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## **DEVELOPMENT DETERMINANTS OF WORLD GAS MARKET**

**Objective.** *The aim of the article is establishment and analysis of factors, features and trends of world gas market development and Ukraine's role in it.*

**Methods.** *The study used: methods of theoretical generalization and comparison, analysis and synthesis.*

**Results.** *On the basis of research there were identified characteristics and trends in the world gas market and Ukraine's role in it.*

**Academic novelty.** *There were identified and classified the demand and supply factors in the world natural gas market.*

**Practical importance.** *The results are intended to improve the system of analysis of market factors in the global natural gas market and the role of Ukraine in it to increase its energy independence.*

**Key words:** *reserves of natural gas, production, consumption, export, import, oil and gas companies, monopolization, shale gas, modernization.*

**Introduction.** Natural gas is one of the most important energy resources in modern economy. The knowledge of the market of this resource sufficiently allows to predict its future price, to form the correct energy policy of the country which is aimed at more efficient use of this resource.

**Analysis of recent research and publications.** Scientific research of such domestic and foreign scholars as G. Burlaka, I. Kopytin, I. Shyhizade, Saprykin, I. Pashkovska, J. Sher, E. Selezneva deal with the investigation of certain aspects of the world gas market. However, overcoming Ukraine's energy dependence needs a solution; factors and determinants of world gas market require additions and systematization.

**Problem statement.** The aim of the article is to establish and analyze the factors, characteristics and trends of the world gas market and the Ukraine's role on it.

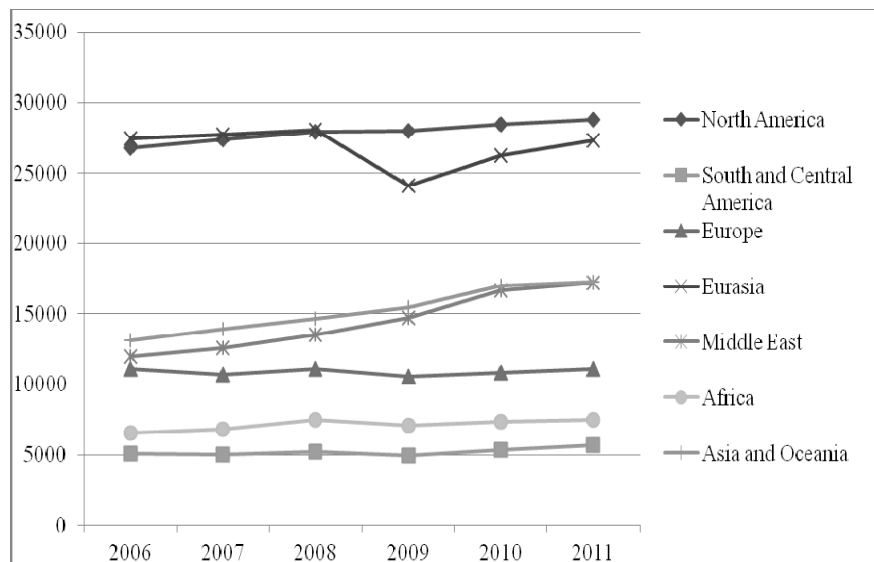
**Basic material and results.** Systematization and analysis of publications and analytic investigation of Ukrainian Razumkov Centre give an opportunity to distinguish the factors, which affect the parameters of the global gas market.

Firstly, the volume of gas proved reserves significantly affects the market conditions. Almost all countries of the world have reserves of natural gas, but the most significant of them are concentrated in certain regions of the Earth. Proved reserves of natural gas have increased by 1.5 times over the past 20 years and are estimated at 144 trillion cbm. Growth is explained by opening new fields (particularly in Russia - in Western and Eastern Siberia, the Barents Sea shelf), and transfer of geological reserves in the proved category.

Large natural gas deposits are located in Russia, the Middle East, the Persian-Arab Gulf, in North America, including the USA, the Far East, China and Africa, namely Algeria and Nigeria.

Europe also has reserves of natural gas, primarily in the North Sea and the countries located on its shores. The largest European natural gas reserves lie in Norway and the Netherlands. Domestic production of natural gas in Germany provides one-fifth of its total needs [1].

Let's analyze the geographic structure of natural gas production by region of the world over the past five years (fig. 1).



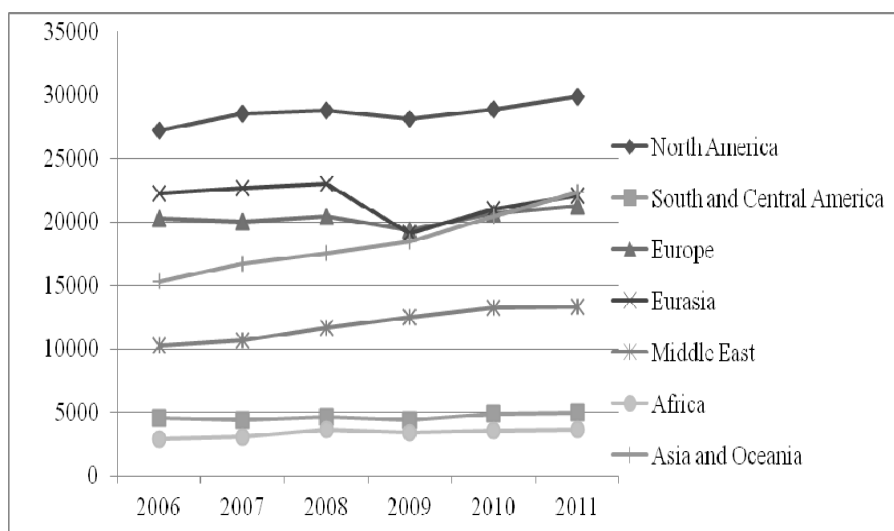
**Figure 1 – Natural Gas Production By Geographical Regions, trillion cbm\***

\* Made with the help of U.S. Energy Information Administration  
[<http://www.eia.gov>]

The figure shows that North America and Eurasia are the world leaders in gas production. In 2008 there was an advance in production of North America and Eurasia. This is due to a sharp increase in the production of shale gas in the USA. Production level of Asia and Oceania and the Middle East has grown steadily and actually become level in 2010, exceeding 15 trillion cbm of gas in each region. Central and South America, Africa has the smallest amount of gas production in the world. It is due to small gas proved reserves and low investment industry in these regions.

The second factor in the global gas market is the volume and dynamics of resource consumption (fig. 2). North America is a leader in gas consumption and the

USA has the greatest part of consumption, because of significant demand of the manufacturing sector and households in fuel resources. In 2009 and 2010 there were almost the same level of consumption of that resource in Asia and Oceania, Europe and Eurasia. In the analyzed period, there was a steady increase in consumption in Asia and Oceania caused by the rapid growth of the economies of this region. In the Middle East growth trend in gas consumption is noticeable, which is associated with the population upsurge in this region and large capital investments in this industry. Consumption levels in Africa, Central and South America have remained almost at the same level for five years.



**Figure 2 – Natural Gas Consumption By Geographical Regions, trillion cbm\***

\* Made with the help of U.S. Energy Information Administration

[<http://www.eia.gov>]

Comparing the data in figure 1 and figure 2 we can conclude that the volume of gas consumption in North America exceeded production in 2010, i.e. the region was a net importer. However Eurasia formed opposite situation: production exceeded consumption, so this region is the world's largest exporter.

Another factor in the global gas market is volume of exports and imports of countries all over the world (table 1).

**Table 1 – Top 10 Net Exporters And Importers Of Natural Gas In The World Market In 2011\***

Net exporters	bcm	Rating	Net importers	bcm
Russian Federation	196	1	Japan	116
Qatar	119	2	Italy	70
Norway	99	3	Germany	68
Canada	63	4	USA	55
Algeria	49	5	Korea	47
Indonesia	46	6	Ukraine	44
Netherlands	33	7	Turkey	43
Turkmenistan	29	8	France	41

Nigeria	26	9	United Kingdom	37
Malaysia	22	10	Spain	34
Others	152		Others	279
Total	834		Total	834

\*Net exports and net imports include pipeline gas and LNG, made with the help of International Energy Agency [<http://www.iea.org>]

The following market features have been determined on the ground of the analysis of volume of world exports and imports of natural gas in the geographical breakdown for the past five years:

- In North America imports is higher than exports.
- In Central and South America exports exceed imports contrary.
- Europe increases gas exports every year.
- Middle East and Africa export more than they import every year.
- Asia and Oceania act as a net importer of gas.

Dynamics and the nature of activity of the largest gas producers in the world are important factors of the global gas market development. According to the American magazine Forbes the biggest oil and gas producing companies in the world in 2012 are Saudi Aramco, Gazprom, National Iranian Oil Co. (table 2).

**Table 2 – The World's 25 Biggest Oil And Gas Companies\***

№	Company	Country	Production, million barrels daily
1	Saudi Aramco	Saudi Arabia	12,5
2	Gazprom	Russian Federation	9,7
3	National Iranian Oil Co.	Iran	6,4
4	ExxonMobil	USA	5,3
5	PetroChina	China	4,4
6	British Petroleum	United Kingdom	4,1
7	Royal Dutch Shell	Netherlands	3,9
8	Pemex	Mexico	3,6
9	Chevron	USA	3,5
10	Kuwait Petroleum Corp.	Kuwait	3,2
11	Abu Dhabi National Oil Co.	United Arab Emirates	2,9
12	Sonatrach	Algeria	2,7
13	Total	France	2,7
14	Petrobras	Brazil	2,6
15	Rosneft	Russian Federation	2,6
16	Iraqi Oil Ministry	Iraq	2,3
17	Qatar Petroleum	Qatar	2,3
18	Lukoil	Russian Federation	2,2
19	Eni	Italy	2,2
20	Statoil	Norway	2,1
21	ConocoPhillips	USA	2,0

22	Petroleos de Venezuela	Venezuela	1,9
23	Sinopec	China	1,6
24	Nigerian National Petroleum	Nigeria	1,4
25	Petronas	Malaysia	1,4

\* Made with the help of Forbes  
[\[http://www.forbes.com/sites/christopherhelman/2012/07/16/the-worlds-25-biggest-oil-companies/2/\]](http://www.forbes.com/sites/christopherhelman/2012/07/16/the-worlds-25-biggest-oil-companies/2/)

The largest oil company in the world is Saudi Aramco, which produces more than 12.5 million barrels daily. In the Forbes rankings there are three Russian companies, one of which hits the top three: Gazprom, which produces over 9.7 million barrels daily. In the list there are three American companies: ExxonMobil (1st place), Chevron (9th place), ConocoPhillips (21st place). The largest group by number of countries is the Middle East represented by six companies which produce together about 29.6 million barrels daily. The smallest group represents African countries. They produce 4.1 million barrels per day.

World trade in commodities, namely gas, is characterized by several features:

- Supply and demand for commodities depend on climatic conditions, natural reserves, political and economic crises, especially in the major commodity areas. Therefore, in general, the international gas trade is characterized by unstable market.

- There is a long-term excess of supply over demand commodities. This leads in some cases to the resource crisis in developing countries, with a narrow specialization raw as exports of raw materials makes them from 50 to 100% of export revenues.

- Partners seek to establish very long relationship based on long-term international contracts in which the exporter is provided by stable sales and the importer – by guaranteed regular supply. In long-term contracts there are about 30% of world commodity exports, while natural gas - 100%, copper, tin, lead and zinc concentrates – 90%, coal – 75%, iron ore – 60%, manganese ore – 30% .

- Purchase and sale of commodities are closely connected with the supply of other types of goods; they make a part of commercial transactions, complex types of foreign economic cooperation (technical, economic, scientific and technical), large-scale transactions on a compensation basis.

- Growth rates of exports of commodities reduce with an absolute increase in the size of trade of this commodity group.

- Growth of trade in fuel and raw materials of mineral origin outpace the growth of trade in food and agricultural raw materials.

- Trade in semi-finished products, based on mineral and herbal products and raw material deep processing / refining and specially prepared material of high quality, increases.

- Requirements for importers to environmental safety of the delivered goods increase.

- The high degree of monopolization of the market. The largest commercial and industrial customers seek to establish monopoly high prices for raw materials

markets. Within corporation supply of raw materials are maintained at reduced transfer prices.

– Government intervention in determining the volume, directions, forms and methods commodity trading and food products increases [2, 3].

There are many reasons to expect increasing demand for natural gas in the long term. Demand for all types of energy other than nuclear and hydro power, is expected to increase over the next 20 years. This overall rise can be attributed to the expected overall growth of the U.S. economy and population, and the increasing use of personal technologies such as computers, smart phones and music devices [4].

Conditions of global gas market depend on supply and demand, which, in turn, are affected by the long-term and short-term factors (table 3).

**Table 3 – Factors Affecting The Demand And Supply In The World Gas Market\***

	Short-term factors	Long-term factors
Demand	<ul style="list-style-type: none"> <li>– Weather</li> <li>– Fuel switching</li> <li>– Economy</li> <li>– Opportunity to choose another forms of fuel</li> </ul>	<ul style="list-style-type: none"> <li>– Needs of house heating</li> <li>– Electricity restructuring</li> <li>– Demographic factors</li> <li>– Technological advancements</li> <li>– Environment emissions regulations</li> <li>– Flexibility and capital investments</li> </ul>
Supply	<ul style="list-style-type: none"> <li>– High-qualified staff</li> <li>– Specific equipment</li> <li>– Permitting and well development</li> <li>– Weather and delivery disruptions</li> </ul>	<ul style="list-style-type: none"> <li>– Onshore and offshore access</li> <li>– Pipeline infrastructure</li> <li>– Financial environment</li> </ul>

\* Made with the help of NaturalGas.org

In order to represent all suppliers that produce and sell natural gas, as well as to ensure the safe and efficient transportation and delivery of natural gas, increasing for natural gas to consumers The Natural Gas Supply Association was established in 1965 [5].

Analyzing Ukraine's place in the global gas market, it should be noted that it depends, like most European countries, on the supply of Russian natural gas. Despite the significant potential of shale gas, Ukraine hasn't its own technology and doesn't carry out research in this area [6].

Natural gas market in Ukraine, as most related with it markets for goods and services remains monopolized by large state-owned energy companies. Changes in the market environment have occurred only in the market segments where limited existing facilities and infrastructure with constant lack of investment resources led to low entry barriers for new entrants. In general, the natural monopoly nature of the assets of domestic gas facilities caused such institutional structure of the market, which cannot be modified without the state, and permanent efforts to reform the gas

market is often reduced to a redistribution of power regulators and control of financial flows. Any regular scheme does not create the conditions for the emergence of real competition relations in the activities of production, transportation or supply of gas. Decisions on incorporation of individual market actors, replacement or market entry of new participants by reducing the share of existing changed only the formal structure of the market, while preserving its institutional construction [7].

Today, facilities of gas producing companies cover up to 25% of demand. The main supplier of domestic gas to the domestic market is Ukrgasvydobuvannya Subsidiary Company (SC), share of which together with other departments of NJSC Naftogaz of Ukraine is 93% of the total natural gas production. The share of independent companies gradually decreases as their development is limited by small depleted deposits, and available funds are not enough to win tenders and obtain licenses for new fields. In addition, existing laws on product distribution do not encourage owners to new investments, limiting their activities by subcontracting functions of public monopolies. Structure of sources of natural gas supplies to Ukraine and its domestic distribution has not changed for the last time. The largest operator in the domestic market is SC Gas of Ukraine [7].

The process of pricing in the natural gas market of Ukraine continues to remain under strict government control. Tariffs for transportation and supply chain transmission and distribution pipelines, retail gas prices for household consumption and the prices for other consumers are under regulation. This system, under all disadvantages of "manual control", allowed to keep control of the internal market and to ensure a gradual rise in prices, as opposed to countries of Central Europe. In the sectors of mining and retail market liberalization would be premature in terms of infrastructure unavailability of gas facilities to such radical changes [7].

Production of natural gas in Ukraine has been decreased over a long period of time; in 1997-2000 production was at level 18 bcm per year, and for the last seven years - at the level of 20-21 bcm per year. In 2010, gas production was 20.5 bcm, including the company Naftogaz of Ukraine - 18.3 bcm. This was achieved through the introduction of measures of improving the efficiency of production and resource bases, the introduction of new fields and deposits [7].

In 2012 Ukraine is planning to sign contracts with companies Chevron and Shell for production of unconventional gas on Olesky and Yuzovsky field respectively. Italian company Eni has already signed an agreement to develop shale gas in Lviv coal basin. According to the calculations of Shell Ukraine could abandon gas imports by 2030.

**Summary.** Ukraine has significant reserves for development of oil and gas industry, but in the near future it will depend on Russian gas supplies. Promising direction is the development of shale gas and transportation of Russian shale gas, which recently has been extracted there. The important factors in the development of the gas market of Ukraine are its demonopolization, modernization of infrastructure, mobilization of foreign investment.

**Prospects for further investigation in this area** are to determine the role of Ukraine in the global gas market, study trends in the market for more efficient gas policy in Ukraine and attaining energy independence.

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