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## ENERGY SECURITY AS A GUARANTEE OF UKRAINE'S INDEPENDENCE

### ABSTRACT

The article focuses on the energy security of Ukraine as one of the most important priorities of the state. It is proved that the coverage of current volumes of gas imports by the capacity of Ukraine's own production will allow the state not to depend on the external market conditions and to protect it from Russian Federation's profiteering. It is stated that it is impossible to achieve energy independence unless a detailed plan has been developed. Such plans are outlined in the *Energy Strategy of Ukraine 2030 and 2035*. The authors analyze the first steps Ukraine has taken to separate from the energy system shared with Russia and to join European networks.

### Key words

energy, security, Ukraine, independence

## Introduction

The *Ukraine's Energy Strategy 2020* claims that Ukraine's energy security is shaped by difficult geopolitical conditions, "between the EU and Russia", which entails both challenges (loss of transit status) and opportunities (independence on gas imports from Russia) (Ministry of Energy and Coal Industry of Ukraine 2015). Regional peculiarities of energy consumption structure restrict the possibilities of optimizing the energy balance of Ukraine. The use of coal as the main heat source for thermal power plants in most regions of the country generates a number of threats to energy security in the short and long term – namely, insufficiency of internal resources to satisfy the country's needs; inconsistency of environmental indicators of the energy and industrial sectors of the economy with the requirements of the EU decarbonisation policy in the view of Ukraine's aspirations of integration with the EU. Due to the prevalence of gas or oil use in other regions of Ukraine, the economy is dependent on the external energy market, influenced by geopolitical changes (Babets, 2017).

The trends in geopolitical situation, which are a source of threats to energy security, are characterized by intensification of political and armed conflicts in regions where significant natural reserves of energy resources are concentrated. With the onset of Russian aggression, hybrid energy challenges for Ukraine have intensified, such as the construction of gas pipelines bypassing Ukraine, i.e. Nord Stream II and Turkish Stream (Ukraine's energy security, 2018). Under these circumstances, the identification and assessment of key external threats, the analysis of their dynamics and the forecast of changes must take into account internal problems and opportunities.

### 1. Energy security in regulatory documents

Energy is an integral part of virtually all spheres of life in the modern world, and thus plays a crucial role not only in the economic progress of the country but also in ensuring sustainable development of society as a whole. At the same time, it is impossible to consider the level of energy supply of the state (society) to be quite reliable under any socio-political conditions. In the context of globalization, the positions of energy donor states are characterized by increased instability, unpredictability, and political selfishness. Consequently, states that

have been and remain energy consumers are faced with the need to build their own energy security systems, the effectiveness of which must counterbalance the dysfunctional impacts (challenges, threats, dangers) produced by the international environment (Stuchynska, 2016).

In the regulatory and legal documents of Ukraine, energy security is treated as timely, complete and uninterrupted supply of quality fuel and energy for material production, non-productive sphere, population, municipal and other consumers; prevention of harmful impact of energy transportation on the environment; transformation and consumption of fuel and energy resources under conditions of modern market relations; trends and indicators of the global energy market (Cabinet of Ministers of Ukraine, 1998).

Energy security should also be understood as the ability of a state, in the form of its governing bodies, to provide end-users with energy in the required volume and proper quality under normal conditions. In turn, during periods when destabilizing factors of internal or external character are active, energy security means the guaranteed minimum-volume coverage of the most important needs of the state, districts, cities, towns, or facilities in fuel and energy resources. The creation of a three-month strategic reserve for oil and petroleum products is a specific dimension to energy security, a standard in Western countries.

In the *Energy Strategy of Ukraine for the Period Until 2030*, energy security is understood as an integral component of the national security of the state, which envisages the achievement of a condition of technically reliable, stable, economically efficient and environmentally safe supply of energy resources for both economic and social spheres of the state. This kind of security is defined as “the ability of the state to ensure efficient use of its own fuel and energy base, to optimize the diversification of sources and ways of supplying energy to Ukraine to ensure the vital activity of the population and the functioning of the national economy in the normal, emergency and state of war regimes, to prevent sharp price fluctuations on energy resources, to create conditions for painless adaptation of the national economy to new prices for these resources at world markets” (CMU Ordinance 2013).

The impulse to developing a new *Energy Strategy – 2035 (ES)* was the change in EU energy policy, i.e. the creation of the *Energy Union in Europe* and the signing of the *Memorandum on full integration of the energy markets of Ukraine and the EU*, the signing of the *Paris Agreement on Climate Change* by Ukraine, as well as the military aggression of the Russian Federation and its occupation of a part of Ukraine's territory. The new strategy should take into account the best European achievements in energy production; it should increase energy

efficiency, carry out decarbonization of the energy sector, i.e. create conditions for gradual reduction of the use of traditional fossil fuels and increase energy production from renewable energy sources, as well as maximize the availability of Ukraine's energy resources. The main differences between the new strategy and the old one include the transition from a fossil fuel-dominated energy sector model, inefficient networks, and the lack of transparency in natural gas and coal markets to a new model that offers equal opportunities for the development of all types of energy production. The importance of improving energy efficiency and the use of energy from renewable and alternative sources should be emphasized (Energy Strategy 2030 vs 2035, 2019).

The previous *2030 Strategy* was approved in 2006, with almost every government (in 2008 and 2013) making significant amendments, so several tasks have been implemented. The 2030 version of the *Energy Strategy*, although having some strengths, paid less attention to forming a comprehensive vision of concerted action needed not only to achieve specific sectoral goals, but necessary for a major transformation of the entire system, taking into account climate change and national security, development and integration into the EU energy markets, modification of citizens' consciousness and consumer habits etc. Best practices have been consolidated in the development of this document, and considerable attention has been paid both to Ukraine's international commitments and its strategic national interests. Therefore the *Energy Strategy 2035* version has addressed these shortcomings by providing a clear and realistic vision of the changes needed (Energy Strategy 2030 vs 2035, 2019).

The priorities to ensure energy security of Ukraine are:

- to reform energy markets, to provide transparency of economic activity, competition in these markets and their monopolization, to integrate Ukraine's energy sector into the EU's energy markets and the European energy security system;
- to improve energy efficiency and to ensure energy conservation;
- to diversify sources and routes of energy supply, to overcome dependence on Russia in the supply of energy resources and technologies, to develop renewable and nuclear energy with regard to the priorities of environmental, nuclear and radiation safety;
- to create conditions for reliable energy supply and transit of energy resources throughout Ukraine, to protect energy infrastructure from terrorist threat;
- to form the energy supply system of the national economy and society in a special period;

- to achieve a high level of energy security, diversification of energy supply sources, to increase energy production, to enhance energy efficiency, to implement energy and resource-saving technologies (CMU Ordinance, 2013).

The International Energy Agency defines energy security as uninterrupted availability of energy sources at an affordable price, which can be considered as worth reflecting upon. It should be stressed that within the country, accessibility is determined not only for the population but for the whole economy. That is, a country can be considered energy secure if at any time it can provide itself with all the necessary sources of energy at a price that can be comfortably paid by its economy. Availability also includes physical delivery capability. Unfortunately, ideally energy-friendly countries facing no risks do not exist.

## 2. Challenges to Ukraine's energy security

In the 2018 report on the International Index of Energy Security Risk, which summarizes the statistics for 2016, Ukraine was ranked 25<sup>th</sup> among the 25 major energy consumers – states for which energy security is of particular importance, so now comparisons can be drawn with such countries as Norway, the US, Mexico, Canada, Australia, Poland, France and some others (Global Energy Institute, 2018). Among them, Norway, the United States, the United Kingdom, Mexico and Denmark have the highest ratings. Apparently, this is not a question of the size of the country, the availability of its own energy resources, being an old democracy or having a colonial past; it is a question of the state's approach at particular times to certain key challenges of the world. In 2016, according to the above index, the key challenges included:

- energy intensity, i.e. how many energy resources are spent on producing a unit of GDP;
- natural gas imports – this risk is exacerbated for most major energy consumers;
- volatility of prices and supplies of oil and petroleum products.

Considering the vulnerability of the energy sector in Ukraine, the following threats to energy security are identified:

- excessive dependence on energy imports;
- insufficient level of diversification of energy sources and technologies;
- limited use of its own energy potential and new technologies;
- low fuel and energy efficiency;

- distortions of market mechanisms in the energy sector;
- criminalization and corruption of the energy sector;
- ineffective energy efficiency and energy policy (Stuchynska, 2016).

Bielkova identifies the issues crucial for the improvement of Ukraine's energy security in the near future (Bielkova, 2018):

1. Among traditional sources of energy for Ukraine, *the focus should be on natural gas*, its production in Ukraine and the ability to transport to/from Europe. Natural gas is a strategic resource for Ukraine as industry and the population largely depends on it. Increasing energy security by providing the state with natural gas also counteracts the construction of the Nord Stream-2 pipeline; in fact it means maintaining gas transit through the territory of Ukraine, and increasing Ukraine's own gas production to reduce dependence on external resources.

The tax policy implemented in Ukraine in recent years on oil and natural gas production is aimed primarily at generating revenue for the state budget. However, the excessively high levels of those taxes, instead of generating profits, have led to a significant slowdown in production of oil and, above all, of natural gas.

2. *The level of import dependence on the dominant resource – natural gas – in total primary energy supply is another important indicator of energy security.* For a long period, natural gas was supplied to Ukraine from the Russian Federation on terms that prevented any diversification of supplies. The gas contract between Naftogaz of Ukraine and Gazprom of Russia signed in 2009 created significant risks for the country, in particular in terms of obligatory volumes of gas purchase, base price and payment terms, and created additional opportunities for Russia to apply pressure<sup>4</sup>. High prices for imported natural gas, annexation of Crimea, trade and gas wars with Russia, and, most importantly, the military aggression of the latter were factors that forced Ukraine to abandon purchases of Russian natural gas starting November 25, 2015 (Ukraine's Energy Sector, 2017, p. 14). Since then, Ukraine has been importing gas from Slovakia, Poland and Hungary. In 2016, Ukraine provided 65.6% of its own gas, which indicates a significant decrease in Ukraine's dependence on natural gas imports (Matviychuk, 2018).

3. *Reducing energy consumption.* One of the greatest problems of modern Ukraine is that Ukrainian enterprises use a lot of energy resources to manufacture their products, which in turn increases the price of manufactured goods. Among the reasons for the possible increase in energy prices there is the inability

to ensure the delivery of the necessary energy to businesses (lack of networks, gas lines, shortages or under-production); the political requirement of cross-subsidization between prices for the population and for industry (industry pays for the population or for some separate service); war in the regions where the necessary resources are extracted or generated; and many others (Bielkova, 2018). Consumption levels per capita, in transport and per unit of GDP in Ukraine are among the highest in the group of large consumers.

4. *Continuation of market reforms in energy sector and integration with other markets* because it is market reforms that will ensure competition, transparent pricing conditions and stable prices in the energy markets in the future. These reforms should also incorporate mechanisms that stimulate innovation and energy conservation.

In terms of non-carbon generation, Ukraine holds a good 8<sup>th</sup> place due to nuclear and hydrogeneration. For a long time, domestic nuclear power plants had been almost entirely dependent on purchases of nuclear fuel from Rosatom, a state-owned Russian company. To reduce this dependence, in late 2014, Ukraine signed a contract with Westinghouse Electric Company for the supply of nuclear fuel, which initiated diversification of nuclear fuel supply. Today, the company delivers 40% of total nuclear fuel imports (Matviychu, 2018). A serious threat to Ukraine's energy security is caused by a significant increase in coal imports from the Russian Federation due to the partial loss of the Donetsk coal basin territory, which contains the largest deposits of anthracite coal. In the territory controlled by the Ukrainian authorities, only 45–48% of coal production capacity remains. In 2016, Ukraine imported from the Russian Federation about 62% of all purchased coal (Ukraines Energy Sector, 2017, 60). The supply of anthracite coal from the territories of the self-proclaimed republics of the DPR and the LPR, which was traditionally exported by Ukraine before hostilities, is an important problem. Regarding electricity, it should be noted that the problem in the electricity market lies not in the lack of energy resources to ensure energy security, but rather in the imperfect tariff and regulatory policy, internal monopoly power and the deterioration of power grids (Bielkova, 2018).

5. Ukraine ranks 2<sup>nd</sup> in terms of per capita transport costs. It is also almost the last in terms of transport energy intensity. Noteworthy is the indicator of losses during transportation and distribution of energy, which is growing annually and has reached critical values (3.7%), which has a very negative impact on the level of energy security of Ukraine, as it indicates inefficiency of the domestic energy system. Losses during transportation and distribution of energy also increase end-user tariffs (Matviychuk, 2018).

### 3. Ways to solve energy security problems

The *Energy Strategy of Ukraine until 2035* set the following goals: to achieve energy independence; to develop a conscious and energy efficient society; to transit to market relations in the FEC; to improve the investment attractiveness of the industry; to integrate gas and electricity networks into EU energy space; to transit to a modern industry management system.

To achieve energy independence, Ukraine has set a number of tasks for itself. At the first stage (until 2020), one of the main goals of the strategy is to further diversify the sources of nuclear fuel supply to nuclear power plants and to address energy security in the context of the urgent need to ensure state sovereignty. Another goal is to reduce the dependence of the energy sector on Russia. It is necessary to minimize (as far as possible) Ukraine's dependence on the supply of key strategic energy sources and diversify their supply routes. In particular, the diversification of the main strategically important types of energy carriers and their ways of supply (namely, natural gas, nuclear fuel and coal of specific types) is an important vector for solving the dependency problems. Diversification is underway in such a complex sector as nuclear generation as well; in particular, significant progress has been made in diversifying nuclear fuel supplies. Six deliveries of fresh nuclear fuel from Westinghouse (the US) to nuclear power units have been made, which has enabled to reduce dependence on Russian fuel (Boiko, 2019a).

Now Ukraine does not import gas directly from Russia. 10 years ago, this would have seemed impossible, but today no one can oblige Ukraine to consume a specific amount. "Gas ceased to be a political noose and began to be a regular commodity," emphasized President Petro Poroshenko in 2017 (Gas has ceased to be a political noose, 2017). Since 2018, Ukraine has been buying the needed amount – 10.6 billion m<sup>3</sup> per year – in reverse mode in Europe. Moreover, since 2010, Ukraine has been obliged to buy 52 billion m<sup>3</sup> of Russian gas, and even if a smaller volume was purchased, it was to pay for at least 41.6 billion m<sup>3</sup> annually (Boiko, 2019b). Since January 1, 2019, Ukraine has launched the retail electricity market and is actively taking steps to launch the new wholesale market model in due time in 2019 and to fully liberalize the electricity market for all consumers in the near future. The ultimate goal is the opportunity for consumers to get much better services and to choose a supplier with a transparent and understandable tariff.



Although Ukraine no longer buys gas from its aggressive eastern neighbor, it is still dependent on *Gazprom* for its transit payments. The main transport route for Russian gas to Europe passes through the Ukrainian territory. Kyiv receives about \$3 billion annually for it. This equals 2.5% of the country's GDP. Moreover, over 64% of the coal and 55% of the enriched uranium required by Ukraine's energy sector is still coming from Russia. Kyiv also pays Moscow for nuclear waste disposal (Forbes: for Ukraine..., 2019).

"Ukraine has the problem of energy security the size of the Dnieper", *Forbes* writes. According to experts, the country is "still unable to wrest energy independence from Russia's iron blades" despite large deposits of hydrocarbons and fast-growing renewable energy as well as powerful nuclear power plants. The combination of too much dependence on Russian oil, gas, coal and uranium, as well as the domestic energy sector, which has never before been reformed, are responsible for a dangerous energy situation. According to the newspaper, revenues from transit of Russian gas to Europe make up 2.5% of the country's GDP. In addition, Ukraine exports 64% of coal and 55% of uranium from Russia. Together with the "monopolistic, inefficient and corrupt" domestic market, this has become an "existential" challenge for the country (Forbes: in Ukraine..., 2019).

The massive transit of Russian gas through Ukraine to Europe may end when Gazprom completes the \$11 billion North Stream-2 project, which will connect Russia with Germany, the largest gas consumer on the continent. The 1230-kilometer pipeline across the Baltic Sea bypasses Ukraine. Once it is built, Moscow will be able to pump up to 110 billion m<sup>3</sup> of gas through it. Recalling that another Gazprom project called Turkish Stream has the capacity of 32 billion m<sup>3</sup>, the Kremlin's plans to bypass Ukraine become apparent. Kiev will not simply lose a significant part of the money it received for transit; Russia will no longer have economic reasons to refrain from further aggression. As a result, one can say that Ukraine's economic and physical security benefits tremendously from Russian supplies (Forbes: for Ukraine..., 2019).

In general, the modern Ukrainian *politicum* believes that energy independence as a component of Ukraine's national interests can be formed only if the state integrates into the European energy market, for which it is envisaged: to implement Ukraine's provisions of the third EU energy package aimed at creating competitive and non-discriminatory conditions for the internal energy market; to integrate the unified energy system of Ukraine into the European Union Electricity Network, which will facilitate the entry of Ukrainian producers into the European market; to expand the cross-border gas supply infrastructure

between Ukraine and the EU, which will lead to diversification of gas supply to Ukraine; to create a trading platform on the basis of Ukrainian underground gas storage facilities and to ensure full entry of Ukraine into the European gas market; to step up Ukraine's participation in regional and sectoral international organizations with the aim of mutually agreed and coordinated solution of common problems; to promote Ukraine's accession to the European energy security system (Mazurets, 2016; Ministry of Energy and Coal Industry of Ukraine, 2015).

An equally important element of the reform of Ukraine's energy sector is *to carry out unbundling*<sup>1</sup> both at the electricity and natural gas market. Over a long time, and in cooperation with many stakeholders, the model for separating system operators at these markets has been developed. Outlining the reform prospects, the Deputy Minister of Energy and Coal Industry of Ukraine Natalia Boiko (2019b) states that the energy grids of Ukraine, both in terms of their organization and regulation, will be fully consistent with the model adopted in the EU by 2020, which was envisaged by the *Energy Strategy of Ukraine until 2035* at this stage. The achievement of this important point of the *Strategy* will create fundamentally new conditions for attracting investments in the energy sector of Ukraine, which will also have a positive impact on the overall economic growth of this country. While speaking about the *Unified Energy System of Ukraine (UES)*, the steps towards full integration of the UES with the continental European energy system are of the utmost importance among the significant achievements; all the activities are actively implemented together with the *NPC Ukrenerg* in cooperation with *ENTSO-E* (Boiko, 2019b).

*The search for investment* is one of the major problems in the development of the electricity industry. The objective of the second stage is to introduce mechanisms for attracting investments needed for implement the program to replace the capacity scheduled for decommissioning with new energy infrastructure. Only powerful investment funds are able to realize such plans, since organizing the financing of construction of new nuclear power plants in Ukraine seems difficult to accomplish, given that the estimated cost of constructing a new unit today is about \$8 billion. Investment sources can come from (Six steps towards Ukraine's energy independence, 2017):

1. Internal resources (\$4–5 billion): company own funds, credits.
2. External investments (\$20–25 billion): the USA, China, the UK, Poland, France.

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<sup>1</sup> Unbundling – a system of internal corporate reorganization, designed to separate types of business: production, supply, transportation.

3. State (\$10–15 billion): funds of the PJSC *Ukrgezvydobuvannya*, public-private partnership, contracts for public activity, external and internal loans.

Such project means billions of dollars of investment, and resources of Ukrainian companies are limited today. Therefore the focus should be moved to foreign companies, in particular, American, Chinese, and European ones who can make 80% of the necessary investments, also in the framework of public-private partnership.

International financial institutions (EBRD, EIB, IBRD and KfW) have begun to finance energy projects aimed at improving critical infrastructure. To date, the MFI's energy loan portfolio consists of 8 existing projects (Rehabilitation of Hydropower Plants, Integrated (consolidated) Program to Improve the Safety of Ukrainian NPPs, Increase of Transmission Efficiency, Construction of 750 kV Overhead Lines, etc.) and 3 international projects are under development (Substation Reliability Improvement Program, Modernization of Transmission Network of the NPC *Ukrenergo* and Improvement of Energy Efficiency in Power Transmission (Reconstruction of Transformer Substations)).

The implementation of the second stage – until 2025 – envisages the decision to extend the lifetime of the existing NPP units, commissioning of new NPPs, and designing and constructing nuclear units. Priority tasks include the *construction of additional balancing capacities* in the context of growing share of the system. By 2035, it is expected that 25% of energy should come from renewable sources, while a significant (from 30.4% to 12.5%) reduction in coal consumption is expected, as well as some reduction in consumption of petroleum products. In order to balance the maneuverability in the Ukrainian UES, the state has started the implementation of important projects for the construction of the Kaniv Hydroelectric Power Plant consisting of four hydroelectric units and the third stage of the Dniester HAPP (In search for balance, 2019).

The *2035 Strategy* envisages the first phase of reforming energy companies in line with Ukraine's commitments under the *Energy Community Treaty*, reducing GDP energy intensity and further developing renewable energy (RES). Prospects for renewable energy in Ukraine require detailed justification, taking into account technical and economic factors. The rational and economically balanced ratio of nuclear generation to renewable energy certainly addresses the issues raised by the *Paris Agreement*. When considering the prospects for renewable energy, it is necessary to take into account the specifics of this type of energy, namely instability of production, low technical performance and large volumes of required reserve capacity. These capacities can be realized by either

specialized maneuvering units using organic fuel or specialized high power batteries. Therefore the share of renewable energy in the energy balance of Ukraine for the future should be substantiated in detail. However, the existing scenarios have a number of significant disadvantages, including the factors discussed above and the investments needed to develop such scenarios (Energy Strategy 2030 vs 2035, 2019).

The energy development program envisages the preservation of AE as one of the main types of generation for the period until 2035. However, in the period from 2030 to 2040, Ukraine will have to shut down 12 of the 15 currently operating reactors – all of them have a 30-year design and a 20-year over-project life. This will require introduction of new capacity to replace the decommissioned reactors, as well as construction of new units. According to the previous *Energy Strategy*, the decision regarding the need for the construction of additional nuclear units was to be made in 2013–2015 (Energy Strategy 2030 vs 2035, 2019).

The third stage of the *Energy Strategy – Ensuring Sustainable Development* (by 2035) is intended to focus on innovative development of the energy sector and improvement of energy efficiency. Carbon emissions (decarbonisation) and the development of RES are expected to be maximally dynamic. The problem of decarbonisation of the energy sector may be facilitated by the development of hydropower, wind energy and other RES, but at the same time by Ukraine's continuing position on the feasibility of using nuclear energy. According to *ES-2035*, sustainable expansion of the use of all types of renewable energy is envisaged, which will become one of the instruments for guaranteeing energy security of the state. The EU forecasts a renewable energy growth of at least 25% by 2035 and an increase in the share of SES up to 10% by 2035.

## Conclusions

To conclude the analysis, the high level of dependence on imports of energy (natural gas, oil, coal, nuclear fuel) is one of the major threats to Ukraine's energy security, carrying risks of falling under economic and political influence of other countries, and dependence on the global market conditions. However, in recent years, Ukraine has noted gradual neutralization of threats to energy security through the decrease in natural gas imports and diversification of supplies, which makes it possible to speak about significant progress in the area of Ukraine's energy security. Besides its external dependence, Ukraine also has serious problems in the domestic energy sector. The infrastructure is aging and in dire need of maintenance and upgrading. The energy market is

monopolized, inefficient and corrupt. Excessive regulation and complicated licensing procedures hamper the production of significant oil and gas deposits in the Ukrainian territory. This creates an unattractive environment for investment.

Ensuring Ukraine's energy independence in the area of protection of national interests is carried out through a series of measures; in particular, strategies were developed with a view to eliminating by 2020 the dependence of Ukraine on energy supplies from a monopoly, to diversify routes and sources of energy resources supply; to integrate the energy sector of Ukraine into the EU energy markets and the European energy security system by 2025, to increase the competitiveness of the national energy sector in the European energy market; and to ensure that by 2035 the energy sector of Ukraine will have become a participant in the European energy market, with free movement of energy resources, investments and technologies.

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