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ENERGY EFFICIENCY MANAGEMENT IN THE RUSSIAN GAS INDUSTRY

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ABSTRACT

Despite the considerable progress made in improving energy efficiency since the Soviet Union breakdown, Russia still belongs to the group of countries with very high primary energy intensity of GDP. This generates great risks, such as the decrease of country's energy security and competitiveness of the domestic energy-intensive industries, a high level of environmental pollution. Rising energy efficiency, especially in the oil and gas production, transportation and refining, as well as power industry is one of the priorities. The aim of this study is to analyze the effectiveness of energy saving measures conducted at one of the three biggest natural gas producers of the Russian gas industry in terms of produced gas volumes, Gazprom Dobycha Nadym, in 2012-2015. The company carries out natural gas, gas condensate and oil production and treatment, performs exploration work and renders customer services at the investment and its own construction sites. The method applied is a descriptive-analytical method based on the company's reports. Analyzing the financial and economic activity it was revealed that the company had sufficient resources to implement energy saving measures. The complex program of energy saving measures grouped according to different characteristics is proposed. The implementation of commercial gas preparation technologies for the reduction of material and energy costs while respecting regulatory requirements for commodity's quality is revealed as the priority area. The practical value of the paper is determined by the possibility to use the proposed decisions by gas companies worldwide.

Keywords: gas industry, energy intensity, energy efficiency, Russia

INTRODUCTION

Most countries pay special attention to the formation of an effective system, which should stimulate and support energy efficiency. This system should ensure reduction of energy intensity of gross domestic product (GDP) and stimulate the attraction of extra investment in the implementation of measures (projects) in the field of energy efficiency. As noted by IEA [1] the Russian economy has much to lose if the view prevails that the wealth of its fossil resources and the predominant interest to produce and supply more fossil fuel resources to the market make it affordable to keep energy efficiency deployment at a lower priority. "In particular for gas... higher efficiency would lead to higher competitiveness and potentially, higher exports and thus higher output; it could help to free up resources for opening new domestic markets, such as gas

for transportation, as well as exports and reduce investment needs; it would foster a healthy domestic competition which would reduce costs” [1].

According to the President Decree No.889 from June 04, 2008 titled “Concerning some measures for improving the energy and ecological efficiency of the Russian economy” Russia is planning a significant reduction of the GDP energy intensity by 2020. Moreover the Energy Strategy aimed at maximizing the use of natural energy resources has been developed. It will also increase economic growth and quality of life standards. Gas industry requires a significant consumption of fuel and energy resources, primarily natural gas for its own technical needs.

THE RUSSIAN GAS INDUSTRY

Russia remains one of the world’s leading energy supplier contributing over 16.7 and 12.7 percent of global production in natural gas and oil respectively. In 2013, domestic production of natural gas reached 544.2 million tonnes of oil equivalent (Mtoe) and dropped to 520.9 Mtoe in 2014. The development of shale oil and gas in the USA has resulted in a substantial production growth and has made the USA the leader in the market.

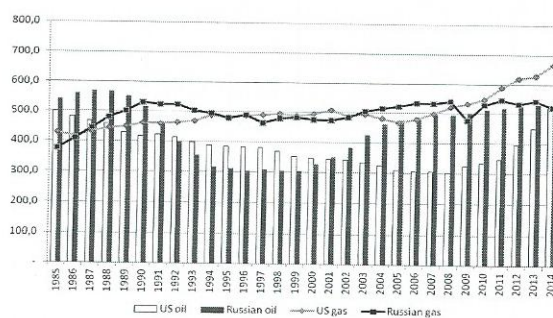


Fig.1. Oil and natural gas production in Russia and the USA, Mtoe.

Despite Russian oil production remains stable at about 11Mb per day through 2035 the country’s gas production grows by 30% by 2035, supported by growing demand in international markets [2]. Paltsev [3] also found that over the next decades natural gas can still play a substantial role in Russian exports. As noted in [4] natural gas is gaining increased attention, as it is a considerably cleaner source of hydrocarbon energy and the second largest source of energy for power generation especially after the Fukushima Nuclear Disaster in Japan.

Natural gas production in Russia gets special attention in comparison to other energy sources, because the sector plays an important role in the domestic economy. As noted by IEA [5] the Russian gas sector has undergone major transformations in the upstream, midstream and downstream segments over the past years that have enhanced the long-term reliability of gas supplies in Russia and to European countries and beyond.

Following Orlov [6], there are three main sources of gas supply in Russia: (1) Gazprom production, (2) non-Gazprom or “independent” production and (3) imports from Central Asia. The sector is mainly represented by a single state run company, Gazprom. The

company dominates not only in the domestic market but also has a strong position in Europe and a growing one in Asia.

CASE STUDY: GAZPROM

Open joint stock company Gazprom is a state-controlled company with a government ownership share of slightly above 50%. Gazprom operates as a vertically integrated company that deals with production, distribution, storage and transmission of natural gas, gas condensate, oil and oil products. The main part in the volume of natural gas consumption for their own technical needs and gross emissions from stationary sources (about 80%) are in Gazprom subsidiaries. Therefore, energy efficiency is a priority direction for long-term development of Gazprom and its gas transmission companies.

Gazprom holds the world's largest natural gas reserves. The company's share in the global and Russian gas reserves amounts to 17 and 72 per cent respectively. Gazprom accounts for 12 and 69 per cent of the global and national gas output correspondingly. At present, the company is actively implementing large-scale gas development projects in the Yamal Peninsula, the Arctic shelf, Eastern Siberia and the Russian Far East, as well as a number of hydrocarbon exploration and production projects abroad [7].

In 2014 Gazprom produced 443.9 billion cubic meters (bcm) of natural and associated gas, 14.5 million tons of condensate and 35.3 million tons of oil. The production in 2014 reached the lowest level in the past ten years at a time when Gazprom launched its super-giant Bovanenkovo field and increased plateau production from the Zapolyarnoye field. Indeed at the same time, Gazprom reduced imports of Central Asian gas, purchases of gas from independent companies and its legacy fields continued to post a progressive decline in output.

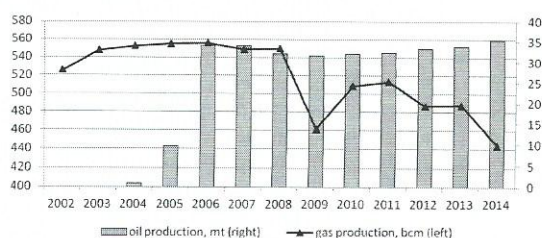


Fig.2. Oil and natural gas production by Gazprom

As noted by [5] “whereas Gazprom remains by far Russia’s leading producer, its share in total production has been steadily decreasing over recent years. Three companies represent the bulk of Russia’s production: Gazprom (73.1%), followed by Novatek (12.6%) and Rosneft (5%)”. Indeed, the share of non-Gazprom production from so-called independent producers has doubled between 2000 and 2010 and have continued growing since then, mainly driven by Novatek [8]. As a consequence, the share of Gazprom in total production has declined from about 83.3% in 2007 to 73% in 2013. Reasons include lower domestic demand and lower exports to Ukraine, its commercial strategy, and higher production from independents benefiting from a more favourable tax and regulatory environment, such as the right to sell gas at non-regulated prices.

In line with [5] "Gazprom's production capacity in 2014 is 600 bcm per year. Reasons for Gazprom producing below its potential in more detail in the subsequent sections and - include: no increase in overall export volumes, no increase in domestic gas consumption, steady imports from Central Asia and the Caspian since 2010, and growing competition from independents on the domestic market". Gazprom brings new fields into production pursuing the goal of cost effectiveness achieved through expansion of gas production facilities concurrently with transmission, comprehensive treatment and storage capacities. Not only reduction of energy production depends on energy saving development, but also competitiveness of domestic producers. Under these circumstances, there is a need to offset energy policy priorities towards increasing energy efficiency at all stages of the production process and providing incentives for investment in energy efficiency.

Total technically feasible energy saving potential in Gazprom for the period up to 2020 is estimated at 28.2 Mtoe (including 22.5 bcm of natural gas). Energy saving and energy efficiency in the gas production, transportation, processing and underground gas storage are determined by the federal legislation and include the following: (1) a reduction of specific consumption of fuel and energy resources for its own needs not less than 1.2 per cent yearly, (2) a reduction of specific consumption of natural gas on its own technological needs and loss in the main activities not less than 11.4 per cent, (3) reduction of greenhouse gas emissions not less than 48.6 million tons of CO₂ equivalent.

The development and introduction of commercial gas treatment technologies are revealed to be the main priority of energy saving in gas production. Rapidly changing conditions of market economy requires the development and implementation of new and innovative methods of cost management aimed at efficient use of resources, increasing competitiveness and addressing the strategic objectives of the enterprise. Cost level determines the strategic positioning of the enterprise in the market; it is the most important factor in shaping the profit margin and, consequently, the possibility of economic growth [9]. Energy savings is accelerating the growth rate of production. It allows reducing the prices for industrial products, to achieve high-end economic results and solve a number of social and environmental problems.

The aim of this study is to analyze the effectiveness of energy saving measures conducted at one of the three biggest natural gas producers of the Russian gas industry in terms of produced gas volumes, Gazprom Dobycha Nadym, in 2012-2015. Gazprom Dobycha Nadym is one of the leading gas-producing companies in Gazprom Group. The company is among the three largest gas producing companies in Russia in terms of hydrocarbon production. The company plays an important role not only in the economy of the Tyumen region but the country as a whole. Environmental protection is one of the top priority activities of Gazprom Dobycha Nadym. That is very important taking into account the region of gas production – the Russian Arctic being very sensitive to environmental risks [10]. Effective use of energy resources is presented by authors in the comparative analysis of planned and actual performance of energy saving in gas production (Table. 1).

It can be concluded that the company managed to slightly outperform the planned economy indicators 2012-2015. Natural gas savings amounted to 655.8 mln.m³, which is 4.5% higher than the planned figure. Performance of electrical energy and thermal

energy significantly exceeded the planned values, indicating effectiveness in conducting energy efficiency measures to improve the efficiency of gas production.

Table 1. Energy saving indicators at Gazprom Dobycha Nadym, 2012-2015

Year	Implementation	Natural gas, mln.m ³	Electrical energy, mln.KW-h	Thermal energy, th.Gcal
2012	Plan	241.1	2.17	2.83
	Fact	260.6	2.98	3.23
2013	Plan	182.3	1.88	2.97
	Fact	191.9	2.13	5.35
2014	Plan	188.9	2.07	0.68
	Fact	194.3	5.08	2.63
2015	Plan	15.4	9.18	1.94
	Fact	9.0	9.23	0.33
Total	Plan	627.7	15.3	8.42
	Fact	655.8	19.42	11.54

We use different ways of grouping by various criteria to determine the effect of various energy-saving measures for the total savings: (1) depending on the type of the resource (providing saving of natural gas, electrical energy or thermal energy), (2) depending on the nature of the event (technological, organizational, economic etc.), (3) depending on implementation costs (cost-free, relatively cost-free, low-cost, expensive), (4) depending on the energy conversion phase (providing primary energy savings, converted energy, final energy), (6) depending on the membership of a particular technological systems and (7) depending on the expected savings of energy resources. Assessment of the planned activities gas producing company in the field of energy saving 2012-2015, grouped according to the type of the resource is given in Table. 2.

Table 2. Economic effect of energy saving measures, 2012-2015

Types of measures	Savings, mln.rub.									
	2012		2013		2014		2015		Total	
	Plan	Fact	Plan	Fact	Plan	Fact	Plan	Fact	Plan	Fact
natural gas	88.80	94.20	89.00	84.90	88.28	107.00	11.75	29.22	277.83	315.32
electrical energy	2.96	3.14	2.22	2.40	3.16	3.27	4.83	5.75	13.17	14.56
thermal energy	3.51	2.66	3.38	6.25	0.74	1.15	3.77	2.08	11.40	12.14
Total	95.27	100.00	94.60	93.54	92.18	111.42	20.35	37.06	302.40	342.02

We can conclude that the actual energy savings in money terms exceeded the plan by 13 per cent. Fulfillment was reached in all types of resources. Gas savings amounted to 315.3 mln. rub., and over-fulfillment of the plan is 13.5 percent. Over-fulfillment in gas production was observed in all periods except for 2013. This fact is explained by the sharp rise in electricity tariffs from third-party providers, as well as an increase in the cost of its own production. Natural gas is one of the significant sources in consumption of energy resources in gas extraction. That is why, for the majority of gas enterprises its saving is a promising direction, as it has significant reserves. We can observe from the Table 2 that among the energy resources in energy-saving activities, natural gas is the most important.

CONCLUSION

The process of enhancing energy efficiency goes through several stages of development – from the struggle with a direct waste of fuel and power (failure to comply with operating requirements) to capital-intensive implementation of measures to modernize and improve the existing technologies of production and consumption of energy [11-12]. Each country is at different stage of this process, and offers a variety of opportunities and conditions for its implementation. Regular and successful energy-saving measures are a prerequisite for the effective operation of any gas producing companies in Russia. All gas companies want to have the energy saving measures. It can be proved by the numerous programs on energy saving and energy efficiency developed by both companies, and the national research institutes.

Working in oil and gas industry is accompanied by a significant consumption of fuel and energy resources, primarily natural gas, both on its own technological needs, and for production as a whole. The use of fuel and energy resources and heat is indispensable in modern industry. Due to the necessity of intensive use of energy resources both on the individual oil and gas companies, as well as in the whole country, with the environmental situation is deteriorating every year. Therefore, it is possible to avoid the influence of it on the environment. In addition, enterprises need to reduce the negative impact of industrial activity on the environment and reduce production costs. Implementation of energy saving measures will increase energy efficiency and reduce the negative impact on the environment. Currently, the role of energy efficiency and environment is becoming more urgent. With the active use of energy-saving technologies companies can come to a significant reduction in the cost of electricity and heat, which in turn will reduce the negative impact on the environment.

In the reporting period, Gazprom is working hard to create regular permanent energy saving system – the system of energy management, the implementation of which will go from the individual technical measures for system solutions in the field of technology and in the field of management. An important technical energy saving measures is the introduction of technologies for renewable energy. Within the framework of the implementation of energy saving measures the overall economic effect has amounted to 2.0 bln. rub.

Studies have shown that the use of energy-saving measures helped to achieve concrete results on significant saving in gas enterprise by Gazprom Dobycha Nadym. Gas savings amounted to 315.3 mln. rub. and over-fulfillment of the plan is 13.5 percent. Natural gas is one of the significant sources in consumption of energy resources in gas extraction. That is why, for the majority of gas enterprises its saving is a promising direction, as it has significant reserves. Analyzing the financial and economic activity it was revealed that the company had sufficient resources to implement energy saving measures. The complex program of energy saving measures grouped according to different characteristics is proposed.

Given the need for a standardized approach to data collection we should strengthen international cooperation and to build capacity for data collection. It is also necessary to improve access to information. International Polar Year 2007/08 highlighted the most pressing scientific issues; it became clear which direction we need to develop in the first place now, in times of climate change, the most urgent need to continue monitoring the state of the Arctic climate system for the continuous assessment of the stability and extent of emerging changes. In conclusion, we note that the solution of such complex problems of environmental safety can only be provided for close international

cooperation. Environmental problems are inseparable from the problems of the control of the current state of the environment and climate change.

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