or a larger community, such as the EU, to effectively respond to external and internal threats that could threaten a stable supply of energy and, thus, overall economic and social stability. On the other hand, energy dependence reflects the extent to which the EU is depend-

ent on the import of energy resources from other countries and regions. This can lead to risk of geopolitical shocks. It is therefore an essential indicator for assessing safety.

While the EU is trying to reduce its energy dependence by diversifying sources and increasing the share of renewable energy sources, it still faces challenges brought about by constant changes in geopolitics. Enhancing energy security is so complicated. Natural gas as a transitional energy source on the way to decarbonisation has increased in importance in the EU in recent years. Its role in the EU's energy strategy was significantly strengthened by the partnership with Russia, but it was disrupted by the Russian invasion of Ukraine in February 2022. This led to a significant cooling in mutual relations and raised questions about future supplies and the EU's strategic direction in the field of energy. Currently a very urgent question is how the EU will deal with the broken energy partnership while maintaining energy security and economic prosperity.

The State of the Art

The crises show how geopolitical events can affect the energy sector. But this relationship works both ways, and changes in energy markets can also have an impact on geopolitics. The ongoing energy transitions have an impact on the changing demand for energy resources and these processes will take long. It means that fossil fuel producers will still have influence. It can be assumed that due to the increase in the use of clean energy, this influence is decreasing. But energy transitions do not mean the end of geopolitical risks. The traditional risks associated with fossil fuel reserves are evolving and not completely disappearing. Transitions could be destabilising for weak producer states that are not successful in diversifying their dependence on oil and gas export revenues. At the same time, new emerging risks of clean energy can be observed in supply chains (Bordoff & O'Sullivan 2023). Both traditional and new security risks have worsened the situation in an international system characterised by rivalry and little cooperation. The introduction of clean energy in recent years and high fossil fuel prices may give further impetus to the transitions. However, geopolitical shocks do not allow long-term development to be predicted.

The key element in the future will be the development of rivalry and cooperation. Geopolitical factors unfold gradually, the relationship with Russia and its position in the international trade with energy resources is crucial. Clean energy cooperation can be protected from wider political tensions and global development can be accelerated in line with the NZE Scenario (IEA 2023: 68–69). The Net Zero Emissions by 2050 Scenario (NZE Scenario) is a normative scenario that shows a pathway for the global energy sector to achieve net zero CO2 emissions by 2050, with advanced economies reaching net zero emissions in advance of others. This scenario also meets key energy-related

Sustainable Development Goals (SDGs), in particular universal energy access by 2030 and major improvements in air quality. It is consistent with limiting the global temperature rise to 1.5 ºC (with at least a 50% probability), in line with emissions reductions assessed in the Intergovernmental Panel on Climate Changes' (IPCC) Sixth Assessment Report (IEA 2024). Undoubtedly, however, geopolitical tensions can reduce clean energy ambitions as well as fossil fuels.

Energy and geopolitics create a situation in international relations where competition for energy resources becomes a key factor influencing world politics (Krejčí 2001). The current energy situation is a result of long-term development and has a fundamental influence on the political and economic stability of states. The importance of energy as a key factor in global security has increased as a result of oil crises, where energy resources have been used as tools of economic and political pressure (Kempe 2023). The current situation in which Russia uses energy as a means of economic and political influence is an example of the geopolitical use of energy as a weapon. Russia has shown that energy resources can be misused for conflict and disruption of international stability (Wright 2022). A fundamental moment is the perception of the Russia-EU relationship, the influence of energy relations on the identity of the EU and Russia, the influence of ideological values on energy relations (Sharples 2011) and the formation of energy interests (Romanova 2016).

An essential element for the investigation of interrelationships is inclusion in the process of energy transformation in the present. Energy transformation in the past and its consequences, as well as the dynamics of change, are presented by Sovacool (Sovacool 2016). Some authors present a conceptualisation of changes related to energy transformation and their consequences (Stirling 2014). Some authors deal with the interdependent relationship between the EU and Russia. Their research is often limited to geopolitical aspects, where they are interested in geopolitical power in addition to economics. Krickovic (Krickovic 2015) states that interdependence in energy is an area that can bring about tension in security relations. This phenomenon erodes the mutual trust that has been built through business ties and long-term contracts. These assumptions do not respect energy cooperation and suggest that energy could be used not only for political purposes but also for security purposes. Geopolitical analyses in the context of energy transformation, consequences and risks have been written, for example, by Griffiths (Griffiths 2019). The intersection of geopolitics and energy security is a critical area of study that has gained increasing interest and signals critical areas of interest and collaboration (Wang, Ren & Li 2024).

The Theoretical Background and Methodology

It is possible to study the (a)symmetry of interdependence between the EU and Russia in the context of energy transformation. Transformation, as the second

theoretical pillar, is the impetus for future changes also manifested in power shifts. It can be expected that new technologies will make some states stronger, while others will be weaker. This fact is reinforced by a number of emerging studies on the topic of energy transformation (Taylor 2020; Gielen, Boshell, Saygin, Bazilian, Wagner & Gorini 2019).

Interdependence can be defined as a relationship between two or more actors, which assumes that a change in the position of one actor will affect other actors (Rosecrance & Stein 1973). The concept of interdependence makes it possible to analyse a whole range of problems (Binhack & Tichý 2012). Symmetrical interdependence is a relationship of equal reciprocal dependence of one subject on another and is the extreme of an interdependent relationship (Keohane & Nye 2001: 9). According to studies, an equivalent dimension of interdependence between states reduces the risk of involvement in conflicts and reduces the risk of disputes in trade relations (Barbieri 1996). Mitrany (Mitrany 1994) proposed a top-down approach directed by governments and governmental organisations responsible for connecting states in specific areas (Mitrany 1994). Deutsch focused on transactional relations between states. These transactions included the intensity of trade exchange, the flow of information and migration (Deutsch 1957). Deutsch assumed that the increased intensity of these transactions between states would necessarily lead to the creation of institutions that would eventually become the basis of a security community.

Nye and Keohane created the concept of complex interdependence by the state and manner of coexistence of states in the international area, which they defined by three characteristics (Keohane & Nye 1973: 24–29). In a situation of complex interdependence, international interactions take place through many communication channels. International relations in the model of complex interdependence is not only the domain of formal interactions between states, but includes many other formal and informal actors and relationships. The importance of individual actors is not only that each actor pursues its own goals, but that at the same time they increase the mutual sensitivity of the foreign policy of interdependent states (Keohane & Nye 1973: 25). Keohane and Nye further write that state policies in a state of interdependence are not subordinated to one priority, such as the military and the securing of defence (Keohane & Nye 1973: 26–27).

The possibility of using force is limited by the costs of interdependence. The costs of interdependence primarily represent the economic losses that a state would suffer from the interruption of informal, commercial, communication, infrastructural and other ties with another state when military force is used. The authors note that in developed countries these costs exceed the potential gains from new territory gained by military force (Keohane & Nye 1973: 29). Invoking an international military conflict also serves as a stabilising internal

political tool in a state of interdependence (Keohan & Nye 1973: 28). Interdependence should not necessarily be characterised as a situation of reciprocal dependence of one subject on another. Such a situation, called symmetric interdependence, is considered one of the extremes of interdependence. Keohane and Nye (Keohane & Nye 2001: 9) emphasise that the unequal distribution of profits and expenditures is at the centre of asymmetric interdependence that provides a source of power.

We assume that Russia will lose a significant part of its power to the EU due to the advancing energy transition. EU energy has major challenges as a result of geopolitical changes associated with the war in Ukraine, but also with other regions of tension such as the Middle East. The EU must deal intensively with energy issues, the main one being the transformation of the energy sector. The authors write that some countries will be significantly damaged by the decline in demand for fossil fuels (Mercure, Pollitt & Vinuales 2019). Countries with large reserves are trying to expand their strategy to slow energy transitions (Griffiths 2019) or create more interdependencies. A typical example is Russia's growing influence in developing countries, where it is building nuclear energy. In relation to geopolitical developments, there is a debate as to whether nuclear power should have a place in Africa's energy system (Payton 2023). Another strategy is influencing public opinion.

Our study identifies changes in fossil energy resource flows through supplier diversification to the EU in the context of Russia's geopolitical developments and policies. At the same time, we can also see the advancing diversification of oil and natural gas importers and Russia's increasing efforts to expand its influence in developing countries (see above). At the same time, we are monitoring the energy transformation in the EU, which is associated with risks and problems, such as securing the supply of specific and rare elements for the production of renewable energy, securing new technologies, managing markets and tenders, regulating market access and new standards, etc. Russia could use these risks and problems to slow down the transformation. Energy transition refers to a major structural shift in how energy is supplied and consumed, with a focus on clean energy. Most of the sustainable energy is renewable energy. Therefore, another term for energy transition is renewable energy transition. Many authors address the impact of political and economic decisions on energy mix and energy transition, as well as energy independence and security (Auer & Anatolis 2014; Díaz, Marrero, Puch & Rodríguez 2019; Meier 2021; Smil 2020; Rusin & Wojaczek 2023).

For the purposes of the study, which deals with the possibilities of reducing the EU's energy dependence on Russia, a suitable methodology has been chosen based on the theoretical framework described above. The methodological procedure is based on two pillars studying the dependence of subjects and the process of energy transformation. The dynamics of current geopolitical and

technological changes make it possible to perceive these changes in the mutual relationship between the EU and Russia.

The aim of this text is to examine the transformation process and diversification of the EU's energy sector. In this text, energy security is examined in the context of geopolitical changes and viewed through the lens of the interdependence between the EU and Russia in the import and export of fossil fuels. The key question is how the import dependence of fossil fuels is developing in the context of geopolitical changes and the existing interdependence of the EU and Russia. A descriptive analysis was carried out to assess the import dependence of the EU and to address the study's main objective. The analysis used a quantitative data series that adequately demonstrated the development of import dependence. The article also addressed the question of how the EU's energy security is changing and what other options exist for strengthening it.

Another approach will be the analysis of the current transformation of the energy mix in the EU, which includes changes at both the technological and institutional levels. Here we also see the various reactions of the EU member states to the energy transformation.

Each actor pursues its own goals, but at the same time they increase the mutual sensitivity of the foreign policy of interdependent states. Other Russian activities also aimed at reducing damage to Russian interests through energy transformation within the EU. The supply structure of energy resources to the EU has changed in the context of geopolitical developments in recent years. This is accompanied by energy transformation following technological development. At the same time, Russian interests in other countries are developing, as is the need to diversify the customer structure of countries with regards to oil and gas. However, the expanding influence of Russia in the field of nuclear energy in developing countries is key. This procedure is supplemented by a comparative element when examining the interdependence between individual EU countries and Russia. Other possibilities for research are undoubtedly in the comparative progress of individual EU member states, which can be the dominant method for analysing the EU's internal differentiation.

Our study used official documents such as strategic and conceptual documents and official studies of the authors dealing with the investigated issue. The database for analytical interpretation was based on the outputs of available data from renovated statistical agencies and international organisations such as Eurostat, the WTO, the International Energy Agency, the WNA and others. The analysis consists of comparing empirical data that show changes in the structure of the EU's energy mix. To evaluate mutual interdependence the commodity natural gas was chosen as a tool, which shows the changes associated with the decreasing share of imports into the EU. The combination of these results documents the importance of mutual energy relations at the EU-Russia level.

Energy Transformation of the EU

Energy consumption in the EU consists of energy produced in the EU and also imported from third countries. In our research, all energy production is presented in the context of imports. The EU covered 42% of gross annual consumption from domestic production and 58% of energy sources had to be imported to the EU in 2023. This shows a tendency of increasing dependence on the part of the EU, because compared to 2020 the EU covered 42.5% of domestic demand with its production.

Oil was the EU's main energy source in 2023. Its share in consumption was 37.7%, natural gas made up 20.4% and the dynamically growing share of renewable resources (19.5%) was in third place. Solid fossil fuels accounted for 10.6% of the energy mix and nuclear energy accounted for 10.6% (Eurostat 2025a). However, there are big differences between EU countries. The share of petroleum products in energy final consumption in 2023 was highest in Cyprus (86.3%), Malta (85.6%) and Luxembourg (61.1%), while natural gas was a significant source of energy in Italy (34.8%), Hungary (29.1%), the Netherlands (29.5%) and Ireland (28.5%). Renewable sources had the largest share in Sweden (50.2%) and Latvia (44.7%), while nuclear accounted for 39.1% of energy in France and 28.8% in Sweden. The share of solid fossil fuels was highest in Estonia (53.4%) and Poland (35.5%) (Eurostat 2025a).

We monitor the energy transformation through changes in the energy mix, the changes of which are a fundamental element of EU energy policy. One of the goals of the energy policy is to reduce the vulnerability and to ensure the resistance of the energy system against external influences. A fundamental element of these changes is the diversification of energy sources in the context of sustainable and low-emission energy. The EU is intensively transforming its energy mix with regard to reducing emissions and supporting renewable energy sources. These changes make the energy mix a strategic tool that strengthens energy security and maintains economic stability.

Changes in the shares of energy sources are key to understanding the development of the energy sector in the EU. Empirical data from this period over the last 22 years shows the increasing importance of renewable sources in the EU's energy mix. The energy transition strengthens energy security, but also moves towards a sustainable and ecologically clean energy sector. In the period under review, oil was still the dominant source of final energy consumption, while the share of natural gas decreased compared to 2000. Solid fuels had a significant relative decrease (from 19% to 11.8%). Renewable sources had positive dynamics and contributed more than 19.5% of the EU's energy mix in 2023 (compared to 2000 – 6.4%). The basic development tendency is reducing the share of fossil fuels in the EU's energy mix. The question remains about the use of nuclear energy, which is approached differently by individual EU

Table 1: EU energy mix in the years 2000–2023 (in %)

Primary source	2000	2010	2015	2020	2022	2023
Solid fossil fuels	18.6	15.7	16.2	10.5	12.0	10.6
Oil	38.7	34.5	33.6	32.6	34.9	37.7
Natural gas	20.6	23.3	20.5	24.4	21.7	20.4
Nuclear	14.8	14.1	14.1	13.1	11.5	11.8
Renewables	6.4	11.2	14.2	17.9	18.4	19.5
Others	0.8	1.2	1.3	1.6	1.5	–

Source: Eurostat 2024a, Eurostat 2025a

Table 2: EU electricity mix in the years 2000–2024 (in %)

Primary source	2000	2010	2015	2020	2022	2023	2024
Solid fossil fuels	30.6	24.2	24.7	12.8	16.2	11.8	9.8
Oil	6.5	2.8	2.2	1.7	2.0	–	–
Natural gas	13.6	20.8	14.7	21.0	20.1	16.9	15.7
Nuclear	32.3	28.6	27.1	24.5	21.6	23.0	23.7
Renewables	15.3	21.9	29.5	38.0	38.2	44,8	47,4
Others	1.6	1.7	1.8	1.9	2.0	3.5	3.4

Source: Eurostat 2024a; Rosslowe, Petrovich 2025

member states. This variability between states remains and is also part of this trend. Nuclear power accounted for 14.8% of the EU's energy mix in 2000. Its share in 2023 was 11.8% (Eurostat 2025a).

These trends show a great effort towards energy transformation and are moving towards a more sustainable and less dependent energy system. It can be seen even better in the changes in the electricity production mix. The share of solid fossil fuels in the evaluated period decreased significantly from 31% to 9.8%. Due to the different policies of the member states the share of nuclear fuel in electricity production is also currently lower (23.7%) than it was in 2010 (32%). What is crucial is the increase in the production of renewable energy sources, whose share increased from 15% in 2000 to more than 47% in 2022 (Rosslowe, Petrovich 2025).

If we evaluate the tendency of the EU energy sector to move towards less dependence and more sustainability, we can also argue for a change in the structure of the EU's own energy production. Renewable energy was the dominant

source in 2023 (46% of total energy production in the EU). The second largest source was nuclear energy (29%) followed by solid fuels (17%), natural gas and oil were at 5% and 3% respectively (Eurostat 2025a). There are differences between EU member states, but in 16 member states, renewable energy accounts for over 50% of national energy production.

Import of Natural Gas into the EU

Another example demonstrating the EU's level of energy security and import dependence is natural gas, which represents more than 20% of the EU's energy mix in the evaluated period. Import dependence is fatal due to domestic production and representation in the energy mix. Russia has long been the largest supplier of natural gas to the EU.

The energy dependence of European states (later the EU) on energy raw materials began to take shape in the 1970s. However, negotiations on oil and natural gas supplies between Western European states and the former USSR were highly constructive and simpler during the Cold War than they are today. Černoch and Zapletalová (2014) attribute this fact to the long-term maintenance of mutual relations between the East and the West at the same, albeit relatively cold, level. A fundamental breakthrough in economic relations between the East and the West occurred during the Ostpolitik period, an ideological pragmatic cooperation with the Eastern Bloc that occurred in the late 1960s and throughout the 1970s. It is already possible to identify the beginnings of the interdependent relationship between the USSR and the states of Western Europe in this period. This relationship was key – especially in the area of mutual cooperation between West Germany and East Germany. German Chancellor Willy Brandt actively promoted this policy.

It was the agreement on natural gas between West Germany and the USSR in the early 1970s that represented a major milestone in economic relations and the further promotion of Ostpolitik. While the Eastern states, including the USSR, needed hard Western currency in order to function and to implement foreign trade, the Western states needed energy supplies to function. Buchan also supports this argument (2009), noting that, due to the Cold War, neither Western Europe nor the USSR expected any significant change in their mutual relations. Negotiations on supplies or prices were therefore relatively simple (Buchan 2009).

Energy relations between the EU and Russia were built on the principle of interdependence, which applied from the collapse of the USSR until 2022. Russia was the main supplier of natural gas and oil to the EU, providing more than a third of its total gas and oil imports. Russia's dependence on gas and oil exports to the EU was similarly high, accounting for 70% of Russian exports. Even 90% of gas exports from Russia went to the EU. Both sources contributed

significantly to the income to the state budget of Russia (50%) (Tichý 2015). However, the abovementioned disproportion is more complex in nature. As a result of historical development an asymmetry appeared. The states of Eastern Europe imported energy resources from the Soviet Union when they were part of the Eastern Bloc. Therefore, they have created a much stronger energy dependency than the western EU member states. The principle of interdependence was important for both actors, but with different consequences. Although the Crimean crisis froze any further development of EU-Russia mutual energy relations, gas imports to the EU remained large. In the following years, even the import of gas from Russia to the EU increased mainly due to the opening of new transport routes (Nord Stream and Turk Stream).

The next step towards reducing mutual interdependence was Russia's invasion of Ukraine in 2022 and a change in the geopolitical situation in Europe. The EU has since reassessed its energy policy and in order to strengthen energy security has begun to reduce its import dependence on Russia. The representatives of the member states declared this effort in the joint Versailles declaration in March 2022. This decision was motivated not only by the new geopolitical reality, but also by the effort to ensure the long-term energy security of the EU. The planned measures were to diversify energy sources and increase the share of renewable sources. This would make the EU less dependent on unstable suppliers. The EU Council accepted measures to ensure the security of gas supplies to the EU and to coordinate joint gas purchases. These steps were intended to strengthen solidarity between member states in energy crises and minimise the effects of gas supply interruptions. Better control mechanisms and improved cooperation between EU member states and with energy suppliers are key elements of the strategy to guarantee energy security (European Council 2024). Tables 3 and 4 show the decline in natural gas supplies from Russia to the EU and the diversification of imports after 2022. Compared to 2021, the flow of natural gas from Russia to the EU decreased to less than a third (from 157 billion cubic metres to 10 billion cubic metres in 2025). This decline has consequences for both Russia and the EU. However, there still remained some flow of Russian gas to the EU due to various exemptions and LNG supplies (Bruegel AISBL 2025). The most recent data shows that Russia's share of total gas imports into the EU was only 13 percent in the first quarter of 2025 and it was still 45 percent in 2021 (European Commission 2024: 4–5 and Bruegel AISBL 2025).

Immediate measures aimed at saving energy and increasing energy efficiency as the cleanest and cheapest way to solve the energy crisis, taken under REPowerEU, allowed a significant decrease in gas imports from Russia. The decline came in parallel with EU sanctions, which forbid seaborne imports of Russian crude oil, refined petroleum products and coal imports.

The annual amount of imported gas in 2023 was reduced by 72% compared to 2021. These changes will direct the EU to phase out Russian fossil fuel imports

Table 3: EU quarterly gas import by countries 2021–2022 (in billion cubic metres)

Country/Q	21/1	21/2	21/3	21/4	22/1	22/2	22/3	22/4
Russia	41.1	43.0	36.3	36.6	31.6	26.7	13.8	11.4
USA LNG	4.1	7.0	3.9	5.9	14.1	14.9	13.2	12.6
Other LNG	9.3	10.9	9.0	10.5	10.6	12.2	14.3	17.3
Norway	20.0	19.9	23.0	23.3	23.4	23.4	23.7	23.4
Algeria	10.1	9.8	8.2	8.7	8.6	8.4	8.5	8.7
UK	1,6	1.4	2.0	3.4	3.5	8.2	8.2	6.4
Azerbaijan	1.3	2.0	2.6	2.8	2.7	3.1	3.1	3.3
Libya	0.9	0.8	0.8	0.8	0.5	0.7	0.6	0.9

Source: Bruegel AISBL 2025

Table 4: EU quarterly gas import by countries 2023–2025 (in billion cubic metres)

Country/Q	23/1	23/2	23/3	23/4	24/1	24/2	24/4	25/1
Russia	10.5	10.5	11.5	12.5	13.7	12.8	14.1	10.0
USA LNG	14.1	16.8	14.5	17,0	15.5	12.3	12.7	18.4
Other LNG	13.2	14.6	12.7	12.2	9.1	9.9	7.1	8.1
Norway	23.5	22.4	20.6	23.9	24.2	23.9	24.9	23.6
Algeria	7.3	8.5	8.9	8.3	7,4	8.6	11.2	9.8
UK	4.6	6.5	3.6	3.1	1.9	3.6	2.1	1.9
Azerbaijan	3.1	3.0	3.1	3.2	3.2	3.2	3.4	2.8
Libya	0.7	0.7	0.5	0.7	0.5	0.4	0.2	0.3

Source: Bruegel AISBL 2025

as quickly as possible. This has also had major implications for Russia, whose revenues from gas sales (including LNG) to the EU have fallen by more than 70% since the peak of the crisis in 2022. Following the 14th sanctions package accepted on 24 June 2024, the EU banned transshipment services of Russian LNG on EU territory for export to third countries. The EU also prohibited new investments, technology and services to complete Russian LNG projects under construction, such as the Arctic LNG 2 and the Murmansk LNG. From August 2022 to May 2024, the EU reduced its gas demand by 18% and saved 138 billion cubic metres of gas (European Commission 2024: 4–5).

The initiation of new sanctions probably began to work and the import of Russian LNG was delayed. The ships probably do not export the gas and store it in floating storage tanks. The EU has not completely banned the import of LNG because some countries such as Belgium, France and Spain are dependent on it. These countries probably did not buy gas from Arctic projects and Russia has to use the so-called shadow fleet for sales, which often uses old ships with unclear ownership. Despite the significant decrease in imports, the EU imported a significant amount of natural gas from Russia in the first half of 2024.

Despite efforts to diversify the import of energy sources some EU countries are still in a risky position (Austria, Hungary). Countries have long-term contracts. Voices for a total ban on gas imports from Russia are getting stronger, including from Germany, which was heavily dependent on imports in the past. For example, in 2023, Austria still imported 65% of gas supplies via pipelines from Russia. This example shows the necessity of comprehensive diversification and significant reduction of dependence on imports from Russia. Diversification will then lead to the strengthening of the energy security of the European Union and also to the political stability of the member states.

The consequences of this development in the European Union have negative effects on Russia, which is reacting and looking for new customer markets. Russia is intensively developing energy relations especially with China (the Power of the Siberia 2 project) and is trying to diversify its markets and reduce its dependence on the EU market. This development signals a fundamental change in the Eurasian energy system, one element of which in the case of the EU is the strengthening of energy security and the search for new supply centres. The second element is the strengthening of Russia's position in Asia and the development of energy projects and the search for customer markets. While gas and oil have long been Russia's main political tool, the situation has changed with Russia's invasion of Ukraine and the EU has moved away from Russian resources. Russia is using another tool in addition to finding new consumer markets for fossil fuels. This is the development of Russian nuclear energy, which creates political ties but also disrupts the West's efforts to isolate Russia. Russia participated in half of all international nuclear power plant, reactor and fuel supply, decommissioning and waste management projects in 2022. Russia is establishing long-term relationships with these countries and gaining influence through these projects. It often uses a high level of cooperation and applies the built-own-operate model. Russia focuses primarily on the countries of the global south (e.g. Bangladesh, Turkey, Bolivia, Nicaragua, as well as African countries like Ghana, Zimbabwe and Mali) (Stognei, Parkin, Smyth & Moore 2024). The European Union significantly supports Ukraine financially and at the same time pays large profits to Russia for imported energy resources. This situation is not rational and although it does indicate significant changes in mutual relations it still has the character of mutual interdependence.

Conclusion

In the context of increasing EU energy security in the field of fossil fuels, the topic is implemented on two main levels: the demand side and the supply side. A political element plays a fundamental role in the territorial structure of energy flows, which is the political and security situation in the supplier regions and current geopolitical developments in the world, especially Eurasia. Energy resources have long been at the centre of international events, resource availability, stable supply, mining control and traffic chokepoint throughput are complicated issues. In the context of current international developments, energy is a strategic sector that plays a key role in geopolitical thinking and political decision-making. Energy security and energy dependence are not only essential concepts, but also indicators of political and economic maturity and independence. While the EU strives to reduce its energy dependence by diversifying sources and increasing the share of renewable energy sources, it faces challenges brought about by changes in the geopolitical environment. Enhancing energy security is highly complicated. The fundamental question is how to deal with the disrupted energy partnership and at the same time maintain energy security and economic prosperity. This text is anchored in the mutual interdependence of the EU and Russia in terms of the import and export of fossil fuels. It is possible to observe the (a)symmetry of interdependence in the context of energy transformation. Transformation, as the second theoretical pillar, is the driving force behind future changes, also manifesting in power shifts.

An example demonstrating the EU's level of energy security and import dependence is the import of natural gas to the EU. Import dependence is fatal due to domestic production and representation in the energy mix. Russia has long been the dominant supplier of natural gas to the EU. The principle of interdependence was important for both actors, but with different consequences. Another step towards reducing mutual interdependence was Russia's invasion of Ukraine in 2022 and a change in the geopolitical situation in Europe. The EU changed its energy policy and, in order to strengthen energy security, began to reduce its import dependence on Russia. Between 2021 and 2023, the annual amount of imported gas decreased by 72%. These changes will direct the EU to phase out imports of Russian fossil fuels as quickly as possible. This has also had major implications for Russia, whose revenues from gas sales (including LNG) to the EU have fallen by more than 70% since the peak of the crisis in 2022.

We suppose that Russia will lose a significant part of its power against the EU as a result of the advancing energy transition. EU energy has major challenges as a result of geopolitical changes linked to the war in Ukraine, but also to other centres of tension such as the Middle East. Our study identifies changes in fossil energy resource flows through diversification of suppliers to the EU in the context of geopolitical developments and the politics of Russia. At the

same time, we can observe the progressive diversification of oil and natural gas importers and Russia's increasing efforts to expand its influence in many developing countries. Diversification of energy supplies, both geographically and through transit routes, is a key element in strengthening the EU's energy security. Diversification of supplies can also be seen as a tool for strengthening the resilience of the European energy infrastructure. Diversification of suppliers undoubtedly increases flexibility and efficiency in energy substitution in the event of crisis. Natural gas supplies from Norway, the USA, Algeria and Qatar have increased, and LNG imports are a key component. The USA has gained a dominant position in LNG imports to the EU, and a further increase was expected in connection with the sanctions on Russia. Though LPG from the USA compensated for the loss of imports from Russia, there is currently concern that Donald Trump will use LNG as leverage in trade talks. Some companies are considering returning to gas supplies from Russia and there is talk of meaningful diversification. In practice, however, this would mean a relatively significant change in the overall direction of the EU. The EU is currently still planning to end imports of Russian fossil fuels by 2027.

The EU is leading to a reduction in energy dependence on Russia via energy transformation with a focus on the development of renewable energy sources and on changes and diversification of fossil fuel suppliers. As part of the analysis of the current transformation of the energy mix in the EU, we encounter different reactions of the EU member states to the energy transformation.

The EU is intensively transforming its energy mix with regard to reducing greenhouse gas emissions and supporting renewable energy sources. These changes make the energy mix a strategic tool that strengthens energy security and maintains economic stability. Renewable sources had positive dynamics and contributed more than 19.5% of the EU's energy mix in 2023 (compared to 2000 – 6.4%). However, the increase in the production of renewable sources in the production of electricity is essential, the share of which increased from 15% in 2000 to more than 47% in 2024. When we evaluate the tendency of the EU energy industry to shift towards lower dependence and more sustainability we can also argue for a change in the structure of the EU's own energy production. In 2023, renewable energy was dominantly the most important source (46% of total energy production in the EU).

Another recommendation for increasing the EU's energy security is the development of and investment in renewable energy sources. Investment in our own renewable sources is key. Additionally, investment in renewable energy sources must be part of broader political, economic and security strategies. Changing the energy mix and developing renewable sources will reduce import dependence and limit the impact of geopolitical pressures.

Even though the EU is trying to diversify the import of energy resources, some EU countries are still in a risky position and are bound by long-term

contracts. This indicates the necessity of comprehensive diversification and a significant reduction of dependence on imports from Russia. Diversification will then lead to the strengthening of the EU's energy security and also to the political stability of its member states. In addition to these consequences, we can also mention changes in the geography of suppliers of energy sources outside of Eurasia, the tendency towards sustainable and clean energy, etc. Russia is losing large profits from energy exports and is exposed to significant economic impacts. Russia is looking for new customer markets, and is intensively developing new energy relations, especially with China but also in the Global South (particularly in Latin America and Africa), and is trying to diversify its markets and reduce its dependence on the European market. With new projects, including the development of nuclear energy, it establishes long-term relations with individual countries and gains influence in them. In the relationship of mutual interdependence, it is also a consequence of the change in the geography of energy supply flows, even on the part of Russia as an energy exporter.

Technological innovation and modernisation of energy infrastructure are among the other basic recommendations for the transformation of the European energy sector. The construction and modernisation of clean energy production facilities is key to the energy transition. The development of modern energy technologies is closely linked to the availability of critical raw materials, which are essential elements for the production of modern technologies, especially in the field of electromobility and energy storage. Ensuring sufficient sources of these raw materials is therefore another crucial factor for sustainable development and technological progress.

Political and regulatory measures are a crucial part of the EU's energy policy. This includes the implementation of the European Green Deal, which aims to achieve climate neutrality by 2050. Furthermore, it is the implementation of Fit for 55, which aims to reduce greenhouse gas emissions by 55% by 2030. The EU's RePower programme aims to reduce energy dependence on Russia by developing renewable sources and modernising infrastructure. International cooperation, not only in terms of energy supplies but also in terms of technological cooperation, is also essential. The current sanctions on Russia remain an important tool of the EU's energy policy, but the turbulent policies of President Trump currently pose new challenges.

The EU will face geopolitical and other risks and achieve energy independence when the proposed measures are comprehensively adopted. The basis is the diversification of energy supply sources, including the diversification of transit routes. Investment in renewable energy sources and support for technological innovation are also essential. Modernising infrastructure, maintaining political stability and effective regulatory measures are the bases for achieving climate goals. A unified strategy will thus ensure energy security and sustainable economic development.

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