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Ovetska O.,

PhD in Economics,

Associate professor of the Department of Management and Administration
Ivano-Frankivsk National Technical University of Oil and Gas (IFNTUOG)

ORCID: 0000-0003-1178-6216

e-mail: ovetska030@gmail.com

Oveckiy S.,

PhD in Technical Sciences,

Associate professor of the Department of Petroleum Production
Ivano-Frankivsk National Technical University of Oil and Gas (IFNTUOG)

ORCID: 0000-0002-3804-8638

e-mail: oveckuj@gmail.com

PROJECT MANAGEMENT OF THE GAS TRANSMISSION SYSTEM'S DEVELOPMENT OF UKRAINE IN THE CONTEXT OF INCREASING ENERGY SECURITY THREATS IN THE CONDITIONS OF WAR

The article examines the current problems of the development and modernization of the Ukrainian national gas transmission system in the context of the implementation of the main strategic tasks (according to the New Energy Strategy of Ukraine) and a number of provisions regulating the legal basis of the functioning of the natural gas market of Ukraine (in particular, the Law of Ukraine "On the Natural Gas Market"). However, Russia's invasion of Ukraine not only made it impossible to fulfill these tasks, but also led to the disruption of the global energy market and the world energy security system. Today, there is an urgent need to transform Europe's energy system, coordinate planning and financing of cross-border and national infrastructure, as well as the development and implementation of a large number of various energy projects.

The need for a new approach to EU-wide infrastructure planning based on regional cooperation with Member States and relevant stakeholders to identify projects of common interest (PCIs) that contribute to the development of energy infrastructure priority corridors and thematic areas is proven. It is justified that the possibilities of transportation and storage of renewable gases (hydrogen, biomethane and synthetic methane) become one of the priority tasks for Ukraine, which offers itself to Europe as a promising and reliable partner.

Keywords: project management, gas transmission system, security, energy strategy, Gas Transmission System Operator of Ukraine, projects of common interest (PCIs).

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Овецька О.В.,

кандидат економічних наук,
доцент кафедри менеджменту і адміністрування
Івано-Франківського національного технічного університету нафти і газу
ORCID: 0000-0003-1178-6216
e-mail: ovetska030@gmail.com

Овецький С.О.,

кандидат технічних наук,
доцент кафедри видобування нафти і газу
Івано-Франківського національного технічного університету нафти і газу
ORCID: 0000-0002-3804-8638
e-mail: oveckuj@gmail.com

УПРАВЛІННЯ ПРОЄКТАМИ РОЗВИТКУ ГАЗОТРАНСПОРТНОЇ СИСТЕМИ УКРАЇНИ В КОНТЕКСТІ ПІДВИЩЕННЯ ЗАГРОЗ ЕНЕРГЕТИЧНІЙ БЕЗПЕЦІ В УМОВАХ ВІЙНИ

У статті досліджено актуальні проблеми розвитку та модернізації української національної газотранспортної системи в контексті виконання основних стратегічних завдань (згідно Нової Енергетичної стратегії України) та низки положень, що регулюють правові засади функціонування ринку природного газу України (зокрема Закону України «Про ринок природного газу»). Проте, вторгнення Росії в Україну не лише унеможливили виконання даних завдань, але й призвели до порушення глобального енергетичного ринку, системи світової енергетичної безпеки. Сьогодні існує термінова необхідність трансформування енергетичної системи Європи, скоординованого планування та фінансування транскордонної і національної інфраструктури, а також розробки та втілення великої кількості різноманітних енергетичних проєктів.

Доведена необхідність застосування нового підходу до загальноєвропейського планування інфраструктури на основі регіональної співпраці з державами-членами та відповідними зацікавленими сторонами для визначення проєктів спільного інтересу (PCI), які сприяють розвитку пріоритетних коридорів і тематичних областей енергетичної інфраструктури. Обґрунтовано, що можливості з транспортування та зберігання відновлювальних газів (водень, біометан та синтетичний метан) стають одними з пріоритетних задач для України, яка пропонує себе Європі в якості перспективного та надійного партнера.

Ключові слова: управління проєктами, газотранспортна система, безпека, енергетична стратегія, Оператор ГТС України, проєкти спільного інтересу (PCI).

Літ. – 13.

Formulation of the problem. In March 2015, the Cabinet of Ministers approved a plan to reform the gas sector, which included, in particular, bringing the corporate governance structure of Naftogaz group companies into line with the principles of corporate governance of the OECD (Organization for Economic Cooperation and Development). And since October 1, 2015, the Law of Ukraine "On the natural gas market" [1] No. 329-VIII (with the simultaneous termination of the Law of Ukraine "On the principles of functioning of the

natural gas market"), which defined the legal principles of the functioning of the natural gas market of Ukraine, came into effect, based on the principles of free competition and security of natural gas supply, as well as capable of integration with the natural gas markets of the countries - parties to the Energy Community. The main tasks of the Regulator in the natural gas market (according to Article 4 of this law) include:

1) assistance in building up a competitive single natural gas market, in close cooperation with the Energy Community Regulatory Board and national energy regulators of other states parties of the Energy Community, within the framework of the Energy Community taking into account interests of natural gas supply security and environmental sustainability, effective opening of the natural gas market to all consumers and suppliers, wholesale buyers and wholesale sellers of the Energy Community as well as ensuring appropriate conditions for effective and reliable functioning of gas transmission and distribution systems, gas storage facilities and the LNG facility in view of long-term development goals;

2) development of competition and proper functioning of regional (international) markets within the framework of the Energy Community, in particular a single market of the Energy Community;

3) elimination of obstacles and restrictions to trade in natural gas between the states parties to the Energy Community, in particular ensuring appropriate level of cross border interconnection to satisfy demand and enhance integration of natural gas markets of individual states parties of the Energy Community, which shall encourage cross-border trade in natural gas within the framework of the Energy Community; etc.

However, Russia's invasion of Ukraine not only made it impossible to fulfill these tasks, but also led to the disruption of the global energy market and the world energy security system. Today, there is an urgent need to transform Europe's energy system, coordinate planning and financing of cross-border and national infrastructure, as well as the development and implementation of a large number of various energy projects.

Therefore, reforms in the gas sector of Ukraine cannot take place separately from the processes and interests of the EU countries regarding the implementation of solidarity actions to strengthen European energy security in response to global challenges and extraordinary events, which quite logically determines the increased attention of scientists to the problems of energy security and project management.

Analysis of modern foreign and domestic research and publications. Energy security issues have been the subject of numerous discussions and debates at national and international conferences, committee hearings, summits and forums. In particular, the "Ukrainian Energy Forum" from Adam Smith Conferences [2] on April 11-13, 2022 for the 13th time brought together managers of leading energy companies and government representatives in a critical period for the future of regional energy security, with the aim of discussing European needs, opportunities for business, and the role of Ukraine in regional geopolitics. Among the topics on the agenda is the discussion of short-term and long-term problems of modernization of the Ukrainian energy industry for the sake of a sustainable and integrated energy future in Europe: gas supply, transit routes, market development, sustainable decarbonization, clean energy, etc.

Actual problems, state and prospects of the development of the oil and gas complex of Ukraine, taking into account modern trends, were also the subject of discussions by scientists at the International Scientific and Practical Conference dedicated to the 40th anniversary of the Department of Management and Administration of the Ivano-Frankivsk National Technical University of Oil and Gas and a collective monograph. In particular, Prof. O.H.

Dz'oba presents the development of theoretical and methodological approaches to the assessment of energy security based on taking into account the risks of subjects of the fuel and energy complex [3]; M. Yu. Petryna, O.Yu. Kushlyk assessed the threats and opportunities of innovative development of the fuel and energy complex (FEC) in the context of energy security [4]; European integration aspects of the development of the oil and gas complex of Ukraine in the context of improving the energy security of Ukraine [5] and the development of the fuel and energy complex as a component of energy security [6].

However, the practical use of the proposed recommendations is characterized by an insufficient level, which determines the need for further research into the problems and prospects of the development of the gas transmission system of Ukraine in the context of increasing energy security with the use of modern project management methodological tools.

Formulation of the goals of the article. The purpose of this work is to determine the priority guidelines for the development and modernization of the Ukrainian national gas transmission system in the context of the implementation of the main strategic tasks in the gas sector and the format of further cooperation to strengthen European energy security on the basis of project-oriented management.

Presentation of the main material. The new Energy Strategy of Ukraine (ESU) for the period until 2035 (approved by the Decree of the Cabinet of Ministers of Ukraine of August 18, 2017 No. 605) is aimed primarily at solving energy security problems in the conditions of the urgent need to ensure the sovereignty of the state in the circumstances of external aggression and offers mechanisms of a transformational nature, determines the strategic orientations of development [7]. In particular, at the stage of reforming the energy sector (in the gas sector of Ukraine), among the main measures for the implementation of strategic goals regarding the formation of the natural gas market, the following is provided for:

- bringing the energy legislation of Ukraine into compliance with the requirements of the EU network codes developed by ENTSO-G, applying the practice of EU tariff formation in the provision of natural gas transportation and storage services, in particular, setting tariffs for entry/exit points from the Gas Transmission System (GTS);

- creation of an independent operator of the GTS by completing the separation from the vertically integrated company and involving partners in the management of the GTS of Ukraine; etc. [7, p. 37-38].

Gas Transmission System Operator of Ukraine, Limited Liability Company (LLC Gas TSO of Ukraine) was established in 2019 to fulfill international obligations to the Energy Community to ensure the independence of the gas transmission system operator of Ukraine (starting from January 1, 2020, LLC Gas TSO of Ukraine is the certified operator of the gas transmission system of Ukraine). The company's mission is to ensure the development of a competitive, transparent and non-discriminatory gas market and ensure reliable gas flows for Ukrainian and European consumers in the most sustainable way. The values of security of supply are sufficient and diversified capacity to transport gas to Ukrainian and European consumers to ensure energy security and uninterrupted supply under any circumstances [8].

Volodymyr Zelenskyy, President of Ukraine, Charles Michel, President of the European Council and Ursula von der Leyen, President of the European Commission, issued a joint statement within the framework of the 23rd Ukraine-EU summit. It states, inter alia, the reaffirmation of Ukraine's role as a strategic state for gas transit and support for the continuation of gas transit through the territory of Ukraine after 2024 [9]. The final documents of the summit "underlined the importance of continuing the modernization of the Ukrainian national gas transmission system and further cooperation on strengthening European energy security. In the context of the existing and future gas transmission systems on the territory of

Ukraine and the EU, the participants of the summit confirmed their mutual commitment to the full implementation of the current EU legislation and the obligations of the Association Agreement. The Parties also agreed to make the best use of each other's existing energy networks and capacities, and to consult and coordinate, as appropriate, on infrastructure developments, which may affect the interests of both Parties. The need for full application of EU energy and competition legislation was underlined. Ukraine and the EU stressed the importance of working together against any potential attempts by third parties to use energy as a weapon, in particular with regard to the impact on the stability of gas transit through Ukraine" [9].

Despite the Russian invasion and ongoing military activities, the Gas TSO of Ukraine continues to fulfil all its obligations to clients and ensure stable gas transit to EU countries. This ability is underwritten by the unique design of the interconnected transit network with many technical redundancies that assure continuity of gas flows. The available gas transport routes to Europe (Ukrainian GTS – 244 mcm per day, Yamal gas pipeline through Poland – 90 mcm per day) are roughly equivalent to twice the technical capacity of Nord Stream-1. Less than 20% of the capacity of the Ukrainian GTS is currently being used; and the Polish Yamal route is sitting completely empty due to self-sanctions taken by the Russian Federation.

In order to secure the EU's energy supply at affordable prices in the current geopolitical context and to phase out dependency on Russian gas, the European Commission has established with the Member States an EU Platform for the common purchase of gas, liquefied natural gas (LNG) and hydrogen - it will be a voluntary coordination mechanism, bringing together the Commission and the Member States, supporting the purchase of gas and hydrogen for the Union, by making optimal use of the collective political and market weight of the EU. The Platform will help ensuring security of supply, in particular for the refilling of gas storage facilities (in time for next winter); will also see to an optimal use of existing gas infrastructure. Kadri Simson, Commissioner for Energy, said [10]: "The Russian aggression against Ukraine has radically changed the geopolitical context of Europe's energy security. We have decided to end our dependence on Russian fossil fuels and need to partly replace them with alternative sources of supply. To succeed in this task, the EU must use its collective political and market power on global gas markets. With the EU Energy Platform, we build on the experience gained over the past months to ensure a coordinated European approach to securing gas imports at the best possible conditions."

The TEN-E Regulation has established a new approach to EU-wide infrastructure planning based on regional cooperation with Member States and relevant stakeholders to identify projects of common interest (PCIs) that contribute to the development of energy infrastructure priority corridors and thematic areas [11]. It also requires Member States to streamline permit granting procedures for PCIs and provides access to financing from the Connecting Europe Facility (CEF) to enable their timely implementation. Since the TEN-E Regulation was established in 2013 gas PCIs have helped to establish a more resilient European gas infrastructure based on more diversified supplies. Gas PCIs have contributed to reduce bottlenecks in the European gas infrastructure, diversify supply sources as well as counterparts and routes. Once the ongoing PCI projects are implemented all Member States will have access to at least three gas sources or the global liquefied natural gas (LNG) market.

In 2022 alone, PCIs with a total additional gas transmission capacity of 20 bcm/year have been or will be commissioned, e.g. the gas interconnector between Poland and Lithuania (the GIPL pipeline), the Poland-Slovakia interconnector, the Baltic Pipe between Poland and Denmark, the Greece-Bulgaria pipeline (IGB). LNG terminals in Cyprus (2 bcm/year) and Alexandroupolis Greece (5 bcm/year) are due to be operational in 2023. Moreover, several

gas PCIs are expected to be completed in the coming years which include several storage projects in South Eastern Europe (Greece, Romania, Bulgaria) as well the LNG terminal in Gdansk in Poland (at least 6 bcm/year). It is thanks to these projects, many of which have benefitted from financial support through the Connecting Europe Facility, that Member States are able to react to recent supply cuts in a spirit of solidarity.

From August 1, 2022, the Gas TSO of Ukraine will increase the volume of natural gas measurement at the Grebeniki point (between Ukraine and Moldova) from 3.96 million cubic meters per day up to 6.12 million cubic meters per day. In addition, by the end of August, the measurement volumes will be increased to 20 million cubic meters per day. Thus, Ukraine, for its part, fulfilled all the prerequisites for transporting gas through the Trans-Balkan corridor. An increase in natural gas measurement volumes in the future opens up more opportunities for both Ukrainian and European traders. EU customers will be able to import gas from LNG terminals in Greece and Turkey via the Trans-Balkan corridor through Ukraine to Hungary, Slovakia, and Poland. Diversification of sources and routes of gas supplies will help strengthen the energy security of the countries of Central and Eastern Europe.

Therefore, today it is important not only to create conditions for the stabilization of the Ukrainian gas sector in order to avoid a transport collapse in the face of the real risk of a complete cessation of gas transit, but it is also necessary to foresee the steps of further energy integration of Ukraine with the EU in the context of energy security.

When shaping the architecture of the European energy system of the future, it is important to take into account the following considerations:

1. LNG opens up new opportunities for Ukraine and the countries of Eastern Europe. Diversification of gas sources and the ability to obtain resources from Norway, the United States, Qatar, and other countries will help strengthen the energy security of the entire region, destroy the monopoly of Russian gas and restore a competitive market. Thanks to the strategic investments of Poland, Lithuania, and Slovakia in gas infrastructure (GIPL interconnector, Baltic Pipe, Poland-Slovakia interconnector, and LNG terminals) Ukraine has gained increased access to the LNG market. The Gas TSO of Ukraine is constantly expanding cooperation with strategic partners to diversify sources and natural gas supply routes to Ukraine.

2. The introduction of hydrogen technologies is gaining relevance in the EU in connection with the rapid development of renewable energy and the implementation of the "Green Agreement" aimed at the transition to a carbon-free economy of the continent by 2050. On August 13, 2020, the GTS Operator of Ukraine joined the newly created European Clean Hydrogen Alliance along with other Western GTS operators (Enagás S.A. (Spain), GAZ-SYSTEM (Poland), GRTgaz (France), Nederlandse Gasunie (Netherlands), Ontrans (Germany), Snam (Italy) and other companies). The European Clean Hydrogen Alliance is part of EU efforts to ensure industrial leadership and accelerate the decarbonisation of industry in line with its climate change objectives [12]. Featuring more than 750 multi projects, Hydrogen mega project is testimony to the size and dynamism of the European hydrogen economy. Projects are located in all four corners of Europe and range from clean hydrogen production to its use in industry, mobility, energy, and buildings

However, to take advantage of existing natural gas pipeline infrastructure to transport hydrogen, [13] the industry must better understand the characterization of the entire system, in terms of age, condition and material. In addition to understanding the impacts of hydrogen on different pipeline materials, the industry must also consider other aspects of operations, such as leak detection and compression. In particular, while the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) requires

pipeline operators to conduct leak detection surveys on a regular basis, those processes were developed to detect methane and natural gas. Because hydrogen is a smaller molecule, leaks may occur and different tools may be required to detect them, especially considering that hydrogen has a wider flammability range than natural gas and methane.

If the zero transit scenario is implemented in Ukraine, significant amounts of main gas pipeline capacity will be released, which can be used for transporting renewable gases to consumers in Ukraine and European countries. Thus, determining the possibility to transport and store renewable gases (hydrogen, biomethane and synthetic methane) becomes one of the priority tasks for Ukraine, which offers itself to Europe as a promising and reliable partner.

Conclusions. Russia's full-scale invasion of Ukraine has far-reaching consequences for the energy security not only of the EU, but also of the entire world, which became a strong argument for reformatting the global energy system and, in particular, the EU's accelerated transition to clean energy. In May of this year, the European Commission presented the REPowerEU Plan, which provides for the final rejection of Russian gas and increasing the stability of the European energy system. The crucial role of hydrogen infrastructure, which is the basis for the decarbonized future of Europe, encourages the implementation of innovative solutions and the most promising projects for the development of hydrogen infrastructure, including in Ukraine.

Taking into account the significant potential for the production of decarbonized gases and the extensive network of main gas pipelines, Ukraine should become a reliable and promising partner of Europe in the energy transition to carbon-free energy. This will certainly be facilitated by the fact that the Ukrainian GTS Operator signed a memorandum of understanding with the European Hydrogen Backbone (EHB) in April of this year (the EHB industry initiative includes representatives of thirty-one energy infrastructure operators united by a common vision of a climate-neutral Europe that ensures development of the market of renewable energy sources). However, it is necessary to determine not only the main obstacles to the large-scale implementation of clean hydrogen projects in Ukraine, additional infrastructure needs suitable for the future use of hydrogen, but also to ensure the regulation of a number of technical (technological), institutional (regulatory) and economic aspects of the project analysis of hydrogen transportation is determined strategies for reducing project risks, etc.

Creating a low-cost hydrogen solution and integrating that into the energy mix requires broad collaboration from stakeholders, research and development (R&D) organizations, industry and nonprofit entities. Among the organizations involved in this research and development is the IFNTUOG Institute of Petroleum Engineering, whose scientists have experience and related scientific developments aimed at promoting the greater use of hydrogen in an integrated energy system to solve the problems of decarbonization.

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