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ANALYSIS OF METHODOLOGICAL APPROACHES TO ASSESSMENT OF ENERGY SECURITY OF THE STATE

Introduction. In terms of increasing levels of internal and external threats significantly increases the importance of ensuring energy security of the state that reflects the degree of independence of the country, economic development and the level of economic welfare. The domestic economy characterized by a predominance of energy-intensive industries, the shortage of fuel and energy resources, which recently provided by imports. Obsolete and physically worn-out production assets, imperfection of economic and financial mechanisms entails low level of energy security. The problem of energy supply of the national economy brought to Ukraine since gaining independence and for many years remained one of the main challenges to the national security of the state. Formed during the Soviet Union the fuel and energy complex (FEC) of Ukraine is not consistent with the existing own resource potential, which is automatically reflected in the power supply system and caused the imbalance of economic processes.

Problems determination. In view of the above, there is a need in solving problems of energy security by analysis of the methods of research and the qualitative improvement of the methodological foundations of the analysis of the energy component of the economy.

Analysis of recent researches and publications. Certain issues associated with the study of problems of energy security considered in the studies of foreign and Ukrainian scientists, in particular: G. Bondarenko, S. Vorontsov, I. Mazur, A. Sidorenko, A. Smenkovskogo, J. Kharazishvili, A. Sukhorukov, T. Krupelnytska, etc. In the works of scientists considered the methodological framework for the analysis of energy security in modern conditions, concepts and models provide the most important components; analyzes threats and develops measures to improve the level of energy security. However, given the importance of research, many unresolved issues in the practice of energy security. Therefore, based on the European experience and thorough analysis of the indicators characterizing the level of energy security in Ukraine it is necessary to carry out

the analysis of existing methodological approaches and assessment of energy security as a component of economic security of the state.

Tasks determination. The aim of the study is a theoretical generalization of scientific approaches to assess the state of energy security of the country taking into account modern trends of development of the domestic economy caused by the financial and economic crisis and the needs of management.

Presentation of the main material of the research. Today there is no single definition of energy security given that quite often. "Energy security" and "security of supply" used as synonyms. World Bank analysts define energy security as the country's ability to produce energy and it is reasonable to use it that will promote economic growth and thereby reducing poverty among the population; to improve the quality of life of citizens through enhanced access to modern energy services. However, for each country the exact definition of energy security depends on the level of economic development, availability of energy resources and energy demand [8].

In the specialized and scientific literature, there is quite a lot of definitions of "energy security". So, "energy security is an integral component of economic and national security, a necessary condition for the existence and development of the state" according to the Energy strategy of Ukraine until 2030 [3]. In the modern sense of guaranteeing energy security is the attainment of a state technically reliable, stable, economically efficient and environmentally sound provision of energy resources to the economy and social sphere of the country. Also creation of conditions for the formation and implementation of policy of protection of national interests in the energy sector [4], which is a reflection of the resource approach.

Scientists of the Institute for strategic research proposed the following definition of energy security of Ukraine, so this concept means the state's ability to ensure the efficient use of own fuel and energy base. The opportunity to implement an optimal diversification of sources and routes of supplies to Ukraine of energy for life support of the population and the functioning of the national economy in normal, emergency and military conditions. The state's ability to prevent sharp price fluctuations for fuel and energy resources, or to create conditions for painless adaptation of national economy to the new prices for these resources [2].

Implementation of state policy in the sector of energy and energy security of Ukraine perform more than fifteen state institutions:

1) President;

2) the Supreme Rada of Ukraine (in the fuel and energy sector are subject to the Parliament Committee on fuel and energy complex, nuclear policy and nuclear safety, the Committee on environmental policy, nature resources utilization and elimination of consequences of the Chernobyl disaster, the Committee on construction, urban development, housing and communal services and regional policy);

3) the Cabinet of Ministers of Ukraine subordinate to the relevant ministries (Ministry of energy and coal industry of Ukraine; Ministry of regional development and construction of Ukraine; the Ministry of emergencies and Affairs of population protection from consequences of Chernobyl catastrophe; the Ministry of ecology and natural resources of Ukraine; Ministry of economic development and trade of Ukraine. The last one Ministry oversees the formation and implementation of energy policy, public policy on economic and social cooperation of Ukraine with the EU. Also oversees single foreign economic policy, policy of integration of Ukrainian economy into the world economy, cooperation with the WTO; state policy in the sphere of cooperation with international financial organizations and to attract international technical assistance, etc. [6, p. 40].

Normative-legal base in the sector of energy security, organization and regulation of energy conservation formed and declared by the Supreme Rada of Ukraine in the 69 Laws of Ukraine [5-9] and regulations in the sector of energy conservation and efficiency. Also in the 82 state standards for energy conservation in the 148 guidance documents on regulation of specific expenses of fuel and energy resources. These documents has been developed and introduced in more than 20 international guidelines and multiple resolutions and orders of the Cabinet of Ministers of Ukraine and decrees of the President of Ukraine for the period since 1997 [6, p. 17].

In Ukraine, the level of energy security assessed in accordance with the Method of calculating the level of economic security of Ukraine, approved by order of the Ministry of economic development and trade of Ukraine of 29 October 2013, №1277 [15]. It is worth noting, that there is the only one official document in Ukraine, which provides status indicators for energy security. To ensure the energy security necessary we need to achieve and maintain the preset in the Methods the limit values of indicators. According to Methodical recommendations about calculation of the level of economic security of Ukraine's energy security is the state of the economy, which promoting the efficient use of energy resources of

the country in the energy market of a sufficient number of producers and energy suppliers, as well as accessibility, differentiation and sustainability of energy resources [15]. According to the document, the assessment of energy security performed in two main stages:

1) Compare the actual values of each of the nine selected indicators with their established maximum allowable values (their list is given in table 1);

Table 1 – Indicators and thresholds of status indicators of energy security according to the Method of calculating the level of economic security of Ukraine

Indicator	Unit	The limit value X_{opt}
The energy intensity of gross domestic product	kg of conditional fuel/UAH	0,2 - 0,5
The degree of fuel and energy resources	%	not less 100
The share of own sources in the balance of fuel and energy resources of the state	%	not less 50
The share of dominant fuel resource in the consumption of fuel and energy resources	%	no more 30
Depreciation of basic production assets of enterprises of fuel and energy complex	%	no more 50
The ratio of investments in enterprises of fuel and energy complex gross domestic product	%	3 - 4
Download transit parts of oil and gas transportation systems:		
the transit of oil	million/tons	56 - 65
gas transit	billion/cubic meters	not less 175
The volume of coal production	million/tons	70 - 100
The share of fuel imports from one country (of the company) to its total volume	%	no more 30

2) identification of level of risk the actual status of each indicator for the economic security of the state, which is done by setting the weighting factors taking into account deflection or undesirable trends approaching to the established limit values (characteristic values of indicators of energy security and their weights is given in table 2).

Table 2 – Characteristic values of indicators of energy security and their weights in accordance with the Method of calculating the level of economic security of Ukraine

Indicators	The lower limit (x^l_l)	The lower threshold (x^l_{thr})	The lower standard (x^l_{opt})	The upper standard (x^u_{opt})	The upper threshold (x^u_{thr})	The upper limit (x^u_l)	The weighting factors a_{ig}
The share of own sources in the balance of fuel and energy resources of the state, %	40	50	60	70	90	100	0,103
The share of dominant fuel resource in the	10	20	30	40	50	60	0,103

consumption of fuel and energy resources, %							
The share of fuel imports from one country (company) in the total volume of its imports, %	10	15	20	25	30	50	0,169
The degree of fuel and energy resources, %	70	90	100	100	140	150	0,083
Depreciation of basic production assets of enterprises of fuel and energy complex, %	10	15	30	35	50	70	0,107
The ratio of investments in enterprises of fuel and energy complex gross domestic product, %	2	2,5	3	4	6	10	0,077
The energy intensity of gross domestic product, kilograms of conditional fuel/UAH	0,05	0,1	0,2	0,5	0,7	0,8	0,098
The volume of coal production, mln.t	40	50	70	100	110	120	0,082
The transit of oil, mln.t	30	40	56	61	63	65	0,094
Gas transit, billion.m^3	110	120	175	175	180	190	0,085

Mazur I. M. covers the concept of energy security as a component of economic security, which combines in its structure the global (international), national, regional and basic (local) level of individual subjects. According to the author, energy security is a four-level hierarchical structure, the subjects of energy security are an institutional and organizational structures, which created within the individual level to counter the internal and external threats (table 3). The author proposes a common system of indicators for evaluation. The selected criteria are critical to the activities of individual companies, sector, region and country as a whole. They comprehensively characterize the most important processes, phenomena and parameters of the energy security of national economy. A negative level each of them represents an energy hazard to the operation of the facility and the need to implement crisis management measures [6].

Table 3 - Key elements of energy security of the economy [6]

Energy security of the economy			
Level			
I	II	III	IV
Types			
Global energy security of the global economy	Energy security of national economy	Energy security of the region's economy	Energy security of the subject (local energy security)
Subjects			
International organizations, institutions, bringing countries and their unions	Institutional and organizational structure of the state in the sphere of energy security, the mission of the oversight structures of international organizations	Institutional and organizational structures of local governments, associations of economic entities, public organizations, etc.	Economic entities of different forms of ownership and their structural divisions, associations of citizens, non-profit agencies and organizations and their structural subdivisions, separate households, etc.
Objects			
Ensure fuel and energy resources; transportation and distribution of fuel and energy resources consumption efficiency of fuel and energy resources; unproductive expenditures of fuel and energy resources; the disruption and imbalances in the energy system, etc.			

In the writings of scientists of the National Institute for strategic studies proposed methodological approach to assessment of energy security of Ukraine, which based on the following principles [16]:

a) Accounting various aspects of the definition of "energy security";

b) Availability and transparency of information on the official websites of state bodies and international organizations;

c) Simplicity and the possibility of the assessment calculations of the state's energy security;

d) The objectivity of determining the state of energy security and threats to it;

d) Validity of assessment results for decision-state decisions.

The authors offer a list of the indicators of energy security divided into four functional blocks:

1) General economic indicators;

2) Indicators of technical condition and resource support of FEC;

3) Financial-economic indicators;

4) Social and environmental performance [17].

In the Energy strategy of Ukraine until 2035 specified that "economical use of energy resources of own production in combination with essential import must be ensured by balanced built system of energy security. It has the flexibility to operate both under ordinary and extraordinary circumstances. Such a system will be one of the guarantees the country's survival during adverse external circumstances, the preservation of its sovereignty, territorial integrity and further economic development".

Note that the standard formula for energy security could considered such a basic configuration [13]:

Energy conservation and efficiency + availability of own energy resources (natural gas, coal, oil, renewable energy sources) + diversification of import of energy resources + building strategic reserves + integration energy space.

In international practice for the assessment of energy security of the country uses methods of qualitative and quantitative analysis. However, in recent years, the majority of experts prefer quantitative methods, the use of which allows not only identifying negative trends in the energy sector and contributes to defining and assessing the level of risk. Among the methods quantitative analysis most common to use are the methods of comparative, indicative and factor analysis. A feature of

the use of these methods is the determination of the list of representative indicators, actual values are in the process of analysis compared with the relevant indicators. Thus in the methods of the comparative analysis of the quality indicators can be used by the corresponding figures in the past, in other countries-analogues and the like. In methods of indicative analysis used maximum allowable value of the representative indicators. Methods of factor analysis used to determine significant factors of influence and assessment of the role of each in the formation of actual values of indicators of the state of energy security.

Given all the above and guided by our own research, for the characteristics of certain aspects of energy security of the state economy are the following factors that determine the level of energy security:

1) Formation of resource base for production of fuel and energy resources;

2) Diversification of sources of energy imports;

3) The country's participation in the redistribution of fuel and energy resources;

4) Realization the potential of energy and resource saving;

5) The efficiency of fuel and energy resources;

6) The state regulation;

7) Reduction of losses of fuel and energy resources in the process of supply and use to minimize negative impacts on the environment;

8) Formation of the optimal structure of energy consumption and use alternative sources of energy.

Consequently, the system of indicators of energy security should provide a quantitative, comparative and relative assessment of its condition and changes depending on the actions of individual factors that affect the national interests in the energy sector. Their informative specification assumes the presence of methods to assess the level of energy security. In addition, it contributes to analyze the impact of trends in threats.

Conclusions from the research.

Based on the analysis of the main methodological approaches and indicators, which characterizing the state of energy security of Ukraine found that the main problems in the sphere of energy security are:

1) Insufficient share of own fuel and energy resources and in this regard a significant dependence on imports in the dominant resource;

2) The obsolescence of the basic production assets of enterprises of fuel and energy complex;

3) Reducing the volume of used capital investments in the fuel and energy complex;

4) High level of energy intensity of gross domestic product;

5) A small proportion of renewables in total primary energy consumption, which points to inefficient alternative energy development in Ukraine.

Thus, the main strategic directions of growth in energy supply through the prism of scientific-methodological approaches regarding the assessment of energy security of Ukraine are:

1) Optimally reasonable increase of level of ensuring of the country's own fuel and energy resources;

2) Improving the efficiency of energy production and energy use as the direction of internal reserves of energy supply;

3) Diversification of sources and routes of supply of fuel and energy resources in Ukraine;

4) Use of the best transit potential of oil and gas supplies to Western Europe;

5) Governance and regulation in the energy sector.

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