



Provision of Energy Security at the National Level in the Context of the Global Gas Transportation Industry Development

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ABSTRACT

The laws of development of the gas transportation industry and the global gas industry are summarized and systematized in this article. Also this article describes the key points that determine the direction and the specifics of the formation of gas transportation systems for the nearest future, taking into account the risks and the most likely priorities of the global gas transportation sector, which plays a leading role in ensuring an adequate level of energy security and the needs of the economy and society in energy resources. The scientific novelty of this study involves the development of a model of the global gas transportation sector taking into account the priorities of the energy security maintenance at the national level and the existing threats. The model of the global gas transportation industry can be adapted to form solutions for the optimization and upgrading the national gas transportation systems. The model's main attention is paid to the growth of technological gas production, which will reduce the environmental and other inter-related risks, and will help to maintain the stability of the global gas transportation industry to possible external and internal shocks.

Keywords: Gas Transportation Industry, Gas Industry, Gas Transportation, Energy Resources, Energy Security

JEL Classifications: R410, Q470, Q380

1. INTRODUCTION

In recent years, especially against the background of geopolitical transformations, attention has been paid not only to search for new sources of energy and the formation of a new energy supply system meeting the demands of society and economy, but also to the development of traditional resource extraction and processing industries. The issues of the improvement of international energy cooperation and the development of energy resources distribution systems become actual. These critical areas are forced to redefine the world's common concept of energy security and the energy security of individual countries and states. According to the research made by the International Energy Agency, the energy security is seen as the threefold concept, in which continuums of energy security at the national level are the following: Availability,

continuity and reliability of energy resources supply. Considering the energy security in the context set out by experts of the International Energy Agency, Winzer points to the institutional fundamental principle and rightly believes that energy security is one of the objectives of the national and international energy policy (Winzer, 2011).

Examining the historical context and the aspects of energy security, Yergin believes that the provision of the latter can be achieved through diversification of production and distribution of energy resources (Yergin, 2008). Referring to the historical experience of the evolutionary development of the global energy sector, he pointed out that the humanity's fears about the adequacy of stocks and physical (economic) access to energy resources were not baseless. In addition, the growth

of terrorism and political instability in producing regions threatens the preservation and provision of an adequate level of energy security. Therefore Yergin considers energy security as strategically oriented and diversified solution in the production, supply and distribution of energy resources in the amounts, which are authentic to the needs of the global society and the global economy.

Thus, it becomes obvious that the development of the energy resources distribution system is significant for the modern human civilization that can be fully attributed to the problems of development of the global gas transportation system (Weijermars, 2010; Dudin et al., 2013; Goldthau and Sovacool, 2012; Florini and Sovacool, 2009). The global gas transportation system is the complex infrastructural and institutional business unit formed by a set of interrelated flows of resources (energy, information, financial), which should be considered as a link between the gas production and consumption sphere (intermediate or final consumption).

From the infrastructural point of view the gas transportation sector of the world economy is formed by a network of gas pipelines (trunk, distribution, pipelines, bridge gas pipes, outlets and inlets). Institutionally, the gas transportation sector of the world economy is formed by a set of international and national standards, rules and regulations, in which the key issues of energy security are structured, taking into account the importance of the gas transportation industry as such for the global economy and the importance of individual organizational and functional component (in particular: Mining, transit, investment, supply and demand balance, gas consumption level, and rationale of such consumption).

A parity of alignment of interests of gas exporting countries, importing countries and transit countries, which provide an opportunity to ensure the movement of gas through their territory (i.e., from the place of production (storage) to the place of consumption) shall be considered as a pivotal point determining the long-term development of the gas transportation industry (Aggarwal et al., 2009; Chai et al., 2015; Daheim and Uerz, 2008).

Given that the gas transportation industry plays a leading role in the distribution of the global flow of energy resources, as well as the fact that the struggle for access to the distribution (transportation) of energy resources is the most likely cause of possible interstate and inter-country conflicts in the medium and long-term perspective, it seems appropriate to consider the development of the gas transportation industry in the context of the final phase of the world economy globalization.

2. METHODS

A set of different research methods has been used within the framework of writing this article. In particular, the content analysis of theoretical and methodological and scientific and practical publications was used on the topic of research (Makarova and Sokolova, 2014; Weijermars, 2013; Toth and Rogner, 2005; Georghiou and Keenan, 2006). It revealed that the long-term development of the gas transportation industry may be considered from various positions, namely:

- In terms of economic, political and economic aspect, the gas transportation industry is a system component, determining not only the direction of the world economy development, but also the direction of political interaction of exporting countries, importing countries and transit countries in terms of the global energy metabolism improvement.
- In terms of logistics the gas transportation industry is regarded as a sphere of interconnected energy, information and financial flows that cause the development of material-technical and technological infrastructure providing the optimal supply of gas to world regions taking into account their current and future needs.
- The environmental point of view involves consideration of the gas transportation world industry as a source of increased environmental risks which arise from the increase in gas consumption on the one hand that will cause, respectively, the increase in its production and the increase in the level of load on the gas pipeline system. And on the other hand the environmental risks may be associated with the political instability not only in the gas production, but also in the transit regions of the world.
- From the financial and investment point of view, the global gas transportation industry is both a potentially attractive investment object and a sector accumulating and generating significant cash flows, regulation and control of which is difficult because of the high territorial and economic distribution of businesses, performing extraction, processing, transportation and sale of gas to consumers.

Also the methods of financial and economic, cluster and factor analysis of the global gas transportation industry state were used as part of this article. It is worth noting that the most appropriate system would be to use a methodical basis, which on the one hand will allow to reveal the patterns of functioning of the world's gas transportation industry in the previous periods, taking into account the accumulated and potential risks, and on the other hand the systematic methodical approach will allow to determine the main prospective lines of this industry development.

3. RESULTS

World regions and individual national states are characterized by a significant differentiation by reserves, gas production and consumption. And this is not only due to the availability of deposits or other geo-natural phenomena, but also due to the national policies for covering the nation's needs in the energy resources, as well as to the national economic security strategies. At the same time, it is well known that economies of countries with large reserves of gas and oil are characterized by a high resource dependency. For example, the gas production in Gulf countries - Iran, Qatar and the United Arab Emirates - along with oil production in the economy structure hold key positions. Also, the gas industry in the structure of the economy of Turkmenistan, Algeria, Venezuela, Iran and Nigeria holds key positions, as it allows integrating into the world economy and finding its niche. But for various reasons, the figures concerning the place of these countries in the world ranking in terms of gas reserves and a place in the world rankings in terms of production vary considerably. This can be explained not only by structural imbalances but by

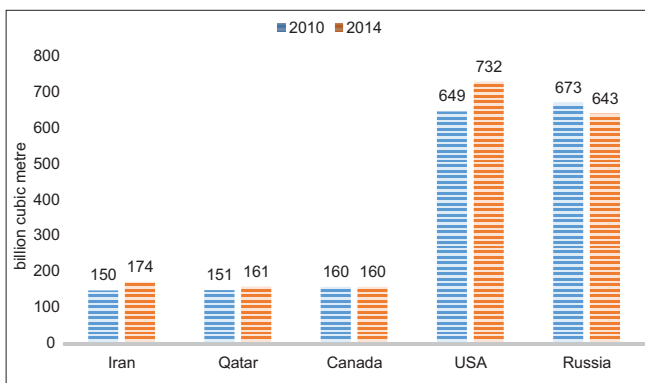
insufficient and (in some cases) extremely low efficiency of operation and development of the gas industry in these countries.

It is worth noting that the oil embargo imposed by the Organization of Petroleum Exporting Countries in 1973 greatly influenced the development of the gas industry in many West countries in general and, in particular, the development of the gas transportation sector (both in terms of functioning of the gas pipeline system, and in terms of supply of liquefied natural gas). Within the balance of energy consumption in most Western countries the natural gas is the export gas by origin, except for Norway, the Netherlands, Canada, Australia and Britain. The particular attention should be paid to the development of the gas and gas transportation industry in Australia and Canada. Australia and Canada are two technologically advanced countries in economical and social terms. But the specific contribution of the oil and gas sector to the economy of these countries is very high. The gas and gas transportation industry in Australia (due to geographical position of the country) is focused mainly on the provision of domestic energy resources consumption.

In its turn, the development of the gas industry and gas transportation sector in Canada largely depends on the efficiency of interaction with the key markets of the USA and the European Union. Canada's experience is indicative also for the fact that in recent decades the efficiency of exploration and production of hydrocarbon resources as a whole and, in particular, that of gas has significantly increased, which in turn allowed to reduce the energy consumption of the Canadian economy. In developing countries and in countries with transitive economy (the latter include Russia), the natural mineral wealth of which are characterized by high level of reserves of various hydrocarbon resources, the gas and gas transportation industry are the strategically important sectors of the national economy, along with the oil production and refining industry, providing significant amounts of budget revenues. The volume of natural gas production of five leading countries as of 2010 and 2014 are presented in Figure 1.

It is obvious that the volumes of gas production by five leading producer countries show an increase in 2010 compared to 2014,

Figure 1: Natural gas production volumes of five leading producer countries



Source: (Natural gas production//Global Energy Statistical Yearbook (electronic resource) access mode <https://yearbook.enerdata.ru/#world-natural-gas-production.html> (LaBelle and Goldthau, 2014)

but at the same time, the relative increase in gas production by countries under consideration amounted to no more than 5% over the period.

This means that the new countries emerge on the natural gas production market (in particular China and Turkmenistan increased the volumes of natural gas production in 2014 at an average of 33-35% compared to 2010 (LaBelle and Goldthau, 2014; Bürer and Wüstenhagen, 2009), and this in turn significantly influences the condition, functioning and development of the global gas transportation industry.

Production of natural gas and its transportation in the various countries of the world have a number of differences. For example, in Canada, Australia, Norway and the Netherlands, the market of gas production and transportation is regulated using the liberal approach that allows maintaining relatively acceptable conditions for competition of independent gas production and transportation companies. In the Russian Federation and in a number of gas-producing countries of the Commonwealth of Independent States the market of gas production and transportation is characterized by a high degree of concentration and monopolization, which is a direct consequence of the resource paternalism policy. In other countries with a high dependence on the resources (for example, in the Persian Gulf), the gas production and transportation industry also plays a role of one of the “pillars” of the national economy, and the market monopolization and paternalistic policies with regard to resource industries also happen to be in these countries.

Several factors, such as the absolute levels of gas reserves, indicators of gas and gas condensate production, natural gas consumption in the country (depending on the physical and climatic conditions, topography, industrial development - Especially chemical), the involvement in the world economy, as well as the total development of the country, availability of advanced technologies for the extraction of natural gas in hard-to-reach places, geopolitical situation in the country itself and in the region or in neighboring countries also influence the development of the gas industry.

In addition, it is possible to detail a number of factors that lead to infrastructure differences of gas transportation industry in the world and in individual countries. Among these factors are the following (Ross and Bustin, 2007; Dudin et al., 2015; Fan and Wang, 2014):

- Geo-climatic and physical characteristics of the surface relief through which the gas pipeline system runs, and the remoteness of the final gas delivery point. This, in its turn, determines the choice of transportation mode: The seabed or the earth plain.
- Geopolitical stability, as well as the territorial and geographical distribution of gas producing countries, importing countries and countries that provide its territories for the gas transit.

Besides infrastructural differences in the approaches of different countries to the formation of the gas transportation system, there are also different concepts of development of the gas transportation industry at the level of individual states. For example, the concept of development of the gas transportation

industry in Russia, Iran, China, Turkmenistan, Venezuela, Kazakhstan, suggests that the industry is a budget forming and powerful tool of influence on foreign economic relations. In its turn, the concept of development of the gas industry and gas transportation industry in Norway, Canada, Australia, Saudi Arabia, the Netherlands, Britain, China suggests that the industry is an important resource for the domestic industry and the economy of other advanced countries of the world (with the exception of Norway due to physical and geographical conditions and relatively small population). In its turn, the concept of the gas transportation industry development in the US is based on the differentiation of sources use, because the US gas industry is developing not only due to the traditional production and transportation of gas, but also due to the production and transportation of shale gas. The development of shale gas sources in the US is in the process of formation and transformation, and highly depends on the price efficiency of the industry development (Matveev, 2014; Shah et al., 2014; Kilian, 2008).

For the scientific study of the characteristics and laws of functioning and development of the gas transportation industry in the world, the authors have used the cluster and factor methods. 20 most significant countries by natural gas reserves and by natural gas exports were selected. The possibility of physical access to statistical data and indicators also became a key factor for the selection of countries for the study. The group of countries under study included the United States, Russia, Iran, Qatar, Canada, China, Norway, Saudi Arabia, the Netherlands, Algeria, Indonesia, Turkmenistan, Uzbekistan, Australia, Malaysia, Egypt, Bolivia, United Arab Emirates, Mexico and Pakistan. The data directly related to the gas and gas transportation sectors were selected for the analysis.

Besides the gas field (traditional, maritime and shale), the availability of the gas pipelines, gas storage facilities (underground, natural and artificial above ground), gas distribution stations, stations for liquefied gas and special vehicles for liquefied natural gas transportation from the place of production (or storage) to the place of direct consumption are also necessary for the development of the gas transportation industry and gas transportation infrastructure.

The following indicators were used: Absolute indicators of gas reserves, gas production indicators, indicators of gas consumption in the country, gas export and import indicators, as well as the length of the pipeline in the country.

On the basis of the cluster analysis 4 groups (Table 1) may be distinguished among the first twenty countries producing natural gas. The first group includes only one country - The United States, the second group also includes only one country - Russia, the third group includes six countries (Iran, Qatar, Canada, China, Norway and the Netherlands), and the fourth group includes twelve countries (Saudi Arabia, Algeria, Indonesia, Turkmenistan, Uzbekistan, Australia, Malaysia, Egypt, Bolivia, United Arab Emirates, Mexico and Pakistan).

The first group, which is represented by only one state (the United States), is characterized by the fact that the United States has

traditionally been considered as the “main” world’s economy. While in 2014 China surpassed the figure of USA in terms of gross domestic product (GDP) (calculated by purchasing power parity): USD 17.630 trillion and USD 17.460, respectively. However, the China’s GDP is much more modest - USD 10.3 trillion. Yet the US economy remains the most innovative.

Also it is worth noting that innovations have been the basis for the origin and development of “shale revolution,” and as a result, significantly reduced the cost of oil on world markets and that of the natural gas, the cost of which is connected with oil prices.

The second group, which includes only one country - Russia, is characterized by the fact that it is the largest world country in terms of its area. It is the second largest economy in Europe (after Germany), the natural gas industry of which in the past two decades has been actively developing through the extensive method of application of new routes for gas pipelines (“Nord Stream,” “South Stream,” which has transformed into a gas pipeline under the Black Sea to Turkey), the development of new deposits (mainly in Siberia and in the Far East), increasing the volume of gas sales and conclusion of long-term contracts (Matveev, 2014). While such policy gives positive results in the early stages (the accumulation of large gold value reserves, increasing the state’s role on the world stage due to the “gas geopolitics”), the possibility of its response to the “shale revolution” and the fall in gas prices in the world markets is controversial.

The third group (Iran, Qatar, Canada, China, Norway, and the Netherlands) is characterized by considerable reserves of natural gas and the minor role of gas for one or other reasons. Thus, Iran has limited ability to export gas because of US and EU sanctions imposed on it, officially because of “nuclear program” of Iran and formally based on UN Security Council Resolution 1929 of 09.06.2010. But this year (2015) the final decision on “nuclear program” of Iran has been formulated. The consequences of this decision implementation, according to some analysts and experts, will be a decline in the world oil prices and consequently in the natural gas prices due to the natural desire of Iran to find its niche in the global market and to solve urgent social and economic problems in the country, which have arisen due to the sanctions of the West.

Canada, the Netherlands and Norway are highly advanced countries, and gas reserves in their territory (both continental and maritime sovereign responsibility zone) exceed the required energy demands at the moment. It is necessary to mention here Norway where the gas consumption, despite the location in the northern latitudes, is abnormally low. This is due to warm Gulf Stream and mountainous terrain, which make the gas supply via pipelines quite difficult because of the low profitability of the project and unsafe necessary pressure in the pipeline.

The Netherlands, the territory of which lies below sea level (polders) in some places, consumes a considerable amount of gas (spaces heating, domestic needs, development of the chemical industry), but the remains extracted from the Dutch sector of the North Sea are delivered to Western Europe countries. Due to

Table 1: Cluster analysis of the global gas transportation sector (as of 2014)

Cluster group	Countries within the group	General characteristics of cluster group		
		Gas production volumes (bcm)	Length of the main gas pipelines (km)	Number of gas storages (units)
1	USA	From 700 to 730	More than 400 thousand	About 50
2	Russia	From 600 to 640	More than 171 thousand	About 22
3	Iran, Qatar, Canada, China, Norway and the Netherlands	From 108 to 175	From 9.3 to 20 thousand	About 5-10
4	Saudi Arabia, Algeria, Indonesia, Turkmenistan, Uzbekistan, Australia, Malaysia, Egypt, Bolivia, United Arab Emirates, Mexico and Pakistan	From 52 to 110	From 1.8 to 8.7 thousand	Up to 5

The World Fact book/Central Intelligence Agency (Electronic resource) Access: <https://www.cia.gov/library/publications/the-world-factbook/geos/ca.html> free. Outlook for Energy: Russia and the world until 2040/Institute for Energy Research, Analytical Centre under the Government of the Russian Federation. 2014. p. 189. (Matveev, 2014; Ross and Bustin, 2009; Shah et al., 2014). BCM: Billion cubic metre

the small number of the population, which by the way is mainly located in the narrow border strip with the United States, Canada is a country of “resettlement capitalism,” where the population has already brought a capitalist experience in economy management, in this case, in the gas industry, and simply just not depleted gas reserves in the development of capitalism in the country in the traditional way (as for example, in Germany, France and other countries with an old capitalist history). At the same time, the exception is Qatar, for which gas is the main export product, but the remoteness from the main routes of gas pipelines (and these are mainly in Europe) and continued geopolitical instability in the region (confrontation in the line “Israel - Persian Gulf countries,” “Sunni world,” which also includes Qatar, and Iran, “ISIL” - The rest of the world” and the issue of Syria, etc.) pose a greater threat to the transportation of liquefied natural gas to these areas (Zhang, 2008; Medlock et al., 2014; Wu et al., 2014).

The fourth group (Saudi Arabia, Algeria, Indonesia, Turkmenistan, Uzbekistan, Australia, Malaysia, Egypt, Bolivia, United Arab Emirates, Mexico, and Pakistan) is characterized by the fact that it includes the developing countries, with the exception of Australia. The others are the developing countries with high per capita incomes (Saudi Arabia, United Arab Emirates), with average income (Malaysia, Mexico) and low per capita income (Algeria, Indonesia, Turkmenistan, Uzbekistan, Egypt, Bolivia and Pakistan).

Australia, having one of the lowest number of the country’s population and the lowest rate of density of population among continents, as well as being a country of “resettlement capitalism,” produces the gas for its own needs and the unsold remains of domestic gas are intended for the needs of one of the world’s geo-economic centers (primarily, the chemical industry) - Japan and China.

Saudi Arabia and the United Arab Emirates are among the main oil exporting countries of the world. The experts call Saudi Arabia as the “oil” superpower, while Saudi Arabia has no gas exports, and uses all gas for its own needs; although it has one of the largest reserves that in the future may serve as a substitute for oil or supplement of its oil exports with gas exports, such as in Qatar.

Turkmenistan and Uzbekistan are Central Asian countries where the natural resources are the main key to power retention and communication with the outside world; this is especially true

for Turkmenistan. Because of the closeness of these countries, certain difficulties arise in the field of statistics on gas industry and industrially proven gas reserves.

Indonesia and Malaysia traditionally belong to the group of newly industrialized countries (although decades later, after the beginning of industrialization, it is difficult to apply the characteristic “newly” to them). The gas availability has become a good tool for the development of local industry in Japan and China in the past decade.

Egypt, Algeria and Bolivia also export oil to the developed countries, usually to their former mother countries, thereby showing the features of neo-colony (Algeria-France, and Libya-Italy also can be included here).

Like Bolivia, Egypt also has the underdeveloped industry and serves the industry mostly by its gas supplies in neighboring countries. Pakistan, the country neighboring with two countries in the BRICS coalition - India and China, as well as an unofficial member of the “nuclear club” (along with India, North Korea and Israel) is quite apart here. Nuclear technologies indicate the significant potential of the state, its technological capabilities, and the gas industry shall play here an important role, because it is the industry forming sector.

Some of the considered cluster analysis factors have different effects on development of the gas and gas transportation industry worldwide, but all of them are positive. The most important factors are the following: The absolute figures for natural gas reserves in the country and the indicators of gas consumption in the country, which naturally affect the development of technologies in the field of extraction and transportation of natural gas. Even if for the moment the country has drained the natural gas reserves, the technological heritage will allow to participate in the natural gas production outside the country - As, for example, in France, Italy, Japan, Germany, USA, China, and Britain. This factor is the most influential (Jaffe, 2014; Montgomery et al., 2005, Chen et al., 2011; Ivanov, 2013). The availability of technologies offer the opportunities to countries that do not have the adequate natural gas reserves for their own use, or have lost them, to earn and participate in the gas production of countries, which have the necessary reserves of natural gas for import. It is also necessary to consider the effect of “shale revolution” (Ivanov, 2013; Shah and Rivera, 2007).

The second most important is the factor that takes into account the amount of natural gas produced that indicates either the development of industry (especially the chemical and fuel industries) or the niche steadily occupied by the country in the international division of labor - The oil and gas niche (raw materials niche).

The natural gas export indicators remain the third influence factor, which is a more significant factor than the natural gas imports (the fourth factor) for the development of global gas industry, upon the analysis of the main twenty "gas" countries of the world. The value of natural gas exports, in contrast to natural gas imports, points to the significant financial contributions and involvement in the global economy.

The fourth factor of the influence on the development of the global gas industry is the natural gas import. The policy of optimization in the consumption of natural gas, and the policy of the accelerating development of alternative sources prevail in the advanced countries that would naturally reduce the consumption of natural gas in the medium term.

The length of the pipeline is the least important factor in the development of the global gas industry. Most likely, this is due to the fact that the pipeline mostly passes not only through the territory of the natural gas exporting country, as well as through the territory of the natural gas importing country, but also through the territory of the transit country. In its turn, the gas transportation system of the transit country may belong to a third country, and the concession, lease conditions (including such an important element as gas storage) are also possible.

Several other features exist in liquefied gas transportation. This method is cost-effective if the exporting country (the classic example is Japan) has no land communication with the importing country (the classic examples are Australia, Indonesia and Brunei). It is necessary to take into account the costs on the gas pipe of a certain length and the final resting place of natural gas with regard to the LPG plant, LPG carriers and liquefied natural gas regasification plants. In this case a significant advantage is that the exporting country is not tied to importing countries by long-term contracts, in other words, the market is more flexible and naturally leads to the market liberalization, lowering of prices and optimization of costs for production, transportation and sale of liquefied gas (Weijermars, 2013; Weijermars et al., 2011; Lu et al., 2013; Baumeister and Peersman, 2013).

Thus, the above results and the patterns of development of the global gas transportation industry in the context of individual world regions and countries allow us to conclude that, given the ever-growing needs of the economy and society in energy resources, the demand for gas will remain at a high level.

It is possible to assume that the projects of inter-regional development of the gas transportation sector announced by some countries will significantly affect the market structure formed in the previous years, also because of the fact that a significant increase in the intensity of energy resources consumption

will be located within Asia as opposed to the current focus on Europe. These and other factors, which on the one hand affect the established relations within the energy exchange, and on the other hand affect the sustainable development of the global economy and society, will stipulate the specific development of the gas transportation sector in medium and long-term run in view of constantly increasing requirements to energy security provision at national and international level. In fact, we can say that the mankind is on the threshold of the birth of a new energy civilization.

4. DISCUSSION

The concept of sustainable development, which has been dominating over recent years in basic and applied sciences (Kilian, 2009; Allegret et al., 2015; Li et al., 2013; Gabriel et al., 2005), is undergoing some transformation, but retains all of its basic characteristics. It is a reminder that traditionally the concept of sustainable development includes three key components: Economic, environmental, and social. Within the economic component the most important aspects of sustainable development provision are the following:

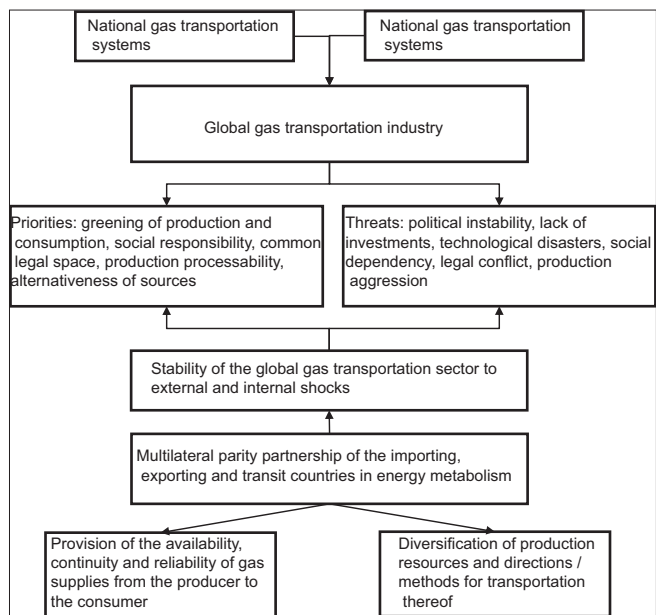
- Innovations and the transition to cognitive economy (knowledge economy)
- Optimization of employment that provides adequate living standard and a certain labor productivity level (required for national economic growth)
- The efficient use of all resources (material, natural, financial, human) in the production in accordance with the understanding of the sustainable development concept.

In the environmental component, in addition to the rational use of natural resources, the most important aspects providing the sustainable development are the following: Saving of clean air and water available to the entire population; commitment to recycling of all waste of economic production and human life and activities. The social component of the traditional concept of sustainable development contemplates the following: The global commitment for respect of the fundamental human rights and freedoms, provision of the required set of social benefits, investments in social intellectual growth.

Over the recent years, a threefold concept of sustainable development has included the energy component (Movagharnjad et al., 2011; Richard et al., 2003; Wang et al., 2013; Huppmann et al., 2011), which is indicative of the formation of a new energy civilization circuit which is still difficult to identify. Most likely, the new energy civilization will be shaped under the influence of three main factors: Environmental, energy and economic. This is due to the fact that a process stimulating the convergence of the energy sector with financial, economic, scientific and technological, social and political and environmental sector happens to exist. Given all the above, it is possible to build an optimal model of the gas transportation industry development (Figure 2).

This model can be used in the design of the gas industry and gas transportation development concept in the world, and at the national level. For this purpose it is necessary to take into account

Figure 2: The optimal model of the global gas transportation industry development



three important aspects: Manufacturability, geographical and climatic characteristics that affect production volumes and gas consumption volumes, the desire of gas producing countries to a high level of economic and social development (Parfenova et al., 2014; Viguier et al., 2006).

In our opinion the most important element is the availability and development of gas production technologies - This is a more important component than the availability of natural gas deposits, because there is no possibility to extract natural gas without them. The country with the natural gas deposits will have to apply to the countries/companies that can provide technologies for natural gas production, which will make the country exporting natural gas dependent on the country/company providing technologies for the extraction/transportation/and production of natural gas/liquefied natural gas. In this case the volumes produced and the income that country has from the sales of natural or liquefied natural gas will be not so important, because the “pumping” of gas revenues in technologically more advanced countries will happen in the midterm.

At first sight the availability of the natural gas has a paramount importance for the development of gas industry and gas transportation sector, respectively. But as the “shale revolution” in the US showed, the discovery of new deposits of natural gas that was previously impossible due to lack of technology development at that time, and the production thereof only recently has become possible or will be possible in the near future due to the development of technologies for the natural gas production, which is also of great importance.

Geographical location and climatic conditions of the country also significantly affect the gas industry development in the country. The location of the country northward and the severity of the climatic conditions define the amount of natural gas that shall be spent for heating residential and commercial premises. The

more continental the climate is, the more natural gas is needed for heating residential and commercial premises. The predominance of mountainous terrain in the relief of the country represents an obstacle for the gasification of the region (as, for example, in Norway).

The factor of high level of state development is determined by the development of chemical industry, heat and power complex, as well as high income of the country population. All these conditions create a solid foundation for the development of the gas industry in the country and a significant prerequisite for the high consumption of natural gas by population and industrial facilities. Also, the high level of the state development, and as a result the considerable incomes of population and industrial corporations, and financial capacities of the banking sector allow prepayments for the natural gas supplies, which has a positive effect on the development of the gas market and reduces the risk of failure of long-term contracts.

Model of the gas transport industry development at a global level shall be based on three key structural elements of energy resources: Production, transit (distribution) of energy resources, and consumption of energy resources. The three structural elements shall be considered in the context of the strategic priorities and the potentially existing threats formed by features of civilization development of individual world regions and countries. The purpose of the gas transportation industry development at the global level is to ensure the rational needs of the economy and society in energy resources (in this case - in gas) and to promote the harmonious evolution of modern human civilization.

Accordingly, the threats to achievement of this objective, taking into account the previously identified positive and negative aspects of development of the global and national gas transportation industries, will be as follows:

- Political instability in power producing countries of Middle East and Africa, and the attempts of political destabilization in other countries with sufficient resource potential in the part of meeting the own and the world’s energy needs.
- Lack of global investments in the renewal and modernization of the world’s gas transportation economy, as well as the lack of investment (international and national) in the search for alternative gas fields.
- Threat of man-made disasters caused by improper production, processing or use of energy resources and the use of obsolete technologies in the production of primary and secondary energy resources (the latter is especially important for certain sectors of the national gas transportation sectors).
- The background to the preservation and improvement of social dependency, due to the availability of the resource rent allocated for enhanced social support of citizens and individual social groups. This problem is most clearly seen in all countries engaged in mining (production) and transportation of gas.
- The legal conflict of national and international laws due to the difference of views on the problems of gas transportation sector improvement, which in turn is a direct consequence of the different government approaches to the development of management of national gas transportation systems.

- Aggressiveness of exploration and production of traditional and new (shale) gas fields, which leads to a rapid depletion of reserves, the resumption of which may last several rather large evolutionary periods.

The above threats to the orderly development of the gas transportation sector at the global level mediate the formation of strategic priorities, which are solved both by optimizing national energy strategies and by improvement of international cooperation in the energy sector. These strategic priorities shall include:

- The need for greening of the production and consumption of energy resources, which mediates the preservation of the global environment, necessary for normal functioning of current and future generations.
- Guarantee of social responsibility of business entities in the exploration, production and transportation of gas with simultaneous rationalization and optimization of the social state support implemented through the receipt of resource rent.
- Formation of a single legal space necessary not only to ensure the adequate level of national and global energy security, but also to ensure the effectiveness of international cooperation in the energy sector.
- Ensure the produce ability of extraction and in broader terms the production/consumption of not only gas but also other traditional energy resources in order to reduce the probability of energy and environmental disasters, respectively.
- Provision of alternativeness of gas production sources, and directions/methods of its transportation.

Identifying the strategic priorities and possible threats makes it possible to formulate the basics of sustainability of the gas transportation industry development model. To ensure the sustainability of the gas transportation industry development model to the internal and external shocks, it is necessary to address the following key objectives:

- Ensuring the availability, continuity and reliability of gas supplies, as well as other energy sources (both for internal and external use).
- Development of multilateral partnership in energy metabolism, aiming to eliminate discrimination of all participants of the metabolism (producing countries, consumer countries and transit countries), while maintaining the dominance of national interests in the field of energy security.
- Diversification of resources origin (both in terms of changing the ratio of use of traditional and alternative sources, and in terms of changes in the territorial exploration and development).

Thus, the present model of the gas transportation industry development, which is adapted to be used at national and international levels, is targeted to support the planned development and harmonization of the evolution of all national (global) areas due to availability of optimal interdependence of structural elements and platforms, ensuring the model stability to external and internal shocks. The interaction of the structural elements and resistance to shocks are ensured by the most complete understanding of the threats and the definition of strategic priorities aimed at leveling (minimization) the

threats to energy security through multilateral partnership of regions of producers (countries), consumers and transitive regions (countries) in the national or global energy exchange.

5. CONCLUSIONS

The study in this article showed that energy, including gas transportation industry, plays a significant role in creating and sustaining the global socio-economic development and the needs of human civilization for energy resources, necessary to maintain a proper standard of living and the growth of economic activity of the countries.

On the basis of the research results, it is possible to conclude that the existing differentiation of the national gas transportation systems and industries is due to the difference of conceptual approaches and strategies for managing the development of mining sectors of the individual countries' economy. Several European countries, as well as North America adopted a liberal approach to the regulation of gas production and transportation sphere that stimulates business activities of oil and gas companies and their competition in the market. In other countries (such as Russia, Turkmenistan, and in some countries of the Persian Gulf), the development of the gas sector is characterized by a high level of monopolization and availability of a paternalistic policy within the production and distribution of energy resources.

The existing differences affect the state of the global gas transportation industry. Of course, in view of geopolitical changes the direction of development of the industry, and its strategic platform will also change. The priority of the global development stability preservation with an appropriate level of energy security provision stipulate the change of the views on the model of development of the gas transportation industry in the medium and long-term perspective. These basic conditions have enabled us to propose a model of the global gas transportation industry development based on identified and forecasted trends.

This article reflects only some theoretical, methodological and practical aspects of the study of forthcoming global gas transportation industry development. At the same time, in further works we plan to investigate such aspects as assessment of the level of efficiency of functioning of the global gas transportation industry, its ability to diversify the traditional and alternative sources of gas production, as well as other matters that are not reflected in this article.

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