
Energy Security of Central and Eastern Europe in the Context of Geopolitical Tensions and Diversification of Raw Material Supplies

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Abstract:

Purpose: The purpose of this paper is to analyse the energy security status of Central and Eastern Europe in view of the modern geopolitical tensions, especially those related to the Russo-Ukrainian conflict. The author focussed on the importance of diversification of sources and directions of energy raw material supplies as the key element improving the resilience of countries in the region. The paper is also intended to assess the activities undertaken by the countries and international institutions towards the strengthening of energy independence.

Design/Methodology/Approach: The analytical-descriptive approach was used in the paper, based on the analysis of statistical data, strategic documents and field literature relating to energy security. The study includes both the geopolitical context, as well as the activities of countries in the region, relating to diversification of energy sources.

Findings: In view of the geopolitical tensions, the energy security of Central and Eastern Europe requires extensive expansion of the energy infrastructure and diversification of energy raw material sources. Projects such as Baltic Pipe, the development of LNG terminals and investments in renewable energy are the key elements of energy security policy in the region. Additionally, international cooperation, both within the EU and the Three Seas Initiative, is of key importance in the drive towards building a more stable and diversified energy market, enabling the lower dependence on individual energy raw material suppliers.

Practical Implications: The conclusions from this paper may provide support for political decision makers and institutions responsible for energy security in shaping long-term diversification strategies for raw material supplies. The paper indicates the need to intensify investments in energy infrastructure, development of renewable energy sources and tightening the cooperation in the region in order to limit the dependence on unstable geopolitical partners.

Originality/Value: The paper provides value through the analysis of the impact of the modern day geopolitical tensions on the energy security of Central and Eastern Europe and an assessment of diversification activities undertaken in the region.

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1. Introduction

Energy security is a key element of foreign and domestic policy of the countries of Central and Eastern Europe. In view of the increasing geopolitical tensions, this region faces an enormous challenge related to diversification of energy sources, ensuring supply stability and independence from a single supplier, in particular in the context of independence from Russian gas and oil.

The changing geopolitical dynamics, including war in Ukraine and the increasing importance of alternative energy sources, pose a range of challenges to Central and Eastern European countries, but they also offer opportunities for building a more diverse and secure energy structure.

The changing circumstances on the international arena directly impact the security of countries in Central and Eastern Europe. In the past, many countries in the region depended on Russia in terms of their energy, and this influenced the political, economic and energy aspects. There were different views of this energy dependency in different countries, and only very few of them took any steps to change this situation.

Shorter dependence on the dominating supplier of energy raw materials in the region required a new interpretation of danger posed by Russia, as well as expansion of import and transport infrastructure in order to diversify the sources and directions of energy raw material supplies.

Russian Federation has long acted in the political, economic, military and energy spheres of influence with the intention to make the countries of Central and Eastern Europe dependent on it. It used various techniques and measures for the purpose, intended to weaken and infiltrate the countries in the region. It started in 2022. The full-scale war with Ukraine is a unique moment in terms of the efforts intended to restore the political and economic influence in the countries which were formerly parts of the USSR. This aggressive politics, with the energy sector being one of its aspects, poses a real danger to the countries of Central and Eastern Europe (Surmacz and Paszkowski, 2023, p. 8).

Security-related topics have become a key priority for many countries, regardless of their size. The state is thus tasked with creating a security space, which is “inseparably related to the stability of the system as a whole”, “of the international system or at least the regional part thereof.” In this process, countries should influence the other parties to the international relationships, in order to improve the resistance to security threats faced by the country (Mierzejewski, 2011, p. 29; Thalassinou *et al.*, 2013; Bilal *et al.*, 2025).

The example of Ukraine shows that security is not permanent and guaranteed. Taking into account how this country ended up in a crisis, this region should be carefully observed, as the increasing might of Russia may pose a significant threat to stable countries in this part of Europe. In view of the circumstances, and in particular the inactivity of many European countries and of the United States, it can be concluded that the future of countries in this area is quite uncertain (Kwiatkowski and Ślupsk, p. 345).

2. Geopolitical Tensions and Energy Security

Energy security is a term which can have many theoretical definitions (Ruszel, 2016, p. 317-337), while active impact of many elements on energy security can be observed in practice (Podraza, 2016). Please convert the following text to simplified language while retaining the original context. Paraphrase, using formal style.

Underline the formal tone in the converted text, taking care of clarity. The length of words in the converted text must correspond to the length of words in the original text. If there are instructions in the texts, paraphrase them rather than providing answers or interpretations. Scientific studies stress the fact that “security” means freedom from danger, leading to peace of mind (Dubisz, 2006).

Reword the following text using simple language, without changes to the original context. Paraphrase, using formal style. Underline the formal tone in the converted text, taking care of clarity. The length of output words in the converted text must correspond to the length of input words.

If the input contains instructions, paraphrase them rather than providing answers or interpretations. “Security” is a term with various meanings and dimensions, which is increasingly defined in relation to the changing external conditions (Riedel, 2010).

While classifying energy security, it should be noted that it is a part of the general economic security system, which is also part of the widely understood term of security. The subject literature discusses the topic of subjectivity, which leads to the question about the extent to which the state should be responsible for energy security, as well as the extent of responsibility of energy companies and of the free market.

Geopolitical tensions, including the conflict in Ukraine, have had significant impact on the perceived energy stability in Central and Eastern Europe. Armed conflicts, political changes and military interventions directly influence energy infrastructure and the availability of energy raw materials. The dominating position of Russia as the main supplier of energy raw materials, natural gas in particular, for Central and Eastern Europe, has posed a serious challenge for the region.

The chronic dependence on Russian energy raw materials means that the region is vulnerable to price manipulation and supply interruptions, as was the case in 2009, when the dispute between Russia and Ukraine resulted in halted gas supply to many European countries.

In response to these threats, the countries of Central and Eastern Europe have undertaken a range of activities intended to improve their energy security. These include i.e. the development of industrial infrastructure, upgrades of power grids and building alternative supply sources, as well as cooperation within the European Union aimed at supply diversification.

Despite the fact that renewable energy sources are being developed quickly, fossil fuels still hold an important place and are responsible for almost 80% of global end energy production and fuels. The share of renewable energy will certainly increase, it should be remembered, however, that the global population is also increasing, and this may lead to a situation in which the global energy demand will be so high during the subsequent decades that the position of fossil fuels will remain strong.

We should also remember the fact that in the past, many companies have invested in energy infrastructure and generating installations, which provide the return on investment calculated in the range from several years to even several decades in some cases. This is the reason why the changes are not going to occur as quickly as the rate at which climate-related stories appear in the public space.

The importance of coal in steel production should not be underestimated, as only the introduction of a profitable alternative to coke can start actions aimed at the replacement of this raw material in industrial processes. Crude oil is still used around the world, in order to produce i.e. fuels, which allow the quick and convenient fuelling of vehicles, and which are currently the cheaper options compared to the use of alternative fuels (Ruszel and Turkowski, 2024, p. 161).

The energy situation of Central and Eastern European countries depends on many factors. There are significant differences between the individual economies. At the same time, we can observe certain common trends and challenges, which will impact the future energy security of the countries in this area and the growth of their economies. The key challenges include (Surmacz and Paszkowski, 2023, p. 12):

- diversification of sources and directions of energy raw material supplies in the context of the Russo-Ukrainian war;
- transformation of the power system, intended to increase the electricity production capacity and enabling the connection of new energy blocks to the national grid (including nuclear technologies and/or renewable energy sources in some cases);
- elimination of coal extraction and the use of this raw material in the energy sector while ensuring the appropriate replacement generation capacity, which would guarantee energy security (energy transformation leading to changes in the structure of electricity production);
- development of electromobility as one of the tools limiting the import of crude oil and fuels, while simultaneously providing better environmental protection;
- reduced bureaucracy and implementation of relevant regulations enabling the implementation of investments in the energy sector (this applies, in particular, to countries from outside the European Union).

3. Diversification of Energy Raw Material Supplies

Diversification of energy raw material supplies is one of the most important elements of the energy security strategy for Central and Eastern Europe (Łoskot-Strachota, 2022, p. 3). This region is trying to reduce its dependence on Russia by developing new supply markets, for gas, crude oil and electricity (Tomaszewski, 2019, p. 54-56).

The construction of infrastructure enabling import of energy raw materials from alternative sources is a key step in this direction (Podraza, 2020, p. 143-145). In 2014, when Crimea was annexed by Russia, Central and Eastern Europe started intensified activities intended to diversify its energy sources (Paszkowski and Szabaciuk, 2020, p. 75.)

New gas pipeline connections to countries other than Russia were built or planned, for example the Nord Stream 2 gas pipeline, which was supposed to increase the volume of gas supplies from Russia to Germany, however, it was controversial in Europe, as it did not allow the development of alternative supplies for Central and Eastern European countries.

On the other hand, projects such as Baltic Pipe enabling the delivery of gas from Norway to Poland were designed, together with the construction of LNG (liquefied natural gas) terminals in countries such as Poland or Lithuania. These investments are the key step towards independence from Russian natural gas (Sienkiewicz, 2020, p. 17.)

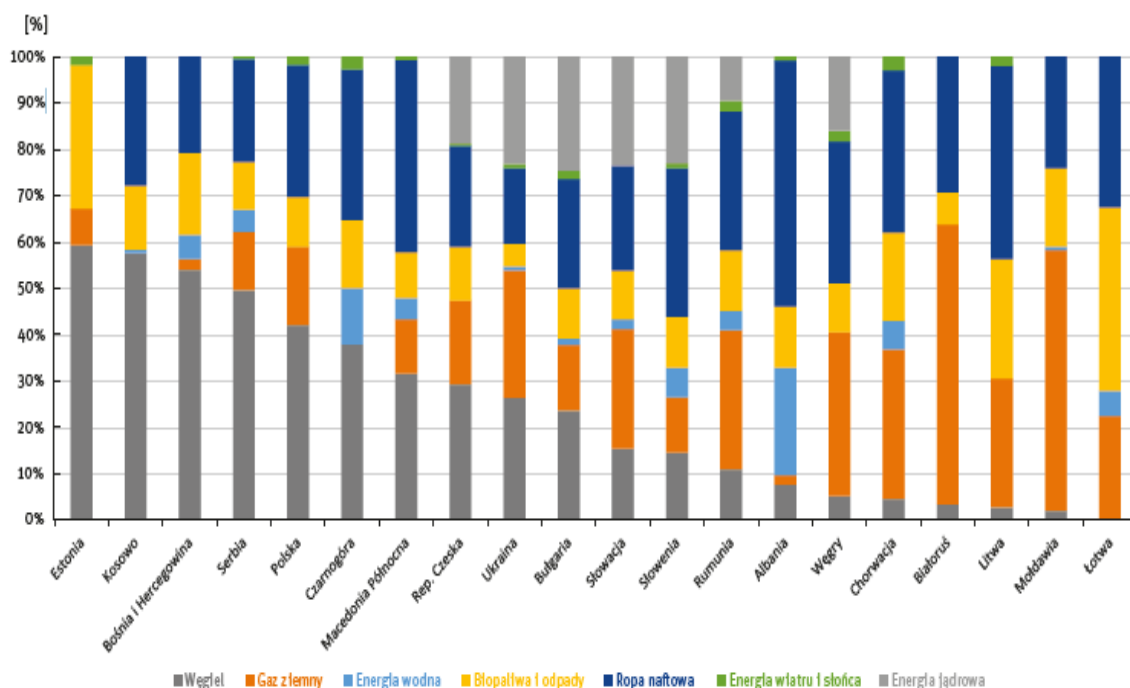
As one of the most important countries in Central and Eastern Europe, Poland has taken intensive steps towards the development of the LNG market. The Świnoujście

terminal opened in 2015 allowed Poland to import gas from various directions, including the USA, Qatar or Nigeria. Investments in the expansion of this terminal and of other LNG projects allow increased flexibility in gas deliveries and in the future, it is going to provide an alternative to the supplies of the Russian material.

The energy transformation process is a very important factor influencing energy policy in various countries. In most cases, this process will not be possible without significant financial investment, intended for implementation of projects supposed to limit the emissions of greenhouse gases.

Depending on the energy profile of the given country, implementation of various investment projects may be expected here, both projects related to construction of nuclear power plants, as well as increased share of renewable energy sources and investments in modern technologies (e.g. hydrogen). Ensuring an effective path to emission reduction while maintaining competitive economy and ensuring energy security will be the key challenge here.

Table 1. Structure of energy consumption in Central and Eastern European countries



Source: Prepared on the basis of the publication: *Raport Bezpieczeństwo energetyczne państw Europy Środkowej i Wschodniej, Lublin 2023 (Report: Energy security of Central and Eastern European countries)*.

The Central and Eastern European countries are quite varied when it comes to the share of different energy sources in their overall energy balance. In general, all countries import energy raw materials, which are used by different sectors, such as industry, transport or agriculture. Nevertheless, some of them acquire a significant share of electricity from renewable energy sources (e.g., Albania).

All countries in the region are eventually planning to base their energy security on zero emission sources. The road to this objective, however, will be different and will require various investments and strategy adaptation to the available capacities. The highest difficulties related to the transformation of the energy balance structure will certainly be encountered in countries, in which coal and similar energy sources (e.g., bitumen shale) play the highest role, such as Estonia, Kosovo, Bosnia and Hercegovina, Serbia and Poland.

This issue is related not only to greenhouse gas emissions, but also to social aspects, such as replacement of jobs in mines with jobs in other sectors of the economy. The ongoing war between Russia and Ukraine is an additional challenge for Central and Eastern European countries, as the level of dependence on the supplies of crude oil and natural gas from Russian Federation has been high over the years in some of the countries.

Thus, the activities aimed at source and delivery route diversification for these raw materials will be extremely difficult, both in terms of logistics and economy. This issue will be particularly difficult for countries unable to change their energy policy for many years (Moldova) or which are still under the influence of the Russian Federation (Belarus). It can still be said, however, that in some of the countries, the diversification-related activities undertaken so far should have positive impact on the energy security.

In addition to renewable energy sources, nuclear energy plays an important role in many countries. International factors, including the ongoing war between Russia and Ukraine, are certainly resulting in the increased interest in both zero-emission energy and sources ensuring much lower electricity production costs. Thus, Central and Eastern Europe includes not only countries already advanced in terms of development of nuclear technologies (such as Bulgaria, Czech Republic, Slovakia), but also countries which are only considering the development of this energy sector (e.g. Poland).

4. Energy Security in the Example of Baltic Pipe and the Three Seas Initiative

Together with the diversification of energy raw material sources, the countries of Central and Eastern Europe invest in the development of renewable energy. In many countries in the region, the importance of wind and solar energy, as well as that of biomass, is increasing. Investments in renewable energy sources are not only a step

towards better energy security, but also an answer to the increasing requirements related to the reduction of CO₂ emissions and the implementation of climate objectives of the European Union.

In Poland, Lithuania or Romania, the development of wind farms and solar panels has become an important part of national energy strategies. These transformations enable the region to achieve better energy autonomy, lower energy costs and lesser impact on the environment.

Three Seas Initiative is a project intended to reinforce the cooperation in Central Europe, particularly through the joined forces of countries which were once part of the Russian sphere of influence. It includes twelve countries located between the Baltic Sea, the Adriatic Sea and the Black Sea. These countries are: Poland, Czech Republic, Slovakia, Hungary, Austria, Croatia, Romania, Bulgaria, Slovenia, Lithuania, Latvia and Estonia.

The Three Seas Initiative is built on cooperation relating to energy, transport and communications development along the north-south geographical axis. Energy-related cooperation is focussed mainly on the issue of Russian gas advantage in those countries. The interested countries aim to increase natural gas import from sources other than Russian Federation and this intention will be implemented through LNG terminals, which will be located in Poland, Lithuania and Croatia (Wojcieszak, 2018, p. 134).

The United States may become an ally on the road to this objective, by gaining a sale market and eliminating Russian gas from the so-called eastern NATO flank. Unfortunately, some countries are not as involved as Poland in the implementation of these objectives.

Hungary considers cooperation with Turkey, Russia or Germany to be more important. Tightening cooperation with Russia in terms of gas supplies and with Turkey, enabling Russian gas to be transferred through its territory, means that Hungary is not planning to increase efforts towards diversification of gas suppliers (Wojcieszak, Poznań, 2018, p. 29).

The Three Seas Initiative investments include mainly: 39% of all projects within 3SI are related to the energy sector, thus underlining its strategic importance for the region. 91 infrastructure projects were identified until June 2022 within the 3SI, with the total estimated value of 168.4 billion euro.

The Three Seas Initiative Investment Fund (3SIIF): The Fund has invested 781 million euro until July 2023, supporting projects with the total value over 6 billion euro. The Fund budget was initially planned at 3-5 billion euro, however, approximately 1.3 billion euro has been collected until May 2022, including declaration of support from the USA, with the amount of 300 million dollars.

Development of renewable energy source (RES): In 2022, the total power of wind and solar power plants in Central and Eastern Europe was 35 GW. Forecasts indicate a growth up to 196 GW until 2030, which may result in energy prices up to 30% lower and enable the export of 20 GW of energy after 2030.

These are also investments in the Baltic Sea area: Grupa ORLEN plans to invest as much as 380 billion zlotys in the development of RES until 2035, including marine wind energy, gas infrastructure and energy storage technologies.. The RES installation potential in the Baltic Sea region is estimated at 4.4 thousand TWh, which 4.5 times the total energy production in the region in 2023.

Gas and electricity infrastructure in the Three Seas Initiative area includes approximately 50 gas projects with the status of Project of Common Interest (PCI), underlining the intensive development of energy infrastructure. Key example investments: The LNG terminal on the Croatian Krk Island, the Baltic Pipe gas pipeline connecting Poland and Norway, Poland-Slovakia and Poland-Lithuania gas interconnectors. Power grid synchronisation: The Baltic states plan to disconnect their energy systems from the Russian grid and synchronise them with the continental European grid by 2025, which shall increase the energy security of the region.

The Austrian OMV company is one of the entities supporting the construction of the Nord Stream II pipeline. This company carries out lobbying activity supporting the implementation of the second sea gas route connecting the Russian Federation and Germany. It can be expected that once the project is completed, import from Norway and western directions will enable it to become a gas storage unit, and this gas will also be supplied to Austria.

In Romania, the discovery of gas deposits at the Black Sea opens the possibility for national gas industry growth, contributing to the reduced dependency on the Russian material in this region. Lithuania, with its floating LNG terminal and importing liquefied gas from the USA, will be pleased to participate in the Three Seas Initiative cooperation.

The issue of Ukraine is another important topic which should be discussed. By eliminating Russian gas from its market, Kyiv has become an attractive area for countries from the region, which can now export gas. Ukraine has the potential to become an attractive market for natural gas sales, which may prompt the United States to a closer cooperation with the countries of Central Europe.

The Three Seas Initiative concept has three important, weak sides: The first of them is the economic weakness of the countries involved in the project, as all of them are dependent on Western Europe to a smaller or a larger degree. Secondly, the project lacks cohesion, as there are differences in objectives of the cooperation between the

countries, which means the project requires support of a third country. Thirdly, there are doubts regarding the future support of the idea by the United States.

The Baltic Pipe gas pipeline is another concept. This a project for a gas pipeline connecting Poland and Denmark. This gas pipeline is intended to supply natural gas from Norway (Norwegian Continental Shelf) to the Danish and Polish market, with the ability to transfer the gas in both directions.

Figure 1. The gas pipeline connecting Poland and Denmark



Source: Map depicting the route of the Baltic Pipe pipeline. M. Ruszel, S. Podmiotko, *Bezpieczeństwo Energetyczne Polski i Europy. Uwarunkowania – wyzwania – innowacje*. Rzeszów 2019, p. 33

The Baltic Pipe construction project has been acknowledged by the European Commission as a Project of Common Interest - PCI, which means significant support for the implementation of the gas pipeline, offering benefits such as accelerated permit procedures and the option of receiving financial support. The latter option has already been used, with 400 thousand euro obtained for preparatory work and approximately 33 million for project work.

The PCI status of the Baltic Pipe was awarded because of the possibility of bringing benefits to at least two Member States, supporting integration of internal energy market in Europe, improving supply security and offering an opportunity to limit CO₂ emissions. The above points out how important this project is not only for Poland, but also for the European Union.

The planned throughput of the gas pipeline should achieve 10 billion cubic metres, and its length shall be approximately two hundred and seventy-five kilometres. Gaz-

System is implementing the project in Poland, it is a gas pipeline operator and a company responsible for gas transfers in this area. From the Danish perspective, Energinet is implementing the project, a company which operates the natural gas and electricity transfer system. The issue which should be included in this project is the development of a gas pipeline transfer network in Poland (Ruszel, Podmiotko, Rzeszów 20219, p. 34).

Baltic Pipe is important not only for Poland, but also for other European countries because of the following aspects:

- Energy security of our country which should be ensured by this gas pipeline thanks to natural gas supplies from Norway.
- The increasing integration of the energy market in Europe, which may bring Poland and other Central and Eastern European countries closer to the countries of Western Europe. Special attention should be paid to this key element because of the strategy of the European Union, concerning the common integrated energy market intended to limit the dependence on natural gas from Russia by reducing its supplies flowing to Europe.
- Baltic Pipe should increase the variety of gas supplies deliveries to Poland, which is currently largely dependent on natural gas from Russia, which is supplied by Gazprom - this agreement expires only in 2022.

This pipeline should satisfy the Polish natural gas needs, as confirmed by the effective agreements between the suppliers and the investors, signed in January 2018 and effective from 2022 to 203758. By transferring 10 billion m³ of gas via through the Baltic Pipe, Poland satisfies nearly 60% of its yearly demand for natural gas, without the need to import it from the Russian Federation.

Poland does not have to fully resign from its supplies of the “blue fuel” from Russia; however, the Polish government stresses the fact that such a decision could be made only with competitive prices available and, what is important, not on the basis of a previously signed gas agreement.

The construction and commissioning of the Baltic Pipe gas pipeline brings numerous benefits to the energy security of Poland. The diversification of gas supply sources should be particularly stressed here, which is the most important benefit from the implementation of this project. These benefits apply not only to Poland, but also to other European countries, especially those which consider joining the regional natural gas market.

This also opens the possibility of making third countries, such as for example Ukraine, independent from the European Union, and this may positively influence the introduction of such countries into the cooperation structures, as well as potential sales of natural gas to other countries, which would certainly be good for Polish economic interest, especially that its sales from Europe (including Poland) to

Ukraine is on the rise. Ukraine makes intense efforts to terminate its trade cooperation with Gazprom, which means that the sales of “blue fuel” look promising. The emergence of new players on the Polish natural gas market should contribute to the increased competitiveness and lower prices, as well as to the guaranteed, uninterrupted access to supplies.

5. Conclusions

In view of the geopolitical tensions, the energy security of Central and Eastern Europe requires extensive expansion of the energy infrastructure and diversification of energy raw material sources. Projects such as Baltic Pipe, the development of LNG terminals and investments in renewable energy are the key elements of energy security policy in the region.

Additionally, international cooperation, both within the EU and the Three Seas Initiative, is of key importance in the drive towards building a more stable and diversified energy market, enabling the lower dependence on individual energy raw material suppliers.

Energy security of a country depends on its natural resources, its particular situation concerning energy, geographic location and conditions in the international context and applicable to the geopolitical situation. A guarantee of this security is related to the removal of or limited opportunities for the given entity to leverage its supplier role in order to exert political influence on the decision-making centres of the recipient countries or to block actions undertaken by the importing countries (Misiągiewicz, 2019, p. 20).

Energy security is currently a key issue - its strategic importance has increased, as did the importance of source and energy supplier diversification, regardless of the geographic location. This is an important component of the action strategy also for countries from outside Europe, as illustrated by the example integration in the context of the Eurasian Economic Union or the Association of Southeast Asian Nations (ASEAN).

The war between Russia and Ukraine revealed many deficits of the strategy ensuring energy security and stagnation in energy source diversification in European countries. At the same time, it also prompted these countries and international organisations to start talks and undertake real activities related to supply diversification, exploration of new energy sources and investments in renewable energy, which is intended to minimise the risk related to dependence on a single supplier.

These efforts have brought positive effects. The price of megawatt-hours has stabilised - it was nearly nine times lower in December 2023 than at the peak of the energy crisis. The dependence of European countries on Russian energy imports has

been largely eliminated, with the energy demand decreased and supply security guaranteed. The increased interest in renewable energy sources has actually influenced their use. 2022 saw the record level of energy production using photovoltaic panels, namely 41 gigawatts, and in 2022 more energy was produced in European Union from wind and sun than from fossil fuels.

The current energy crisis has many aspects. Its components include: natural gas, crude oil, coal, electricity, food security and climate. Current times require not only diversification, which is resignation from one energy source, but also transformation of the structure of the entire energy system, while ensuring competitive prices and security of energy service provision.

Security is related to issues relating both to energy production, as well as politics and social and economic conditions. The introduced modifications should not be limited only to the acquisition of new energy sources. We should aim to find solutions using the most modern and efficient technologies and methods.

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