

**FORECAST FOR DEVELOPMENT OF THE OIL AND GAS INDUSTRY OF RUSSIA AND
PROSPECTS FOR EXPORT OF OIL AND GAS TO NORTHEAST ASIA**

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Introduction

In 2000-2004, oil production increased by more than 150 million tons and reached 459 million tons. It is expected that in 2005, it will reach 480 million tons. During the same years, gas production rose almost by 50 billion cu m. It will reach 640 billion cu m in 2005. Russia is the world's largest exporter of oil and gas. In 2004 net-exports of crude oil, petroleum products and gas from Russia exceeded 520 million ton of oil equivalent.

An analysis of world economic development for the last quarter of the 20th century and a forecast for the first half of the 21st confirms that the growth in global demand for energy sources in the next decades will first occur as a result of increasing energy consumption in China and other Asia-Pacific region (APR) countries. Under the conditions of APR rapid industrial development and continued economic growth in Russia, the demand for oil and gas in East Asian countries will further rise due to economic, technological, demographic and environmental factors.

The majority of Russia's energy resources are concentrated in its Eastern territories – Siberia, Far East, Arctic and Far East offshore. After meeting domestic demand with supplies from West and East Siberia, Sakha Republic and Sakhalin, export deliveries to APR countries are expected to rise significantly. In establishing specific routes and means of energy resource transportation from Russia to APR, the following main questions will arise:

- How large is the projected oil and gas production of East Siberia and the Russian Far East in long- and medium-term outlooks?
- How large is the projected domestic crude, refined products and natural gas demand in East Siberia and the Russian Far East?

- What is the projected volume of oil and gas export from West Siberia to APR via East Siberia and Far East?
- How will the risk of large oil and gas deliveries to the new markets be reduced?
- How large will the capital investment be for construction of specific transportation infrastructure projects?

An integrated analysis of the resource, technological and economical factors enables us to find answers to these questions.

The role of the oil and gas industry of Eastern Siberia and the Russian Far East in Russia's energy strategy

The formation and development of the Eastern Siberia and Far East oil and gas industry and realization of prospective export projects for Russia's entry in the Asia-Pacific energy market are the most important aspects of "Russia's Energy Strategy until 2020". In June 2002, the Russian Government approved the "Strategy of economic development of Siberia". This strategy stresses the need to create new centers of oil and gas production in East Siberia. The Strategy places particular emphasis on the development of transport communications: "Construction of the main oil and gas pipelines, 'West-East', for exports would favor the development of a fuel-energy complex in the East Siberian Region and the Far East and allow solution of the most important strategic tasks, related to entry into the prospective markets of the APR countries".

In August 2002, the Russian Government approved "Russia's Energy Strategy until 2020". The document took into account the statements on "Conception of development of an oil and gas complex in Eastern Siberia and Far East towards the realization of prospective international projects," which was developed by the Siberian Branch of the Russian Academy of Sciences (SB RAS) and commissioned by the Russian Ministry of Energy. The statements in the Energy Strategy are broadly in agreement with the "Strategy for economic development of Siberia," accepted by the Government. Both will act as additional reference points in the decision-making of economic organizations in the fuel-energy complex of the country. The Strategy calls for the increasing role of the eastern regions in Russia's oil and gas industry and

diversification of exports after entry in the Asia-Pacific Region market. The fields of the Siberian Platform—Eastern Siberia and Sakha Republic (Yakutia)—will form the basis for creating a large-scale oil and gas industry in the Eastern Territories of Russia, meeting the domestic demands of these regions and arranging long-term oil supplies to the APR. An additional large system of oil and gas supply, mainly for export, will be created on the basis of the fields of the Sakhalin Shelf.

The optimistic variant of the new “Russian energy strategy,” anticipates that production will reach 520 million tons of oil and 730 billion cu m of gas. The gas resource estimates anticipate that annual production could reach 900 billion cu m of gas. The strategy envisages that along with the conventional trend in Russia’s oil and gas exports to the European market, oil and gas will be supplied to the Asia-Pacific Region countries—China, Japan, South Korea, and the USA.

Developmental prospects for the oil and gas industry in East Siberia and the Russian Far East

According to estimates of the IPG SB RAS and SNIIGGIMS, the initial recoverable hydrocarbon resources of onshore and offshore Eastern Siberia and Far East are equal to 85-90 billion tons of conventional hydrocarbons (CHC), including 20-22 billion tons of oil, 1.5-2 trillion cu m of associated gas, 58-61 trillion cu m of free gas, and 3-5 billion tons of condensate.

The proved oil reserves (A+B+C1 categories) are estimated at 386.8 million tons in East Siberia, 459.5 million tons in the Far East, including 204.6 million tons on the Sea of Okhotsk shelf; the probable oil reserves (C₂ category) in these regions are 605.1 million tons and 303.1 million tons (including 193 million tons on the shelf), respectively.

Oil in the considered regions is notable for its high quality, exceeding the Russian export standard Urals by the major parameters. Generally, these are light and low-sulfur grades. Most of the proved oil reserves of Eastern Siberia and Far East (86.1% and 68.2%, respectively) have a density of less than 0.87g/cu m; at that, almost 50% of the reserves, concentrated in Eastern Siberia, and about 78% of those in Far East have a sulfur content of less than 0.5%.

The proved reserves of free gas (including the gas of gas caps) are estimated at 2361.6 billion cu m in Eastern Siberia, 2167.1 billion cu m in Far East, including 863.3 billion cu m on the Sea of Okhotsk shelf. The probable reserves are 1701.2 billion cu m and 1423.1 billion cu m, respectively, including 326.1 billion cu m on the Sea of Okhotsk shelf.

Development of large-scale oil and gas industries in eastern Russia will be based on the Yurubchen-Tokhomo petroleum accumulation zone (Yurubcheno-Tokhomskiye and Kuyumbinskoye fields), Sobinskoye field (Evenk Autonomous District), Kovyktinskoye and Verkhnechonskoye fields (Irkutsk Region), Talaknskoye and Chayandinskoye fields (Sakha Republic, Yakutia), Piltun-Astokhskoye, Odoptu, Chaivo and Lunskiye fields (Sakhalin's offshore).

With sufficient investment into exploration and development of already-existing field and the establishment of refining and transportation infrastructure, the volume of oil production in East Siberia and Far East could reach 55-60 million tons by 2010 and 80-85 million tons by 2020. By the same year, annual oil production could amount to 35 million tons in the Evenk Autonomous District, 23 million tons in Sakhalin, over 8 million tons in Sakha Republic, 7-8 million tons in Irkutsk region, about 6 million tons in Krasnoyarsk Kray, and over 2 million tons in the Taimyr Autonomous District.

Oil production targets estimate as much as 29 million tons for the Yurubchen-Tokhomo field, 6 million tons for the Kuyumbiinskoye field, 7 million tons for the Verkhnechonskoye field, 5 million tons for the Talakanskoye field. Sakhalin's projected offshore crude output from four major fields could reach 20 million tons. However, the companies that have the E&P licenses for these fields have stated that the above figures were underestimated. Thus, according to Slavneft Oil and Gas Company, annual crude output from the Kuyumba and Tera-Kamo blocks of Yurubchen-Tokhomo zone could reach 35-37 million tons.

The estimates provided by IPG SB RAS have shown that the proved and probable reserves of Krasnoyarsk Kray, Sakha Republic, Irkutsk Region and Sakhalin's

offshore—with the establishment of suitable transportation infrastructure—would allow increasing the annual gas production to 65-70 and 120-140 billion cu m by 2010 and 2020, respectively. Also, the annual gas production is projected at a level of 25 billion cu m in the Kovyktinskoye field, 10 billion cu m in the Sobinskoye field, 15 billion cu m in the Yurubchen-Tokhomskoye field. Natural gas output from four major fields on the Sakhalin shelf could be no less than 20 billion cu m. According to operators' targets, the above production levels might increase significantly: RUSIA Petroleum said output of natural gas at the Kovyktinskoye field would amount to 30 billion cu m; operators on the Sakhalin shelf plan to increase production to 100 billion cu m of gas.

If new field within the study area are brought into production, gas production could be increased to 140-155 billion cu m by 2025-2027. By 2015, annual gas production could reach 35-37 billion cu m in Sakha Republic, 28-30 billion cu m in Irkutsk Region, 20-21 billion cu m on Sakhalin shelf, 14-15 billion cu m in the Evenk Autonomous District, 5-6 billion cu m in Krasnoyarsk Kray, 4-5 billion cu m in the Taimyr Autonomous District. Annual helium production could reach 135 million cu m by 2015.

Domestic consumption forecast and export projections

By 2030, the consumption of crude and refined products including crude field use and losses is expected to increase to 32-40 million tons in East Siberia and the Far East, of which 17-22 million tons is expected for East Siberia and Sakha Republic, and 15-20 million tons for the Russian Far East. By 2030 in the area of interest, the projected demand for gasoline will increase to 7-11 million tons, for diesel fuel to 10-14 million tons, and for fuel oil 2-4 million tons.

Demand for natural gas in East Siberia and Far East is expected to be 20-25 billion cu m in 2010, 30-40 billion cu m in 2020, and 40-55 billion cu m in 2030. Demand for natural gas in Sakha Republic and East Siberia will amount to 12-15 billion cu m, 17-23 billion cu m, 20-30 billion cu m; in Far East to 7-10 billion cu m, 13-17 billion cu m, and 20-25 billion cu m in 2010, 2020 and 2030, respectively.

In 2004 supplies via trains from West Siberia through East Siberia and Far East to China have been sustained at more than 7 million tons of crude oil. Annual crude supplies from fields on the Sakhalin shelf to APR and North America markets are at a level of 2.5-3 million tons.

Predictions for 2020 crude exports from the fields in East Siberia and Far East are at a level of 65-70 million tons. Taking into account West Siberian oil supplies, the total export volume of crude and refined products from Russia to APR could increase to 100-110 million tons (table 1).

Table 1. Russia's crude oil and products export forecast (100 million tons/year)

From / Year	2004	2005	2010	2015	2020	2025	2030
Crude							
West Siberia	7	10	20	30	35	35	30
East Siberia	0,1	0,1	6,0	20,0	35,0	45,0	55,0
Sakhalin	3	3,2	18	20	25	27	35
Total	10,1	13,3	44	70	95	107	120
Products							
Total	7	7,2	9	10,2	11,5	11,8	12
Crude oil and products							
Total	17,1	20,5	53	80,2	106,5	118,8	132

After meeting domestic demand for fuel, anticipated competitive export of Russian gas from East Siberia and Sakha Republic could amount to 75-80 billion cu m by 2020. Total gas export from Russia to APR markets including West Siberia's supplies through Altay Region and Altay Republic to northwestern China could amount to 140-150 billion cu m/y by 2030 (table 2).

Table 2. Russia's gas export forecast

From / Year	2004	2005	2010	2015	2020	2025	2030
West Siberia	0,0	0,0	0,0	0,0	0,0	8,0	40,0
East Siberia	0,0	0,0	0,0	30,0	60,0	82,0	82,0
Sakhalin	0,0	0,0	13,4	13,4	18,0	20,0	23,0
Total	0,0	0,0	13,4	43,4	78,0	110,0	145,0

Transportation options

The main factor structurally constraining the development of the oil and gas complex in this region is the lack of an efficient supply system of oil and gas from the production areas to the main consumers. The arrangement of large oil and gas

supplies from the fields of Eastern Siberia and Sakha Republic (Yakutia) to Russian consumers and APR countries involves the construction of a network of very long pipelines, plants for processing and liquefaction of natural gas, and creation of infrastructure for shipment of oil and oil products, LNG and condensate at the ports of Khabarovsk and Primorye kray.

To project the transportation systems, it is reasonable to combine the corridors for routes of the projected oil and gas pipelines, which would significantly cut down (no less than by 10%) the demand for investment, shorten the pay-back period of the projects and make them more attractive for investments.

When substantiating the plans, it is important to take into account four general factors: (1) social, (2) economic), (3) geopolitical, and (4) ecological.

The social results include gas supply to settlements and plant facilities of Russia's eastern areas, providing additional jobs in construction and maintenance of the oil and gas transportation systems, and preventing work crises in coal plant facilities of the region.

The economic conditions would be defined by the capital intensity of the projects, the possibility of connecting with existing fields and fields to be discovered, and marketing conditions.

Russia's geopolitical interests lie in the maximal use of Russia's territory and infrastructure for oil and gas transportation, security of the domestic market, and individual entry in international markets.

Ecological factors consist of improving the environment as a result of gas supply and the preventing the emergence of new risks related to the construction and exploitation of oil and gas pipelines. It is necessary to minimize the impact on lands, lower the risks of pipeline disruption and damage, especially in areas of high seismicity, and to prevent contamination of Lake Baikal.

To realize Russia's social, economic, geopolitical and ecological interests, it is reasonable: (1) to create a common transmission corridors for oil, gas and condensate, (2) to give priority to supplies for Russian consumers, including the oil refineries and petrochemical plant facilities of the region, (3) to open alternative channels of entry in foreign markets, when arranging export supplies.

The government of Russia has accepted the decision to construct the "Eastern Siberia–Pacific" oil pipeline via the "Tayshet–Skovorodino–Perevoznaya bay (near Vladivostok)" route. In East Siberia higher priority is assigned to the following regional oil pipeline projects: the "Yurubchen-Tokhomo oil and gas accumulation zone–Poyma," connecting with the Trans-Siberian trunk line, the "Tayshet–Ust-Kut," "Talakan–Verkhnechonskaya oil and gas accumulation zone (TVZ)–Ust-Kut," as well as the construction of a large oil-loading terminal. As a result, using the Baikal-Amur railroad, a new channel will be formed for supplies of both West Siberian and Eastern Siberian oil in the eastern direction.

When forming a pipeline network in the region, gas supplies should be provided, in the first place, to the south of Eastern Siberia, including Transbaikalia. This implies construction of pipelines: "Kovyktinskoye–Sayansk–Angarsk," "Kovyktinskoye–Irkutsk–Proskokovo," "Irkutsk–Ulan-Ude–Chita," and "Chayandinskoye–Kovyktinskoye." After 2008, with increasing gas outputs in Eastern Siberia and Sakha Republic (Yakutia) and developing infrastructure of gas supplies in Eastern Asia, a final decision could be made on routes of gas pipelines from Chita to the Russian ports in the Pacific Ocean with pipeline outlets to China and Korea.

Investment

Estimates show (table 3) that the 'intensive' option of creating new large centers of oil and gas production in Eastern Siberia and Sakha Republic (Yakutia) would require \$86.8 billion in investments, including \$14.5 billion in exploration, \$42.3 billion in field facilities construction, \$10.4 billion in oil and gas pipelines in the Lena-Tunguska province and systems of gas processing and storage, including helium, and \$19.6 billion in the network of trunk oil and gas pipelines, terminals and LNG production plants.

When arranging oil supplies from Eastern Siberia and Sakha Republic for exports, the net profit of investors after selling every ton of oil would be from 7 to 25 dollars at an oil price of \$13.5/barrel, from 32 to 50 dollars at an oil price of \$22/barrel, and from 45 to 65 dollars at an oil price of \$28/barrel, depending on fields and regions of oil supply.

In the price structure, the profit share would be from 6.5% to 29% at the oil price of \$13.5/barrel, from 22% to 32% at the oil price of \$22/barrel, and from 22% to 34% at the oil price of \$28/barrel, depending on fields and regions of oil supply.

If the project with oil output in Eastern Siberia and Sakha Republic at the level of 55-60 million tons is realized, the net profit of companies would be more than \$55 billion up to 2030, and over \$30 billion would come to the budgets of all levels. If the level of the production reaches 110-120 million tons, the net profit of companies during the same period would be more than \$120 billion, and above \$45 billion would come to the budgets of all levels.

The development of the gas potential of Eastern Siberia and Far East would provide for the long-term sustainable development of the economy and energy sectors of this key macroregion of Russia, improve the regional balance of energy production and consumption in the country, and allow Russia to occupy an adequate position among suppliers of oil, gas and processed products in the APR market.

Table 3. Investment requirements for the development of oil and gas resources in Eastern Siberia and Sakha Republic (Yakutia) until 2030 (billion dollars)

Index/ Option	Base	Intensive
Oil	55-60 million tons/year	115-125 million tons/year
Gas	115-125 billion cu m/year	115-125 billion cu m/year
	Exploration	
For oil	1.80	12.00
For gas	0.70	2.50
In total	2.50	14.50
	Field facilities construction	
Oil fields	19.27	30.49
Gas fields	11.8	11.8
In total	31.07	42.29
	Creation of the system of hydrocarbon processing and transportation in the Lena-Tunguska petroleum province*	
Infrastructure of gas processing and storage	1.2	1.3
Oil and gas pipelines	8.84	9.1
In total	10.04	10.4
	Creation of trunk systems of oil and gas transportation to Eastern Siberia and Far East and for exports*	
Oil and gas pipelines	12.6	13.9
Oil terminals and LNG plant	5.70	5.70
In total	18.30	19.60
Total	61.91	86.79

*In estimating investments for construction of oil and gas pipelines, reduction of costs is taken into account when routes pass through common transmission corridors.

Conclusion

1. The new “Russian energy strategy” anticipates that production will reach 520 million tons of oil and 730 billion cu m of gas. Gas resource estimates anticipate annual production could reach 900 billion cu m of gas.
2. The strategy envisages that along with the conventional trend in Russia’s oil and gas exports to the European market, oil and gas will be supplied to the countries of the Asia-Pacific Region— China, Japan, South Korea, and USA.
3. Predictions for 2020 crude exports from the fields in East Siberia and Far East are at a level of 65-70 million tons. Taking account of West Siberian oil supplies, total export volume of crude and refined products from Russia to APR could increase to 100-110 million tons.

4. After meeting domestic demand for fuel, anticipated competitive export of Russian gas from East Siberia and Sakha Republic could amount to 75-80 billion cu m by 2020.
5. Diversifying supply oriented toward routes and transportation means is key to reducing commercial risks in oil and gas export.
6. Russia's oil supplies are to be implemented along the lines of the eastward extension of existing trunk lines from West Siberia to China, Korea, Mongolia and the Russian Far East ports with connection to new productions from East Siberia and Sakha fields.
7. Pipeline gas exports from East Siberia and Sakha Republic are expected to go to Russian Far East ports and to Northeastern China and the Korean peninsula.
8. Major exports of crude oil and LNG from Sakhalin are to be carried out via the ports of Sakhalin region, Khabarovsk region and Primorsk region.
9. Creating new large centers of oil and gas production in Eastern Siberia and Sakha Republic (Yakutia) would require \$86.8 billion in investments, including \$14.5 billion in exploration, \$42.3 billion in field facilities construction, \$10.4 billion in oil and gas pipelines in the Lena-Tunguska province and systems of gas processing and storage, including helium, and \$19.6 billion in the network of trunk oil and gas pipelines, terminals and plants for producing LNG.