STRATEGY OF UKRAINIAN GAS INDUSTRY DEVELOPMENT: EUROPEAN CONTEXT

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ABSTRACT

Ukraine is an important consumer of natural gas. About 75 - 76 billion cubic m (bcm) of gas is used in the country annually. In spite of essential volume of domestic gas production (20 bcm per annum), gas is imported from Russia and Turkmenistan to meet the demand.

Due to its geographical location and developed infrastructure Ukraine is the largest country in the world by the volumes of gas transit. Annually through the Ukrainian gas pipelines the transit gas deliveries amount 130 -140 bcm, including supply of 110-120 bcm to the countries of Central and Western Europe.

Taking into account the course to the European integration, the programs of the Ukrainian natural gas industry development should be taken into account when the future European energy policy is formed.

Energy strategy of Ukraine up to 2030 provides for achieving the two basic goals:
- sustainable satisfaction of domestic demand for gas;
- stable operation and development of gas transmission system for guaranteeing reliability and security of gas transit to Europe.

Due to improvement of the fuel-energy balance structure and the energy-saving measures the share of natural gas in primary energy consumption will decrease by the end of the period by 10 - 12% against 41 % at present. Gas consumption will decrease and in 2010 it will comprise 71,7 bcm, in 2020 - 53,7 and in 2030 - 49,5 bcm.

It is planned to increase the domestic production, bringing it to 28,5 bcm annually at the end of the period.

Reliability and security of gas transit to Europe is strategically important task. This issue is accomplished by reconstruction and technical renovation of gas pipelines and compressor stations, implementation of European standards in their operation, using of energy-saving technologies and equipment, utilization of secondary energy resources.

Although there is a developed network of natural gas vehicle filling stations (about 160 stations of different productivity with the volume of gas sales at 0,5 bcm) in Ukraine, further development of the networks and optimization of the stations arrangement are provided for. This will allow the NGVs to drive not only along the basic highways, but also along the other roads of the country, to substitute at the end of the period up to 14,4% of motor fuels against 3,4% in 2005 by the compressed natural gas (CNG).

Important role in the strategy is given to diversification of sources and ways of gas deliveries. Kazakhstan and Azerbaijan can become new sources of gas imports. For transportation of gas from Kazakhstan and also for expanding deliveries from other Central Asia countries, it is expedient to build gas pipeline Aleksandrov Gay - Novopskov - Uzhgorod.

For import of gas from Azerbaijan and other Caspian countries it is planned to use the planned Nabucco gas pipeline. Taking into account large export potential of Iran, building of gas pipeline Iran - Transcaucasia - Black Sea - Ukraine is contemplated, as well as others.

Forecasted diversification of sources and routes of gas deliveries to Ukraine is of interest also for other European countries, since gas from new sources can be shipped to them through the gas transmission system of Ukraine.
Ukraine is a major consumer of natural gas. The country annually consumes about 75 billion cubic m (bcm) of gas, with consumption pattern being similar to that in the EU countries. Despite significant volumes of gas produced locally (totaled at 20 bcm a year), Ukraine imports gas from Russia and Turkmenistan to satisfy its needs, which makes it the third largest gas importer in Europe.

By virtue of its geographic location and developed infrastructure Ukraine is the largest gas transitor in the world. Ukrainian pipelines transport 130 to 140 bcm of gas per year, including 110 to 120 bcm to the Central and Western European countries, which account for about one-fourth of their total gas consumption. Ukraine is now and will remain in the future a major gas corridor for gas transmission to Europe.

Given its course towards European integration, the country will in the foreseeable future become a member of the European Union and will play an important role on the European gas market. Ukrainian gas sector development programs are, therefore, closely linked to similar programs of other European countries and should be taken into account when formulating long-term energy policies of the European Union.

Ukraine’s Gas Sector Development Strategy until 2030 provides for the following major objectives to be achieved:

- to ensure stable and economically sound satisfaction of internal demand for natural gas;
- to reduce dependence on external gas supplies;
- to effectively use transit potential of Ukraine, taking into account its being located between the major gas reserves and largest consumers in Europe;
- to integrate the Ukrainian gas transmission system into the European network.

On the background of low gas prices and energy inefficient economy, gas consumption in Ukraine had been increasing for years, totaling 118.8 bcm in 1990. Ukraine was third largest gas consumer in the world after the US and the Russian Federation. With Ukrainian independence restored, gas consumption had been declining with every year until it was set at the level of 75 to 76 bcm/year in the last decade.

Currently, natural gas accounts for 41% in primary energy consumption, which is too much for a country, which imports gas.

Therefore, it is planned to reduce the gas component in the fuel and energy balance of the country by 10% to 12% by improving its fuel balance through increased use of coal and electric power produced by nuclear power plants. However, energy saving should be the major factor in reducing energy consumption.
Taking into account the above factors, the optimal development scenario envisages that gas consumption will be reducing and will total 71.7 bcm in 2010; 53.7 bcm in 2020; and 49.5 bcm in 2030. In 2005 gas consumption was 76.5 bcm (Figure 1).

Natural gas demand will be satisfied both with indigenous production and import.

![Gas consumption and production](image)

**Fig.1. Natural gas consumption and production**

### 4. GAS PRODUCTION

The existing potential gas resources make it possible not only to ensure stable production over a long period, but also to increase output. This will necessitate extending the scope of geophysical studies and exploratory drilling that could provide additional gas reserves 1.5-2 times exceeding output.

With 400,000 to 420,000 m/year of prospect drilling, natural gas addition is predicted at the level of more than 1 trillion cubic meters. In such a case gas production could be 23.2 bcm in 2010, 26.1 bcm in 2020, and 28.5 bcm in 2030. In 2005, gas production was 20.5 bcm.

In order for such production volumes be maintained, close attention will be paid to improving: efficiency of the reserves exploitation, hydrocarbon recovery factor, and gas production stimulation techniques. Gas processing volumes will be expanded to recover propane-butane fraction, and other valuable components.

As may be noticed from comparison between natural gas demand and predicted production from local gas fields, the local production/gas demand ratio will be increasing. In 2020 it will be 48.6%, and in 2030, 57.6%, compared to 26.8% in 2005.

### 5. GAS SUPPLY RELIABILITY AND SECURITY

The design input capacity of Ukraine’s gas transmission system is 290 bcm, and its output capacity is 175 bcm, including 140 bcm capacity oriented towards Central and Western European countries. The total length of gas pipelines is 37,000 km, and the aggregate power of compressor stations totals 5,400 MW. The gas transmission system provides gas supply to local customers, transit of gas to southern regions of the Russian Federation and about 80% of transit gas deliveries from Russia to other European countries (Figure 2).
Ensuring reliable and smooth gas supply to local customers and transit gas deliveries to Europe is a strategically important goal. It will be attained by implementing a program for gas pipelines and compressor stations rehabilitation and technical re-equipment, introducing European operating standards, application of energy-saving technologies, secondary energy resources recycling, and abating of environmental impact.

This can be exemplified by the projects which have been implemented and concerned replacing gas turbine engines of compressor units with new, enhanced-efficiency turbines, using 43% - efficiency combine cycle gas turbine units at compressor stations, as well as turbine expanders generating power by utilizing pressure drop at gas distribution stations. All this makes it possible to reduce fuel gas consumption by compressor units and to enhance energy efficiency of the system.

While new routes are being opted for construction of new gas pipelines, increased gas consumption in European countries boosted gas transit via Ukraine by 20% over the last 15 years, rather than made it experience any decrease. In fact, it reached 121.5 bcm in 2005, compared to about 100 bcm in 1991 and 110 bcm in 1995-2000. Optimizing the operation of Ukrainian gas transmission system, enhancing its reliability, constructing new gas pipelines will not only stabilize the gas transit levels achieved, but in the long run will also increase them somewhat.

Although Ukraine already has a developed network of NGV-refueling compressor stations (about 160 stations of different capacity with total sales of 0.5 bcm), there are plans to further develop the network (to 500 in 2020 and more than 900 stations in 2030), and to optimize the stations location. This will make possible to use compressed natural gas vehicles not only on highways, but also other roads in Ukraine, to substitute with compressed natural gas more than 10% of motor fuels in the end of the period, compared to 3.4% in 2005, and will also have a positive environmental effect.

Currently, Ukraine has actually only two gas import sources, Russia and Turkmenistan, and only one delivery route – via Russian territory. The Strategy assigns special importance to diversification of gas sources and supply routes. Kazakhstan and Azerbaijan are viewed as possible new gas import sources.

To transmit gas from Kazakhstan and enhance deliveries from other Central Asian countries it would be expedient to build a pipeline from Aleksandrov Gai to Uzhgorod (via Novopskov). The first stage of this pipeline is planned to be built in the near future. Taking into account increased gas supplies through Belarus-headed pipelines, this gas pipeline section will help increase gas supply in the direction of Slovakia by 16 to 19 bcm.

To import gas from Azerbaijan and other Caspian region countries, it is planned to use Nabucco gas pipeline, which is being designed under the auspices of the European Union. This may be achieved by constructing a branch from this pipeline or using the operating gas pipelines based on the swap principle.
Given the significant export potential of Iran it is planned to build a pipeline from Iran to Ukraine (via Transcaucasia and the Black Sea). This gas pipeline can be used to supply gas to other European countries.

Establishing an LNG market in the Black Sea basin would also be an interesting project. This would require building a terminal at one of the Ukrainian ports, where LNG would be received and regasified. In case of problems arising with regard to tankers passage through the Bosporus, an LNG plant could be built in a Georgian or Turkish port, where gas would be delivered by pipelines from Azerbaijan, Turkmenistan, and Iran. Such a system could provide with LNG not only Ukraine, but also Bulgaria, Romania, Moldova and other countries, enhancing thus gas supply safety and security of the whole region.

There are also some more interesting gas supply diversification options. Given high prices for gas, transportation of compressed natural gas (CNG) can be rendered economically feasible. It could be transported by barges, involving no problems when passing the Bosporus. In addition, such mobile kind of transport would make it possible to supply gas to cities and countries far away from maritime ports. This, of course, requires a proper infrastructure be established.

Given growing gas consumption by EU countries and longer distances to major gas sources, underground gas storage facilities play an increasingly important role in ensuring reliable gas supplies. Ukrainian gas storage facilities, which are located in the Western region, have significant spare capacities and at the moment are actually underused by the European Union.

These facilities are connected with main gas pipelines of all neighboring countries, and in the future may play a more important role in both covering the seasonal differences in gas consumption and shaving peak demand not only in Ukraine, but also in other European countries. Using them as the basis for creating European-level storage facilities could become an important factor ensuring safe and stable operation of the European gas market.

6. CONCLUSION

Implementing the key provisions of the Strategy will enhance Ukraine's supply with locally produced gas from 26.8% to 57.6%, strengthen safety and security of gas supply not only for Ukraine, but also for customers in the EU countries.

LIST OF FIGURES

Fig. 1 Natural Gas Consumption and Production

Fig. 2 Gas Transmission System of Ukraine