
The Sakhalin Projects and the Gas Supply Program for the Far Eastern Region

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Discussions focusing on natural gas projects in Eastern Russia usually take place in the context of the prospects for exporting this fuel to neighboring markets. In reality, both the Russian government and regional administrations are prioritizing projects aimed at supplying natural gas to domestic users via pipelines. In July 1999, for example, the government approved a special gasification program for the three provinces in the Far Eastern region: Sakhalinskaya Oblast, Khabarovskiy Krai and Primorskiy Krai (see annex). This paper reviews the current situation and the prospects for natural gas supply from the fields offshore from Sakhalin Island, focusing on four broad subject areas: (1) the current energy supply situation in the region; (2) natural gas sources and the long-term availability thereof; (3) the parameters of the gasification program for the area; and (4) the prospects for the implementation of the program.

The paper demonstrates the gigantic lag between the projected volumes of natural gas production and the miniscule availability of this fuel today. This illustrates both the scale of underdevelopment in the most important provinces of the Far Eastern region and the opportunities associated with the oil and gas projects underway offshore from Sakhalin. On the other hand, it also shows that the availability of natural gas to domestic users depends on highly capital-intensive, export-oriented projects and advanced technologies that currently do not exist in Russia.

In Russia, the energy sector is the key component of the economy. In the Far Eastern region, its role is even greater and will grow further in the future. The share of the energy sector in the industrial production of Sakhalin Oblast and Khabarovskiy and Primorskiy kraia is between 30% and 40%. However, the regional energy supply mix and existing flows of fuels are far from being either optimal or cost effective. There are vast differences between the provinces not only in terms of resource endowment, but also in the distribution of processing facilities and power generating capacity. Along with the cold climate, these factors contribute to an energy intensity in industrial sectors that is higher than the national average, as well as declining competitiveness among local enterprises, job losses and bleak development prospects in general.

On the other hand, Sakhalinskaya Oblast and Khabarovskiy and Primorskiy kraia have many similar problems in their energy and fuel supply difficulties; these include: (1) the very limited, highly localized availability of natural gas; (2) the high cost of locally produced coal and insufficient production thereof; (3) the high cost of coal transported from other regions; (4) shortages and interruptions in the supply of electricity and heat; and (5) the slow pace of the introduction of more efficient generating capacity. The alleviation of these problems depends on the development of hydrocarbons offshore from Sakhalin and the availability of natural gas delivered via pipelines to local users.

In Sakhalinskaya Oblast, natural gas accounts for approximately 22% of the primary energy supply. Annual consumption of gas is close to 650 million cubic meters. However, only three of the eighteen administrative districts of Sakhalinskaya Oblast have access to natural gas: Okha, Nogliki and Aniva. In these three northern areas, gas is supplied by Rosneft-Sakhalinmorneftegas and Anivagas (Aniva district).

In Khabarovskiy Krai, the share of natural gas in the primary energy supply is only 11%. Only about between 0.8 billion cubic meters (Bcm) and 1.0 Bcm of natural gas is available annually. Gas comes from the inland fields in the northern part of Sakhalin; it is delivered primarily to Komsomolsk-on-Amur via a pipeline commissioned in 1987. Natural gas is not available in Primorskiy Krai.

The irony is that there are immense natural gas resources in the fields offshore from Sakhalin, far exceeding even long-term domestic needs. Under the current economic conditions, the limited domestic market cannot justify the huge investment needed for production. In this regard, the regional gasification program almost exclusively depends on foreign investors and the implementation of such projects as Sakhalin I and Sakhalin II. It is well known that the total of volume of investment required for these two offshore ventures is estimated at \$25 billion. Long-term export contracts are the precondition for the financial viability of these and other projects.

These two projects are based upon an investment framework known as the Production Sharing Agreement

(PSA). Under to the PSA, after royalties are deducted, the oil and gas recovered by the investor are to be split into two parts, consisting of the compensating part that covers the investor's costs and the profitable production part. The latter segment is divided between the investor and the state. Therefore, the Russian share of the hydrocarbons produced is formed from both the royalty payments and the share derived from profitable production. This share of gas can be delivered to the domestic market. If the volume is insufficient, a portion of the investor's gas share can be purchased. However, once again, only long-term export-oriented gas supply contracts could ensure the viability of these projects and the subsequent gas supply to the domestic market.

The Sakhalin I project includes three large oil-gas-condensate (OGC) fields: Chayvo, Odoptu and Arkutun-Dagi. The recoverable reserves of hydrocarbons in this project are estimated at 305 million tons (Mt) of oil and 485 Bcm of natural gas. The peak production levels for oil and gas are 12.4 Mt and 20.4 Bcm respectively. At present, work is focused on the development of the Chayvo field and the construction of transportation infrastructure. Oil production will start in the second half of 2005. The associated gas produced in the process (about 3 Bcm) will be delivered to Khabarovskiy Krai via a pipeline.

The Sakhalin II project includes the Piltun-Astokhscoe and the Lunscoe OGC fields. The total recoverable reserves of hydrocarbons are estimated at 185 Mt of oil and 800 Bcm of gas. The first phase of the project was focused on the development of the Piltun-Astokhscoe field. The second phase commenced in 2003 and will result in the integrated development of both fields, allowing year-round production of oil (9 Mt) and natural gas (16 Bcm). The hydrocarbons will be recovered from offshore platforms, delivered to the south of the island by pipeline and shipped for export. Natural gas will be exported in the form of liquefied natural gas (LNG), from the plant located in Prigorodnoye.

The Sakhalin III project includes four licensed blocks: East Odoptu, Ayashskiy, Veninskiy (gas) and South Kirinskiy (gas and condensate). Seismic exploration work revealed 35 potential agglomerations containing an estimated 450 Mt of oil and condensate and 1,400 Bcm of natural gas. According to a study conducted by the research institute SakhalinNIPImorneft (part of Rosneft-Sakhalinmorneftegas), the project could sustain annual production of oil and condensate at a level of 15-20 Mt and natural gas at 45-60 Bcm over a period of 20-25 years. The Sakhalin III project also includes the West Schmidt and East Schmidt blocks. The license holder for the geological study of these two blocks is Rosneft Company. However, the exploration work has been conducted by Rosneft and British Petroleum. This work revealed 24 promising structures containing 320 Mt of oil and condensate and 950 Bcm of natural gas. These reserves could allow the annual production of about 5-9 Mt of oil and condensate and 18-30 Bcm of gas over a period of two decades.

The Sakhalin V project includes blocks adjoining the Okha district and the Schmidt Peninsula. About 40 promising agglomerations have been revealed in the project area so far. The reserves of oil and condensate are estimated at 935 Mt and those of natural gas at 1,250 Bcm.

The design for the project, which has been produced by the SakhalinNIPImorneft Institute, asserts that there is the potential to produce 35-50 Mt of oil and condensate and 45-65 Bcm of gas annually for a period of 15 years.

The Sakhalin VI project (East Pogranichniy block) consists of 18 agglomerations of oil and condensate, as well as natural gas reserves estimated at 180 Mt and 400 Bcm respectively, allowing the production of 4-6.5 Mt of oil and 5-6.5 Bcm of natural gas for more than 15 years.

These discoveries and the parameters of these projects would allow the construction of a large-scale oil-and-gas complex, including offshore and onshore production facilities and an inland transportation and processing industry. In the future, the estimated annual levels of oil production could reach 50-60 Mt, while natural gas output could be maintained at 65-85 Bcm a year. These production volumes could cover the domestic needs of the Far Eastern region, while also providing considerable revenues from exports to neighboring countries. It is worth noting in this context that estimates of regional internal demand for oil and gas are significantly below anticipated levels of production. For the whole of Russia's Far Eastern region, domestic demand for oil could grow from 7 Mt in 2005 to 15 Mt in 2020. Demand for natural gas could expand faster, from the current 2.5 Bcm to between 15 Bcm and 20 Bcm in 2020.

It would not be unrealistic to predict that the Russian share of natural gas produced by the Sakhalin I and II projects could initially cover domestic needs, allowing the implementation of the gasification program. The supply of gas to users in the central and south districts of Sakhalin could be covered by the Sakhalin II project alone. The share of gas from this available to Sakhalinskaya Oblast is likely to be between 1 Bcm and 3 Bcm annually from 2013. From 2015, a further 1-2 Bcm is expected to become available from the Sakhalin I project.

Russia's Ministry of Industry and Energy, the federal body in charge of this project, commissioned the SakhalinNIPImorneft Institute to design the program. The program was reviewed and approved by the Administration of Sakhalinskaya Oblast and the Khabarovskiy and Primorskiy regional administrations, as well as by the federal ministries and agencies concerned. Estimates of domestic demand for natural gas are based on the assumption that by 2020, Sakhalinskaya Oblast will consume about 5.6 Bcm of gas, significantly exceeding per capita gas consumption levels in Khabarovskiy Krai (7.5 Bcm) and Primorskiy Krai (7.0 Bcm). However, more conservative estimates suggest that gas consumption is likely to be between 11 Bcm and 15 Bcm a year, still much higher than average per capita gas consumption in Russia and neighboring economies.

The program should be implemented in four five-year stages. In order to deliver the proposed volumes of gas to Khabarovskiy and Primorskiy kraies, there will be a need to modernize the existing Okha – Komsomolsk-on-Amur gas pipeline and construct a new delivery system to Khabarovsk and the Vladivostok-Nakhodka area.

On behalf of the government, the Joint Stock Company Daltransgaz, currently located in Khabarovsk, serves as the management body for the implementation of the gasification

program. On the other hand, in order to speed up the work, the administration of Khabarovskiy Krai, in collaboration with Rosneft, undertook the construction of a gas pipeline from Komsomolsk-on-Amur to Khabarovsk. In 2001, the SakhalinNIPImorneft Institute prepared a technical and economic study regarding the construction of this pipeline. This feasibility study was approved by the government in 2001.

Based on the maximum transport capacity of the existing Okha – Komsomolsk-on-Amur gas pipeline, this feasibility study proposed limiting the capacity of the entire project by 4.5 Bcm a year, including the supply to users in the industrial centers of Amursk and Khabarovsk. The supply of gas to Khabarovsk City should begin in 2006. The project consists of the existing Okha – Komsomolsk gas pipeline with two submarine sections via the Nevelskoy Strait, two linear compressor stations, the new 375.2 km-long section of the Oktiabrskoye – Khabarovsk pipeline, branch pipelines and three gas distribution stations located in Khabarovsk. The feasibility study also provides for the construction of distribution infrastructure and related services.

In Sakhalin, reconstruction work has been carried out at the existing pipeline in the northern part of the island, including the preparation of the system to receive gas from offshore sources. In 2001, the gas pipeline was connected to the gas-turbine electric power plant in Nogliki. Currently, the construction of the Chayvo-Boatasino pipeline is underway; this will permit the initial supply of gas from the Sakhalin I project to Khabarovskiy Krai. Moreover, in 2002, the construction of the pipeline from Aniva to Yuzhno-Sakhalinsk was completed; this pipeline allows gas from offshore fields in the south of the island to be used to supply the needs of Yuzhno-Sakhalinsk City, Aniva and Troitskoye.

In Aniva, the Sakhalingazenergo Company is planning the construction of a module-type gas-fired power plant with a capacity of 4 MW, which will eventually be expanded to 8 MW. The fuel for this power plant will be supplied by Anivagas. The design work has already been carried out and construction will begin in August 2005. The plans of Sakhalingazenergo also include the gasification of localities in the southeastern part of the island, using LNG. LNG production could take place at the low-tonnage plant using technologies procured from domestic sources or the Sakhalin II project.

The regional administration is also reviewing the most effective options for utilizing natural gas not only in power generation and heat production, but also as a feedstock for chemical industry. The concepts underlying the application of gas have been compiled by a joint working group consisting of representatives of Sakhalinskaya Oblast, including Sakhalinenergo, research institutes and Anivagas, as well as experts from Mitsui, Mitsubishi, UNIKO and Pacific Consulting.

In Khabarovskiy Krai, the Komsomolsk – Amursk gas pipeline was commissioned in 2000, with natural gas being supplied to the Amursk I power plant. Branch

pipelines to Solnechniy, Elban and Khurba settlements are now operational; other branch lines have been constructed to link up with new users in Komsomolsk-on-Amur, with new users in the industrial centre of Komsomolsk being connected to the system. Since 2002, there has been steady progress in the construction of the Komsomolsk – Khabarovsk main pipeline and 200 km of the planned 355 km pipeline has been laid down to date. The first deliveries of gas from the Sakhalin I project, planned to be between 1.2 Bcm and 3.0 Bcm per year, will begin in 2006. The contract between the supplier (ENL Company) and the customers (Khabarovskenergo and Khabarovskkraigaz) was signed in May 2005, followed by a transportation contract with Rosneft–Sakhalinmorneftegas.

Gas exports to China would significantly improve the economic feasibility of the gasification program, because the pipeline's capacity could be much larger and the construction costs of the pipeline would be split among a much greater number of potential users. However, the estimates demonstrate the reasonable economic effects of the gasification in the southern area of the Far Eastern region, even if the project remains purely domestic. Natural gas, as a much cleaner fuel than coal, promises significant environmental benefits. The program will help to reduce transportation costs and the volumes of coal shipments. In addition, natural gas can be used as a substitute for diesel and fuel oil to a considerable degree. The thermal efficiency of the new and modernized power plants could be improved significantly. Moreover, the supply of natural gas would help to promote new applications and advanced technologies in both the commercial and the housing sectors, improving standards of living in rural areas in particular. In addition, the delivery of natural gas from Sakhalin in the proposed volumes will practically resolve the entire problem of energy security supply for the southern part of the Far Eastern region.

Annex: Gasification Program for Sakhalinskaya Oblast and Khabarovskiy and Primorskiy Krai¹

Program designed by:

OJSC Rosneft-Sakhalinmorneftegas in cooperation with a number of institutes; approved by the RF Government Resolution No. 852 in July 1999.

Program goal:

The main goal is the supply of natural gas to consumers in the Far East using the Russian share of gas extracted from the Sakhalin oil-and-gas fields. Possible exports to foreign markets (China).

State customers:

The customers are the RF Ministry of Fuel and Energy (Mintopenergo) and the RF Ministry of Agricultural Production. Several customers' functions were conveyed by Mintopenergo to Rosneft.

Estimated demand for natural gas in Sakhalinskaya

¹ Source: http://www.rosneft.ru/english/projects/far_east.html

Oblast and Khabarovskiy and Primorskiy Krai:

The demand is expected to increase from 3.68 Bcm in 2000 to 20.57 Bcm in 2020.

Gas delivery:

Using the existing Okha – Komsomolsk-on-Amur pipeline (130 km long); constructing a new Sakhalin – Khabarovsk – Vladivostok pipeline (1,587 km long).

Capital investment:

Over \$4 billion, including \$3.5719 billion for long-distance pipelines and \$472.1 million for distribution and heating facilities.

Project status:

2000 OJSC OC Rosneft and the Far East regional administrative bodies established a joint venture, OJSC Daltransgas

2001: First stage of project work implemented

2002 Funding from the federal budget started. 20% of OJSC Daltransgas conveyed to the State. Implementation of the first stage of the program, construction of the 500 km-long Komsomolsk-on-Amur – Khabarovsk pipeline with an annual capacity of 4.5 Bcm started. By the end of 2002, some 54.2 km were built. Construction is to be completed in 2006. According to the 2002 business schedule, the amount of capital spending as part of the gasification program totaled about 930 million rubles.

2003: By the end of 2003, some 122 km were built; the amount of capital spending as part of the gasification program totaled about 1.8232 billion rubles. Following

the results of the 3rd issue placement, the capital stock of Daltransgas was allocated as follows:

- Rosneft: 20.91%
- Rosneft-Sakhalinmorneftegas: 4.09%
- RF Ministry for Federal Estate: 20%
- Khabarovsk Territory Ministry for Federal Estate: 54.87%
- State Property Management Committee of the Primoriye Territory: 0.24%

On August 26, OJSC Daltransgas's 4th issue placement worth 550 million rubles was registered with the Federal Commission on the Securities Market; the placement was to be completed by the first half of 2004.

2004: As of the start of June 2004, 190 km of pipes had been welded together to form a section of gas pipeline. In the period between the start of construction and May 1, 2004, almost 2.5 billion rubles of investment was utilized. Following the fourth issue of shares (the placement was completed on February 26, 2004), the interests of shareholders in Daltransgaz (which participates in the gas pipeline project) were distributed as follows:

- Rosneft (14.32%) and Sakhalinmorneftegas (10.68%)
- RF Ministry for Federal Estate: 27.63%
- Khabarovsk Territory Ministry for Federal Estate: 47.24%
- State Property Management Committee of the Primoriye Territory: 0.13%.

2005: As of January 1, 2005, 243.7 km of pipes had been trenched and covered; almost 4.1 billion rubles of investment was utilized.