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The Energy Dimension in Russian Global Strategy

Russia and Regional Energy Links in Northeast Asia

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Abstract

The main purpose of this paper is to clarify the prospects for energy links between Russia and the Asia Pacific region (primarily Northeast Asia).[1] Russia is important for Northeast Asia as a sizable potential supplier of oil and natural gas. The future of Russia's energy links with this large energy consuming area is assessed in the context of the nation's domestic priorities, its potential to fulfill the role of a massive energy supplier and Russia's long-term plans to export oil and gas and diversify markets.

The most important among the topics discussed in this paper is the capacity of Russia to deliver energy to Asian regional markets on a large scale. Russia's Eastern neighbors generally underestimate this capacity. This paper begins with a brief overview of the energy links between Russia and Europe, as well as an overview of oil production dynamics in recent years.

There are certain misconceptions concerning plans to construct an export-oriented delivery infrastructure for oil transportation in Eastern Russia. More specifically, the pipeline routes to Nakhodka and Daqing are commonly seen as mutually exclusive projects. Initially, Russia's state oil transportation monopoly, Transneft, proposed a 3,765 km-long pipeline with a capacity of 1 million barrels per day (b/d) from Angarsk to Nakhodka only, including a deep-water port and an oil terminal with storage tanks.[2] Later, a pipeline to China was added to this plan, as a replacement for the project backed by Russia's Yukos and the China National

[1] Geographically, Northeast Asia includes China, Chinese Taipei, the Hong Kong SAR, Japan, North and South Korea, Mongolia and Russia. This sub-region is part of the larger Asia Pacific area. Some of the economies, including China, Hong Kong, Taiwan (Chinese Taipei), Japan, the Republic of Korea, and Russia, belong to the Asia Pacific Economic Cooperation (APEC) forum, while others, such as Mongolia and the Democratic People's Republic of Korea, are not affiliated with this regional body.

[2] Transneft holds a monopolistic position, covering oil supplies within the Commonwealth of Independent States (CIS) and handling more than 90% of crude oil exports. It seems likely that, when Yukos initiated the dialogue on a pipeline project to China, Transneft felt that if private oil firms were to fund new pipelines this could jeopardize not only its own role but also the interests of the state, including its control over the oil majors.

Petroleum Corporation (CNPC). This paper provides more details on the routes of these pipelines and some background information related to the design of the integrated system.

Detailed and balanced information on Russia's long-term plans to export oil and gas to Northeast Asia is often missing. In this regard, the *Energy Strategy to 2020* [3] adopted in 2003 proposes important changes in Russia's long-term production and export plans for oil and natural gas projects in Eastern Siberia and the Far Eastern region. The plan specifies that towards the end of the projected period, oil and natural gas exports to Asia should respectively amount to one-third and one-sixth of their total cross-border supplies.

This paper addresses some issues related to natural gas projects in Eastern Siberia and prospects for the available gas reserves to be monetized, utilized domestically and exported. Finally, this paper examines the problem of dealing with Russia as a major supplier of oil by the oil importing economies in the context of their policies towards the Organization of Petroleum Exporting Countries (OPEC).

Introduction

Asia, as a whole, is emerging as the leading region in the world in energy consumption. The economies of this huge economic area, including Association of Southeast Asian Nations (ASEAN) member countries,[4] China and India, are likely to continue to demonstrate high rates of economic growth, following the paths of Japan and South Korea as very large energy importers. Combined, these economies are poised to overtake North America and the European Union (E.U.) in total energy demand.

[3] *Russian Energy Strategy 2020* available at www.mte.gov.ru (in Russian).
[4] ASEAN member countries: Brunei Darussalem, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and VietNam.

In 2001, the combined volume of energy consumption by the economies of Northeast Asia (1,650 million tons of oil equivalent) already exceeded that of the fifteen E.U. countries (1,480 million tons of oil equivalent). In 2002, Japan, South Korea and China (including Taiwan and Hong Kong) imported a total of $180 billion worth of various fuels, nearing the energy imports of the U.S. By 2020, sub-regional oil imports could almost double, reaching 18 million b/d. More than 70% of incremental demand for oil will be generated by the Northeast Asian transport sector, with most of the increase arising from motorization in China. By 2020, China is expected to import 6 million b/d of oil and up to 1.95 million cubic feet of LNG. In addition, China's domestic oil output is projected to flatten. Also, in two decades, demand for natural gas in the sub-region is likely to triple, reaching 240 million tons a year.

The strategic value of Russian oil for Japan and other economies of Northeast Asia is obvious. Japan is the world's second largest importer of oil after the U.S., with daily imports of about 5.4 million barrels a day in 2003. It is followed by South Korea, the fourth largest oil importer (2.3 million b/d), China (1.8 million b/d) and Taiwan (880,000 b/d), which are the ninth and tenth largest importers of oil. In 2000, China also imported 360,000 b/d of oil products, while Japan imported 900,000 b/d of oil products.[5] China is eventually expected to surpass Japan, consuming about 10 million b/d of oil and oil products by 2020. The combined import of crude oil on the part of Japan, South Korea and China (including Taiwan and Hong Kong) may reach 11-12 million b/d by 2010 and exceed 17.5 million b/d by 2020 (Table 1).

[5] *BP Statistical Review of World Energy*, June 2001, pp. 6, 9 and 19.

Table 1: Oil Production and Consumption, 1999-2020
(Million b/d)

	Production		Consumption		Imports	
	1999	**2020**	**1999**	**2020**	**1999**	**2020**
China	3.2	3.1	4.1	10	0.89	6.9
Hong Kong	0	0	0.23	0.48	0.23	0.48
Taiwan	0.01	0	0.77	1.0	0.77	1.0
Japan	0.02	0	5.4	5.8	5.4	5.8
South Korea	0.01	0.01	2.0	3.4	2.0	3.3

Source: APEC Energy Demand and Supply Outlook 2002 (Tokyo: APERC, 2002), 56.

The demand projections, however, differ. Estimates provided by the U.S. Energy Information Administration (EIA) contrast with those provided by APERC (Asia-Pacific Energy Research Center), particularly for China and Japan (Table 2). Oil demand in East and South Asia, including India and ASEAN,[6] is projected to grow rapidly from 15 million b/d in 2000 to 27 million b/d in 2020, including an increase from 11 million b/d to about 20 million b/d of oil cargo that will pass through the Malacca Strait. The main source of this demand is the expansion in the transportation sector, particularly in China, with a projected annual increase in fuel consumption of 5.7% compared with a 4% average increase in transportation sector demand in the APEC region.

[6] In the wider Asia Pacific region, only China, Indonesia and Malaysia produce oil in significant quantities. In 2000, their combined oil output was 5.4 million b/d, including 3.3 million b/d of crude oil extracted in China, 1.4 million b/d in Indonesia and 0.72 million barrels a day in Malaysia. Oil extraction is forecast to remain more-or-less at roughly current levels in Indonesia and Malaysia, while declining in China, so the output of all three oil-producing economies would level off at 5.6 million b/d a year by 2010 and most probably decline thereafter.

Table 2: Oil Demand and Imports, 2000-2020

	Demand, 2001 Million b/d	Demand, 2020 Million b/d	Imports, 2020 Million b/d
Japan	5.7	6.4	6.4
China	4.3	10.6	7.6
South Korea	2.1	3.0	3.0
Taiwan	0.8	1.0	1.0
India	1.8	4.9	4.0
World	75.4	119.4	--

Source: Energy Information Administration, http://www.eia.doe.gov/oiaf/ieo/oil.html

Currently, 60% of China's oil imports originate from the Middle East while this dependence ratio for Japan and South Korea exceeds 88% and 79% correspondingly. The dependence of the APEC economies on imported oil is projected to increase from the current 36% to 54% in 2020. In East Asia, the share of oil imports in oil consumption will rise to 72%. In Northeast Asia, dependence on imported oil is expected to exceed 90%, with China becoming the third largest oil importer in the world, following only the U.S. and the E.U. It is expected that with the development of new oil fields in Eastern Siberia and the Far Eastern region, including Sakhalin, oil exports from Eastern Russia could be a significant factor in regional oil balances, enhancing oil supply security and price competition.

Russia and the E.U.

Naturally, interest in accessing Russia's energy resources is growing. The question is whether Russia can become a reliable source of energy for Northeast Asia. The answer is simple: Russia's standing in Europe reflects that of an indispensable and reliable world-class energy exporter. Russia's energy exports are predominantly destined for Europe, with energy industries accounting for 25% of gross domestic product (GDP) and providing for one-third

of industrial output and consolidated budget revenues, as well as about one-half of export earnings and the proceeds of Russia's federal budget. Moreover, energy exports account for 45% of all Russian exports to the E.U.

More than 80% of Russian oil exports (crude oil and oil products) and more than 60% of natural gas exports are shipped to Europe. In 2002, Russian gas exports to the Western markets amounted to 129.5 billion cubic meters (BCM), covering 26% of Europe's overall gas consumption, including 17% of the E.U.'s total gas demand.[7] This interdependence is bound to grow further. During the next three decades, E.U. energy production is expected to decline by about 17% while net energy imports are expected to grow by 15%. E.U. energy dependence on external sources is projected to rise to 70% by 2030. The level of external dependence on oil will reach 90% while for natural gas it will approach 80%. Reliance on nuclear power in Europe is unlikely to expand without a broad public and policy consensus, not to mention a reasonable solution to the problem of disposing of nuclear waste.

Russia's role in supplying energy to Europe has been recognized by the E.U. as an important policy issue. Extensive energy links have made Europe and Russia economically interdependent, requiring closer policy coordination.[8] A Green Paper published by the European Commission underlines the need for partnership with Russia in its capacity as one of the world's key energy-producing economies.[9] In 2000, the two parties agreed to establish a long-term partnership in the energy sector.

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[7] Alexey B. Miller, "The Eurasian Direction of Russia's Gas Strategy", Keynote Address, 22nd World Gas Conference, Tokyo, June 4, 2003, p. 6. See also *Green Paper – Towards a European Strategy for the Security of Energy Supply* (Technical Document), European Commission, 2000, p. 29.

[8] See *Promoting International Co-operation*, Communiqué, International Energy Agency, the Governing Board Ministerial Level Meeting, 28-29 April 2003.

[9] Op. cit.

The sixth E.U.-Russia summit, held in October 2000, in Paris, proposed establishing an energy dialogue. The exploratory phase of this dialogue was completed by the eighth summit in 2001. The E.U.'s expansion in membership will make both this dialogue and cross-border energy links even more important, considering the traditional energy dependence of the economies of Central and Eastern Europe on Russia.

In general, the concept of E.U.-Russia energy partnership can serve as a model for Russia-Northeast Asia energy relationships. This concept covers oil, gas and electricity and aims to improve investment opportunities in the energy sector in order to upgrade infrastructure, promote efficient and environmentally friendly technologies and enhance energy conservation in Russia.

The list of goals includes the improvement of the legal basis for energy production and transport, security for long-term energy supplies, the physical security of transport networks, new transport infrastructure projects of common interest and pilot projects in the field of energy conservation. These are exactly the issues that Japan, South Korea and China should discuss with the Russian government, energy companies (including energy exporting enterprises) and regions.

Oil Output and Reserves

Russia is among the world's leading crude oil producers and is the second largest exporter of crude oil. Since the late 1990s, the Russian oil industry has been making a rapid recovery from the dramatic decline that occurred with the fall of the former Soviet Union (FSU). In 1988-1998, the volume of recovered oil fell from its peak of 12 million b/d to its lowest level of 6.1 million b/d. By 2001-2003, Russian oil majors were among the world leading oil companies in boosting production. In a March 25, 2004 press conference, Russian Minister of Economic Trade and

Development, German Gref, commented that a rise was expected in Russia's crude exports from 4.84 million b/d in 2004 to 4.94 million b/d in 2005 and 5.0-5.2 million b/d in 2007. The official numbers for crude assume an expansion in volumes along five main routes:

- *Northern Baltic*: 1.24 million b/d through the expanded Baltic Pipeline System and up to 0.9 million b/d through the Kola Peninsular ports.
- *Caspian-Black Sea-Mediterranean*: expansion in capacity of the Atyrau-Samara pipeline to 0.5-0.6 million b/d and of the Novorossiisk and Tuapse ports to 1.18 million b/d.
- *Central Europe*: integration of the Druzhba-Adria pipeline, 300,000 b/d.
- *Eastern Siberia*: Taishet-Nakhodka project, up to 1.6 million b/d.
- *Far East*: mainly Sakhalin projects, about 100,000 b/d.

Vyacheslav Ruksha, head of Russia's new Federal Agency for Sea and River Transportation, also told *Reuters* in late March that Russia had the capacity to increase oil and product exports through its Black Sea terminals by 1 million b/d. He added that this would mainly be used for crude pumped through the Caspian Pipeline Consortium (CPC) pipeline from Kazakhstan. Through Russia's own ports on the Baltic, as well as ports in Estonia, Latvia and Lithuania, Ruksha estimates that Moscow could raise crude and products exports from 2.6 million b/d to around 3 million b/d while another 1 million b/d could be shipped to Europe as transit oil from Central Asia.

Official and industry forecasts for oil output have, in recent years, lagged far behind the actual results. For example, the Russian Energy Ministry is forecasting oil output of 8.2 million b/d for 2004 while oil companies are projecting a total of 8.6 million b/d. Transneft expects oil output to increase by 1-2 million b/d. Efficiency in the oil industry is rising as well. In 2001-2002, the increase in oil output required about $8,000 in investment per barrel per day

capacity. This is less than half of the amount previously quoted in international estimates. Russia is now seen as the most dynamic player among the world's crude oil suppliers. In 2002, its oil output reached 7.7 million b/d, increasing to 8.5 million b/d in 2003 and projected to rise to 9.1 million b/d in 2004[10] (Table 3).

Table 3: Oil Output and Non-CIS Exports by Transneft, 2001-2002
(Million b/d, %)

	Oil Output		Non-CIS Exports		
	2001	**2002**	**2001**	**2002**	**2003**
Lukoil	1.49	1.51	0.46	0.52	0.51
Yukos	1.16	1.40	0.49	0.51	0.54
Surgutneftegaz	0.88	0.98	0.32	0.35	0.37
TNK	0.69	0.75	0.29	0.30	n/a
Sibneft	0.41	0.54	0.15	0.21	0.23
Tatneft	0.49	0.49	0.18	0.16	0.19
Russia, total	6.96	7.59	2.57	2.66	

Source: Ministry of Energy

Russia's non-CIS (Commonwealth of Independent States)[11] exports of oil through the Transneft system has risen to 3 million b/d, accounting for about 40-45% of the total oil output. Transneft will introduce about 2-3 million b/d of additional transport capacity in the next two decades. Oil exports to CIS markets are projected to be around 1 million b/d by 2020. Non-CIS markets in Europe will get about three times more. In 2003, oil exports to all markets exceeded 4 million b/d, accounting for most of the additional output.

The World Energy Council (1998) had estimated Russia's proven oil reserves at 46.5 billion barrels. However, during the 1990s, an international audit of four oil majors, including Yukos,

[10] The government commission on access to export pipelines, headed up by Viktor Khristenko, now Industry Minister, has approved a Russian oil balance for 2nd quarter 2004. The plan provides for growth in oil output to 8.76 million b/d, up 10.1% year-on-year and 1.9% quarter-on-quarter) and total exports and transit volumes of 4.8 million b/d (up 9.7% year-on-year and 3.6% on the export target for 1st quarter 2004). Russia actually posted a 10.6% year-on-year hike in oil production over January-February, while its non-CIS oil exports through the Transneft system surged 22%. Only exports of Russian crude to the CIS showed an 18% drop, due to less attractive prices.

[11] Commonwealth of Independent States (CIS) countries: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.

Lukoil, Surgutneftegaz and TNK (excluding Onaco), put their combined reserves only at 40.2 billion barrels. The EIA estimates that Russia's proven oil reserves are 60 billion barrels while some Russian estimates are as high as 90 billion barrels. If U.S. standards applied, the production-to-reserves ratio can be conservatively estimated at 26 years at current output levels. Less conservative estimates approximate this ratio at between 32-38 years. If, however, unconventional oil resources are taken into account, Russia's total oil deposits could be as large as 300 billion barrels, offering an opportunity to recover oil for another one hundred years or more at current production volumes. In any case, excluding the Middle East, which is largely closed to foreign private investors, Russian oil reserves account for about one-quarter of the world's proven oil reserves.

It is important to note in this context that the admissions recently made by Royal Dutch/Shell in regard to its own petroleum-reserve data -- reduced across the board by around 20% -- raises the question of how much faith should be put into such numbers. Western accounting regulators set the current disclosure rules in 1982 but decided that these figures should be treated as supplementary information outside companies' official financial statements. The reason cited by regulators at the time was that the numbers were not reliable enough to justify the cost of having them audited independently. In energy reserve reporting, there is always an assumed wide margin of error. There is also no requirement that reserve results be reviewed by third parties.

There are technical and economic issues that must be taken into consideration. Proved reserves, defined as oil or gas for which future recovery is reasonably certain, fall into two main categories: developed and undeveloped. Undeveloped reserves are prone to subjectivity in expert assessments. The primary determinant in measuring their volume is the current price of oil and gas. Higher prices mean higher reserves. At lower prices, the owner or the license-holder may find it uneconomical to invest in drilling. In this case, the undeveloped petroleum underground is

not counted in the category of proved reserves. There is also no requirement that companies provide details about the date and geographic details of their specific undeveloped reserves to verify whether some of these supposedly proven reserves remain perpetually undeveloped.[12]

Oil Reserves in Eastern Russia

According to evaluations by the Siberian Branch of the Russian Academy of Sciences, the proven reserves of oil in Eastern Siberia do not seem sufficient to justify a long-distance, high-capacity oil pipeline on the scale of the proposed pipeline to Nakhodka. On the other hand, specialists admit that, without such a pipeline, it will be impossible to provide these known reserves with an infrastructure that supports their commercialization, let alone the investment required for further exploration. An alternative approach, pursued through the concept of the Baikal-Pacific Pipeline (BPP) project, is to stimulate the exploration, development and production of local oil in Eastern Siberia and the Far Eastern region by relying on supplementary oil shipments from Western Siberia. In other words, oil resources that do not justify a pipeline in their own right could be developed, if supported by connections to the Nakhodka pipeline.

By 2010, the oil fields of the Siberian formation, with 9. 5 billion barrels of its proven oil reserves, could produce about 600,000 million barrels a day, including 260,000 b/d at the *Yurubcheno-Tokhomskoye* field in Krasnoyarskiy Krai and about 200,000 b/d at the *Verkhne-Chonskoye* field in Irkutskaya Oblast. The development of these and other fields will require billions of dollars in investment, not to mention a considerable period of time. In addition, 200,000 b/d of oil can be produced in Yakutia (Table 4).

[12] Jonathan Weil, "Oil Reserve Data Can Sure Be Slick," *The Wall Street Journal*, March 12-14, 2004, M7.

Table 4: Siberian Platform: Oil Reserves* (Million Barrels)

	$A+B+C_1$	C_2
	Krasnoyarsk Krai	
Yurubcheno-Tokhomskoye	429	2213
Sobinskoye	22	60
	Irkutskaya Oblast	
Verkhne-Chonskoye	1172	309
	Yakutia	
Talakanskoye	780	133
Chayandinskoye	73	170
Srednebotuobinskoye	400	88
Total	2876	2973

Source: Energy Systems Institute, Irkutsk

*Note: Russia employs its own methodology to measure reserves. One can roughly equate $A+B+C_1$ with the "proven and probable reserves" classification used internationally, while C_2 can be assumed to designate "possible reserves", although there are certain mismatches.

Moreover, the exploration of the Yurubcheno-Tokhomskaya zone (UTZ) was discontinued in 1991 but was resumed a decade later by Yukos. Less than 10% of the entire area of about 10,000 square kilometers has been explored thus far. The geologists from Yukos, responsible for the exploration of the UTZ, insist that the oil collectors of the zone are much older that those in Western Siberia, making the combined oil resources of the UTZ larger than those of the whole of Eastern Siberia.

Sakhalin provides an example of how proactive exploratory policies lead to development projects, creating new sources of oil exports. Sakhalin's recoverable offshore reserves of oil are estimated at more than 11 billion barrels and those of natural gas at 3 trillion cubic meters. These resources are much better explored than those in Eastern Siberia (Table 5).

Table 5: Sakhalin Offshore Oil Reserves
(Million Barrels)

	Sea Depth, Meters	Recoverable Reserves, million barrels	First Output, Year	Production Peak, million b/d
Sakhalin-1	30-50	2.256	2005	0.16
Sakhalin-2		1103	1999	0.17
Sakhalin-3				
Kirinskiy	< 300	514.5 cond.	2014	--
East Odoptu	< 500	514.5	2014	0.14
Ayashskiy	< 500	713	2014	0.18
Sakhalin-4	< 30	--	--	--
Sakhalin-5	< 140	4410	2010	0.71
Sakhalin-6	30-60	300 million tons of oil equivalent	--	--

Source: Rosneft, 2002

In addition, it seems that, compared with the BPP, the Sakhalin projects have a greater capacity to alter the almost complete import dependence of Japan, South Korea and China on Middle Eastern oil. On the other hand, the investment parameters of these projects also reveal their high costs and long implementation time (Table 6).

Table 6: Profiles of the Sakhalin Projects

	Sakhalin-1	Sakhalin-2	Sakhalin-3
History	30 June 1995 – PSA signed; 10 June 1995 – PSA enacted	22 June 1994 – PSA signed; 10 June 1996 – PSA enacted	1 May 1999 –Kirinskiy Block PSA approved, 5 August 1999 – commission appointed to define terms of development
Fields	Chaivo (main), Arkutun-Dagi, Odoptu	Piltun-Astokskoe (oil), Lunskoe (gas)	(1) Kirinskiy Block (2) East Odoptu and Ayashskiy Block
Reserves	Oil-2.3 billion barrels; Natural gas – 485 BCM	Oil-1.1 billion barrels natural gas-642 BCM	(1) Oil -514 million barrels; natural gas-730 BCM (2) Oil-1.227.5 million barrels; natural gas-67 BCM
Investors	Exxon-Mobil (30%), SODECO (30%), Rosneft (8.5%), Rosneft-Sakhalinmorneftegas (11.5%), and ONGC (20%)	Shell (55%), Mitsui (25%), and Mitsubishi Corporation (20%)	(1) Exxon-Mobil (33.35%), Chevron-Texaco (33.35%), Rosneft-Sakhalinmorneftegas (33.3%) (2) Exxon-Mobil (66.7%), Rosneft-Sakhalinmorneftegas (33.3%)
Operator	Exxon-Neftegas Ltd.	Sakhalin Energy Investment Co. Ltd.	(1) PegaStar Company (2) Exxon Neftegas Limited
Total investment	$15 billion	$10 billion	--
Investment as of January 2002	$670 million, including $170 million in Russia	$2 billion, including $181 million in Russia	--
Targeted markets	Sakhalin, Khabarovskiy Krai, Primorskiy Krai, Northeastern China	Oil – Asia-Pacific region; gas -- Japan, South Korea, Taiwan, China	--
Delivery mode	Oil pipeline, gas pipeline	LNG, 9.6 million tons/year	--
Supply volumes, readiness	20 BCM/year, 20 years, from 2005	Oil – 62.5 million barrels/year, 31 million barrels recovered in 1999-2002; gas–19 BCM / year.	--

Source: Rosneft, 2002, Administration of Sakhalinskaya Oblast.

The most advanced of the projects is Sakhalin 2, to which Shell and its partners have committed $10 billion of investment. Sakhalin 2 total confirmed reserves of oil are estimated at 2.5 billion barrels, permitting the extraction of about 170,000 b/d. At present, export shipments of oil from Sakhalin 2 are seasonal due to limited access during winter. After an oil pipeline is built to the south of the island, however, oil shipments will occur year-round.

Another two projects are incorporated in Sakhalin 3 -- the Kirinskiy Block, with an estimated 514.5 million barrels of oil reserves, and the East Odoptu field, which has 713 million barrels of oil reserves. Many parameters of the Sakhalin 3 project, including investment requirements, have yet to be finalized. ExxonMobil and ChevronTexaco were stripped of their license in January 2004 because the production sharing agreement (PSA) terms must now be defined through a competitive bidding process. Extensive exploratory work is needed and the first output is expected in around 2014. Eventually, Sakhalin 3 is expected to produce twice as much oil as Sakhalin 1 and Sakhalin 2 combined. The peak output from all these projects, however, is unlikely to exceed 600,000 b/d a year.

Ownership, Taxes and OPEC

In Russia, there are about 2,300 oil fields with licenses on their exploration and development. Most of these fields were discovered, prepared for development and monetization before 1991, incurring huge investment costs and long lead-times for exploration. In 1992-1993, with only a few exceptions, all sizable fields were transferred to the control of privatized or soon-to-be privatized companies.

Ownership

In the late 1990s, only 5% of Russian oil reserves remained under state control. Some of the fields from this "undistributed fund" were sold. Initially, licenses were granted free of charge and without bidding or competitive offering. The majority of the licensed fields, however, remained undeveloped due to the shortage of investment capital, the lack of transportation infrastructure and the availability of already commercialized reserves. Moreover, in the absence of a clear legal mechanism for license cancellation, the state has to wait until 2013, when most of the 20-25 years licenses begin to expire.

The "ownership structure" reveals that only 22% of Russian proved oil reserves belong to approximately 200 small oil companies while the rest is under control of the oil majors. Unlike the majors, the small companies are very important to development of small oil fields. These companies, however, face very considerable investment risks of a geological nature because every new well costs $2 million or more. Although these small producers are not super-profitable, they can withstand even very low oil prices without losing their profitability.

Unlike the smaller companies, Russian oil majors control depreciated assets inherited from the Soviet days. Currently, there are 150 Russian independent oil producers and their total share in oil output is 6%. These companies work on small fields with recoverable reserves of no more than 73.5 million barrels. Each year, about 40 fields with reserves of more than 7.35 million barrels are discovered.

In general, super-large oil fields account for only 0.4% of oil fields discovered in Russia and their share in overall reserves is 28.7%. Large fields represent 6% of the total number and 42.2% of oil reserves, while medium field shares are 9.3% and 14.8% of the total number of oil fields and overall oil reserves, respectively. The share of small fields is 84.3% of the total number of discovered oil fields and their combined recoverable reserves represent 14.3% of the total oil reserves in Russia. In other words, about 30% of Russian oil reserves are concentrated in medium and small fields. Moreover, about 1,400 oil fields belong to the category of micro-fields with oil reserves of less than 7.35 million barrels. The inflexible taxation system, however, does not encourage small companies to work with the approximate 300 small and micro-small oil fields, which have combined estimated oil reserves of about 7.35 billion barrels.

Revenues and Taxes

The Finance Ministry has published the 2003 data concerning Russia's oil sector performance. The figures could serve as a useful argument in favor of increasing the tax burden on the oil sector (Table 7).

Table 7: Russia's Oil Sector Performance, $ Billion

	2002	2003	Growth, %
Revenues	57.0	71.8	26
Crude export sales	29.6	40.7	38
Product export sales	12.9	14.5	12
Product domestic sales	14.5	16.6	14
Tax payments	21.7	27.9	29
Transportation costs	9.0	12.3	37
Oil production costs	15.2	18.1	19
Long-term loans	4.6	9.6	109
Dividends	3.0	5.6	87
Asset acquisitions	2.8	5.5	96

Source: Finance Ministry

Indeed, the last two years have been exceptionally good for oil companies. Backed by high oil prices in the international markets, oil firms have managed to boost revenues sufficiently to offset higher transportation and production costs, as well as the greater tax burden. Oil producers offered higher dividends and purchased more assets. Exports remained the principal earnings driver and their share of total revenues was up from 73.5% in 2002 to 76.8% in 2003. Export sales were responsible for 90% of the revenue increase.

Naturally, the Russian government wants the oil companies to pay a larger share of their revenues in taxes. An early 2004 joint meeting of the Ministries of Finance and Economic Trade and Development, attended by President Vladimir Putin and Prime Minister Mikhail Fradkov, was followed up by the announcement from Finance Minister Alexei Kudrin that

the oil industry would face a tax burden of an extra $2 billion in 2004 if the price for Urals Blend export crude averages $27 a barrel or an extra $900 million if the price falls to between $24 and $27 a barrel. The sum will be levied via the hydrocarbon tax and export duty. The exact pricing formula was not revealed but might be imposed as soon as this year. A new hydrocarbon tax is projected to be introduced in 2005.

Russia and OPEC

The behavior of Russia's privatized, competitive and increasingly efficient oil sector, coupled with the Russian government's goal to repay the external debt through enhancing the country's role as a key oil exporter, helps determine how Russia reacts to OPEC. In purely economic terms, coordination of Russian production volumes with OPEC policies may not be feasible. In 2002, Russia and four other non-OPEC oil producers agreed to cut their oil exports. Russia reduced its exports by 125,000 b/d or 1.6%. The subsequent increase in international oil prices resulted in $1.15 billion in extra proceeds but an overflow of oil on the domestic market, including the markets of the CIS economies, caused domestic oil prices to collapse, hitting Russia with total losses of $1.45 billion.

Russia is one of the largest oil producers outside of OPEC. On the other hand, the strategy of OPEC is to react promptly to oil price fluctuations by reducing or increasing exports. For Russia, other options should be considered. One possibility is to establish a strategic oil reserve managed by the government that could be tapped to ameliorate destabilizing price fluctuations. When international oil prices were low, the Russian government could purchase oil and expand this stockpile. The accumulated stocks could be released when international oil prices recover. If Russia adopted such a strategy, creating a strategic oil reserve of about 588-735 million barrels (about the size of the U.S. strategic oil reserves), Transneft would have to increase considerably its storage capacity. This project could be very expensive, both

in terms of capital and maintenance costs. Moreover, if neighboring oil-importing economies join such a project, potential benefits could be significant, including enhanced security of oil supplies and reduced short-term risks of supply interruption as well as supply and oil price independence from the Middle East producing nations and OPEC.

Oil Delivery Infrastructure

With government leadership lacking, pipeline infrastructure planned for Eastern Russia has become a point of contention domestically and created misunderstandings in Moscow's relations with China and China's relations with Japan. When Japanese Prime Minister Junichiro Koizumi visited Moscow in January 2003, he offered President Putin assistance in financing the pipeline construction. Japan also expressed readiness to provide funding for exploration and development of the new oil fields in Eastern Siberia. During this historic meeting, other mega-projects were discussed, including a pipeline to Murmansk and a pipeline to Daqing, in Northeastern China.

It is hard to tell whether it was the idea of Transneft controlling all export-oriented pipelines in Russia that persuaded Yukos, Lukoil, Sibneft and TNK (Tyumen Oil Company) to propose a mega-pipeline from Western Siberia to Murmansk (3,600 kilometers if an inland route were selected or about 2,500 kilometers if it were a mixed inland-sea route) to transport from 1.2 million b/d to 2.4 million b/d of oil, mostly for exports to Western Europe and North America. The Russian government, however, responded that there would be neither a privately-owned pipeline to Murmansk nor any other non-state pipeline projects in Russia. According to then Russian Prime Minister Kasyanov, the oil majors' participation in funding new pipeline projects would be taken into account by means of reduced transportation tariffs. Moreover, Transneft indicated that, after completion of the second phase of the Baltic Trunk Pipeline System (BTS) expansion, the capacity of the state-owned BTS would support oil

exports to North America.

These developments demonstrate the highly competitive nature of relationships among various interest groups in Russia, including state-owned companies, privatized oil majors, the federal government and its branches, regional authorities and the office of the president. Worse, the rules of this game have remained fluid for years, inspiring various lobbying activities. In the absence of state coordination and clearly defined long-term development plans, federal agencies have opted to follow proposals originating from private companies.

Angarsk-Daqing Pipeline

Beijing is keenly interested in importing oil from Russia via a pipeline built to Daqing as a way of maintaining employment and ensuring the continued use of its existing infrastructure in this strategically important region of Northeastern China. Development of oil resources in Daqing, carried out with the assistance of Japan, accounts for about 1 million b/d of crude oil production (30% of China's total oil output) but capacity is expected to decline.

Mikhail Khodorkovskiy, former Chairman of the Board and CEO of Yukos, was the key player in negotiating a pipeline project with China. Initially, Yukos proposed the building of a pipeline to the Beijing region via Mongolia. Chinese partners resisted this option. Negotiations on the route and oil pricing continued and in one interview Khodorkovskiy compared the bureaucratic practices of his negotiating partners with those of the Soviet era, suggesting that the Pacific coast route could be an alternative if the Angarsk-Daqing project were delayed. In March 2000, the project was discussed during the second session of the Russia-China Subcommittee on Energy Cooperation, part of the standing commission in charge of preparing for bilateral meetings of the heads of the respective governments. Shortly before that session, Khodorkovskiy visited Beijing (November-December 1999) to sign

agreements with CNPC and the China Petroleum and Chemical Petrochemical Corporation (Sinopec)[13] to supply oil by rail. In July 2000, he visited Beijing again, this time as a member of the delegation led by President Putin.

In July 2001, during a summit in Moscow, the Russian Ministry of Energy, Transneft and Yukos signed an agreement with the SDPC (State Development Planning Commission of China) and CNPC, regarding a feasibility study for a pipeline to China.[14] Yukos and Transneft jointly backed this project and allocated $30 million for the assessment. Yukos, however, was the main promoter of the project. The plan was to begin construction in 2003. Yukos was also acting as a prime potential supplier of oil from the Tomsk and Khanty-Mansiysk areas of Siberia and was prepared to sustain the proposed export volumes alone.[15]

The Russian Ministry of Foreign Affairs was also actively participating in the process, including implicit references to the Yukos project made on various occasions, some of which were made by the minister.[16] In addition, a number of documents were issued at various stages at the federal level in support of the project.[17]

[13] China has reorganized its state-owned oil and gas assets into two vertically integrated and regionally focused firms. CNPC and Sinopec were ordered to carry out an asset swap that transferred some exploration and production assets to Sinopec and some refining and distribution assets to CNPC. In addition, CNPC siphoned off most of its high quality assets to its subsidiary PetroChina. The China National Offshore Oil Corporation (CNOOC) handles offshore exploration and production and accounts for more than 10% of domestic crude output. These companies have successfully carried out initial public offerings (IPOs) of stock, bringing in billions of dollars in foreign capital, including about US$2 billion of stock sold to ExxonMobil, BP and Shell.

[14] The distance to be covered by the pipeline is 2,247 kilometers, of which 1,452 kilometers cross Russian territory, with the remaining portion on China's territory. The pipeline is to traverse the territories of Irkutskaya Oblast, Buriatia and Chitinskaya Oblast.

[15] Reportedly, 20,000 b/d of additional oil production capacity from the new fields may require $300 million of investment. If the 1 million b/d capacity Transneft pipeline is eventually used only for oil supplied from new fields in Eastern Siberia and Yakutia, these areas will need about $10 billion invested in exploration and development.

[16] People's Daily Online, Huang Ying, *People's Daily*, June 14, 2002.

[17] The instructions originating from the Government of the Russian Federation were dated 22 January 1999, No. 8048 and 03 September 1999, No. 1367-p. In addition, government orders were issued on 10 March 1999, No. ЮМ-П2-07669, 27 October 1999, No. НА-П2-35698, 29 November 1999, No. ВП-П2-8924, and 10 January 2000, No. НА-П2-00286.

In September 2001, when Chinese Prime Minister Zhu Ronjii visited Russia, a general agreement on the evaluation of the project was signed by the heads of the delegations, stipulating that by July 2002, the respective sides would determine the investment requirements, negotiate tariffs and confirm the legal aspects of their cooperation. It was also agreed that China and Russia would adjust their construction blueprints by July 2003. In July 2002, CNPC proposed opening a credit line for Yukos to finance the construction of the Russian section of the pipeline and offered a guarantee to off-take 600,000 b/d of crude for two decades, starting in 2010. China also agreed to increase oil purchases from Yukos by rail by 10,000 b/d up to 60,400 b/d in 2005.

As one of the top managers at Yukos noted, China coordinated the pipeline route to Daqing within its regional development plans but, for Yukos, the economics of the project were the main priority, rather than the routing options.[18] On the other hand, Khodorkovskiy, speaking of the long-term energy strategy for Russia, admitted that central coordination is necessary in planning pipelines and railways, even for privately funded ventures.[19]

Environmental Constraints

The Yukos' pipeline construction plan proposed three alternative options for routing a pipeline. The *eastern route*, circumventing part of Buriatia, passes through 39 rivers, streams and channels in Irkutskaya Oblast, including rivers that enter Lake Baikal. This route is as little as 16.5 kilometers away from the lake in some sections. According to the feasibility study, the estimated time that would take an oil spill to reach the lake is between one to two hours. This prompted the authors of the feasibility study to designate the eastern route as the least acceptable.[20] In Buriatia, the eastern route is also problematic because all the rivers

[18] See interview with Yuriy Beilin, http://www.yukos.ru/119.shtml
[19] See *Kommersant*, May 29, 2002, , http://www.yukos.ru/805..shtml
[20] *Investment Requirements Assessment for the Russia-China Pipeline, vol. 7*, Environmental Impact Assessment from the Construction and Exploitation of the Oil Pipeline, Book 1 <<OBOC>> Non-Technical Resume (Moscow, 2002), available at http://www.yukos.ru/pdf/OBOC.pdf

crossed by the pipeline are very fast, including the Snezhnaya River, which would be crossed at a distance of 120 kilometers from the lake. On this route, the estimated time taken for an oil spill to affect the lake is between five hours to two days. The eastern route also cuts through four natural reserves in Buriatia.

The *central route* crosses rivers that are also connected with Lake Baikal via the Selenga River. This option includes five river crossings, with the estimated time for an oil spill reaching the lake in one to two days. In Buriatia, this route cuts through the Tunkinskiy National Park, Borgoyskiy Preserve, Altacheiskiy Federal Preserve and Tunguyskiy Preserve. In the Tunkinskiy National Park, the law prohibits pipelines, electric power grids and trunk roads. The feasibility study, however, proposes that 80 kilometers of the pipeline run through the most protected zone of the park.

Within the boundaries of Irkutskaya Oblast, the *western route* crosses the drainage basins of both the Angara River (21 crossings) and Lake Baikal (59 crossings), with the time taken for an oil spill to reach the lake about three days. This route also cuts through the Tunkinskiy National Park but, of the 125 kilometers affected by construction, only 14 kilometers would affect the most protected area.

In summary, the eastern route, which is designed to circumvent the Tunkinskiy National Park, creates an environmental risk for Lake Baikal. The two other routes are less troublesome within Irkutskaya Oblast but run through the Tunkinskiy National Park in Buriatia. It also seems that, even if the federal legislation is amended, the five administrative regions in Buriatia to be transited by a pipeline have identified 39 spots requiring archeological excavation and conservation before construction can take place. Even if fully financed and staffed, such massive research efforts would take at least two or three summers.

In Chitinskaya Oblast, a pipeline is also proposed that would be routed through the drainage basins of Lake Baikal and the Amur River, crossing 123 streams and several small and large rivers. There is also a section of the route that cuts through marshes, requiring a detailed feasibility study to ensure the pipeline's post-construction stability.

Nakhodka Pipeline

A domestic debate was also unfolding concerning the advantages of the Pacific coast route, with a growing number of experts favoring this option. Some participants in the discussion proposed to evaluate not only the profitability of the project but its role in regional development and geopolitical interests. Others pointed out that Yukos had experienced numerous difficulties and uncertainties in negotiating with Beijing. In addition, the idea was aired that building an oil pipeline to Nakhodka along with a gas pipeline in the same corridor would reduce the costs of both projects.

The idea of building a 3,765 kilometer-long pipeline linking Angarsk and Nakhodka originated with Semyon Vainshtock, president of the state-owned Transneft Company, Russia's principal oil transportation firm.[21] The management of Transneft believed that a larger pipeline to the Pacific coast would allow access to multiple markets in Northeast Asia and possibly even North America. This pipeline would also allow the tapping of new oil fields in remote areas.

[21] In 2002, Transneft increased the intake of crude from oil producers to 7.6 million b/d, 10% more than in 2001. Exports amounted to 3.8 million b/d of crude oil, up by 9%. Deliveries to Russian oil refineries increased by 10%, reaching 37.6 million b/d. Total turnover has increased by over 10%, amounting to 17.2 million b/d. Transneft's network incorporates 48,610 kilometers of long-distance pipelines with diameters ranging from 420 mm to 1,220 mm, 336 oil pumping stations and 849 storage reservoirs with a capacity of 13.24 MMCM. In 2002, Transneft transported 93% of the oil produced in Russia.

Yet another argument in favor of the Angarsk-Nakhodka pipeline is its impact on regional development. Indeed, in 2002, the Russian government re-adopted a modified program for the economic and social development of the Far Eastern region and the provinces adjacent to Lake Baikal. At present, the program's implementation requires much more investment than the regional and federal budgets can provide. According to Transneft's top management, Russia's economic security would be far better protected by a pipeline to Nakhodka that accesses more than one destination,[22] serving domestic oil transportation needs along the way.

In early April 2002, Vainshtock discussed this project with President Putin and Transneft's representatives, and the government of Primorskiy Krai signed an agreement concerning Transneft's intention to build a pipeline to Nakhodka. Later in April, similar agreements were signed with the other provinces involved.[23] In addition, Presidential Order Number Pr-1315, dated July 17, 2001 and presumably solicited by Vainshtock, authorized Transneft to draft a pre-feasibility study report.

The pipeline's cost was estimated at $5.2 billion and its capacity was put at 1 million b/d. For comparison, the cost of building the Angarsk-Chita-Daqing pipeline of 604,100 b/d capacity was estimated at $2 billion (Russian section). Oil for both pipelines should originate from Western Siberia, Krasnoyarskiy Krai and Irkutskaya Oblast. Several routing options for the domestic pipeline were under review and the Angarsk-Kazachinskoe-Tynda-Skovorodino-Khabarovsk-Nakhodka (Perevoznaya Bay) option was selected. This route involves the BAM (Baikal-Amur Railway) and the TSR (Trans-Siberian Railway) infrastructure corridors.

[22] In a similar context, the Baltiysk Pipeline System (BTS) has been built with oil export terminal facilities in Primorsk, near St. Petersburg, in order to have an alternative route to the southern export route via Novorossiysk.

[23] The estimated cost of the project is $5.2 billion, including a deep-water port and an oil terminal with a stockpiling capacity of 4 mmcm. The pipeline, with a diameter of 1,220 mm, will be equipped with 26 pumping stations. A feasibility study is scheduled to be completed in 2004, while a pipeline could be commissioned in 2007. Oil for this pipeline will be shipped from Western Siberia, as well as new projects in Krasnoyarskiy Krai, Irkutskaya Oblast and Yakutia.

In January 2002, the Russian Ministry for Economic Development and Trade approved the proposal and organized a presentation of the project with the participation of the Energy Ministry and oil companies. Transneft also completed the environmental assessment report.[24] In June 2002, the project was presented at the APEC Investment Forum in Vladivostok and at the Baikal Economic Forum in Irkutsk in September. The Energy Ministry consequently proposed combining both pipeline projects, accompanied by a massive investment in exploration and development. It was emphasized that the main route proposed by Transneft (Angarsk-Nakhodka) could also serve Daqing. Indeed, Skovorodino, as a split point of the main pipeline, is almost opposite Tahe, which is on the Chinese side of the border, at the northern tip of Heilongjiang Province.

The plan includes building an oil pipeline linking the Yurubcheno-Tokhomskoe oil and gas field in Krasnoyarskiy Krai that runs from Western Siberia to Angarsk near Lake Baikal. Then, a mega-pipeline should be built in an easterly direction along existing railway routes. From Tynda, a larger pipeline would stretch along the Trans-Siberian railway to Nakhodka, while a smaller one would turn south, crossing China's border.

A decision to postpone authorizing a pipeline to China and evaluate in detail the west-to-east option was reportedly discussed during the Russian Security Council meeting on November 27, 2002. According to Sergei Darkin, Governor of Primorskiy Krai, Putin questioned the entire concept of the pipeline infrastructure proposed for Eastern Russia at the meeting.[25] Apparently, the Nakhodka option had gathered strong support on the part of regional leaders,

[24] "On Nature Conservation" # 7-FZ, Article 3, 11, 32, 33, 46 of January 10, 2002, Federal law "On Ecological Expertise" # 174-FZ, Article 12, 14, 27 of November 23, 1995, Order of the State Committee of the Russian Federation for Nature Conservation "On Endorsement of Provisions for Estimating the Impact of Planned Economic or Other Activities on the Natural Environment in the Russian Federation" # 372, Article 3, 4 of May 16, 2002.

[25] Svetlana Babaeva, Oleg Zhunusov and Maria Ignatova, "An Alternative Route for Oil", *Izvestia*, December 9, 2002, http://www.izvestia.ru/economic/article27560

who favored it due to positive impact on domestic economics, oil security and access to multiple export markets.

Furthermore, the routing option (vis-à-vis Lake Baikal) proposed by Transneft could offer a way out of the environmental deadlock created by the "southern route" pipeline, which traverses Tunkinskiy National Park in Buriatia. The most important factor, however, is possessing sufficient oil reserves to justify building and operating this kind of dual system with a capacity of about 1.6 million b/d of oil or more. If this integrated pipeline infrastructure and large-scale exploration and development of new fields materialized, as much as 15-20% of Russia's total oil output and 25-30% of its entire oil exports, could be diverted to new Asia Pacific markets. The integrated plan, steered by the Russian Energy Ministry, also envisages building in parallel a high-capacity gas pipeline (about 33 BCM) connecting the Kovykta gas field and a gas pipeline network in Western Siberia with the Pacific coast of Russia.

In addition to reduced investment and operational costs, the advantage of the Nakhodka project is the strong positive impact on regional development and the investment climate in Eastern Russia, as well as much faster exploration and development of local gas and oil in Eastern Siberia and the Far Eastern region. A proposed connection with oil and gas reserves in Western Siberia would increase the reliability of the Baltic Pipeline Transportation System (BPTS), justifying the commercial development of new and smaller oil and gas fields in remote areas that currently do not have trunk pipeline access.

The chances of implementing this mega-project are generally good, given Putin's attention to the Far Eastern region. During his visits to the Far East and Eastern Siberia, the Russian president has stressed the strategic importance of the delivery infrastructure to be built in

Eastern Russia, serving the domestic development needs. He has noted that a smoothly operating transport network not only determines the rate of development of remote areas but also increases Russia's competitive advantages. The Russian transport system upgrade includes commissioning modern trans-shipment facilities such as oil terminals and terminals for trans-shipping LNG. It is very important to balance the port sector with the railway and pipeline infrastructure. This would make it possible to improve Eastern Russia's export potential and to resolve a number of practical issues as part of the goal of utilizing the capacity of the region's key transport arteries.

Putin has instructed the Russian government to draft priorities for developing the country's pipeline system. "Transport infrastructure and energy facilities should be created here first of all for developing this country and this region. It is here that consumers should be found for the energy facilities to be constructed. This is what the Economic Development Ministry should be thinking about rather than about pumping natural resources out for export… we have to create transport and other infrastructure here. We have to create energy capability, above all for the development of our own country. So, here we have to think about creating consumers for electricity, gas and oil. We have to create conditions here so that industry can grow and jobs are created."[26]

The Taishet-Nakhodka oil pipeline construction project, expected to cost Transneft $10.75 billion, is to be the subject of an official presentation in Irkutsk. Although the government has not made a formal decision on the issue, the route to a Pacific port seems to be favored over the China pipeline option. Transneft itself drew up the new route starting 500 kilometers northwest of Angarsk, the original starting point, after the Natural Resources Ministry advised against the former projects on environmental grounds. The pipeline would stretch 4,500 kilometers, most of it underground and skirt Lake Baikal to the north. The new

[26] 26 February 2004, *ITAR-TASS News Agency*, Moscow.

development does not rule out construction of a branch line to China but it does indicate a government preference for the Pacific route.

The New Energy Strategy

The recently published *Energy Strategy to 2020* provides some details concerning external priorities for developing Russia's energy sector. Russia is within the top echelon of the world's largest oil producers and exporters and is the leading exporter of energy in all its forms, including natural gas and oil products, coal and electricity. The *Energy Strategy 2020*, which was approved in August, 2003 envisages the expansion of Russia's energy sector and the growth of energy exports (Table 8).

Table 8: Russian Energy Production and Exports, 2002-2020

	Production		Exports, US $ billion	
	2002	2020	2002	2020
Oil (million b/d)	7.7	9.1-10.5	3.7	2.8-6.2
Oil products (million b/d)	2.7	2.9-3.3	1.5	0.6-1
Natural gas (BCM)	590	680-730	185	235-245
Coal (million tons)	253	375-445	47	55-60
Power generation (billion kWh)	892	1,215-1,365	14	30-75

Source: Ministry of Energy

The energy sector development outline for Eastern Russia contains significant potential for investment. In general, cross-border energy undertakings are expected to serve, in addition to energy security needs, other interests including: (1) cementing improved political relationships; (2) promoting trade, investment and technological and manufacturing links among regional neighbors; (3) providing additional incentives for economic advancement at the local and regional levels; and (4) supporting increased efficiency and lower environmental impacts in energy use.

In summary, the development of energy industries in Russia is seen in the context of technological advancement and high-tech research and development efforts that will reduce project costs and enhance energy efficiency. For example, a new high-tech phase in generation could be based on superconductivity, cryogen technology applications in power generation and transmission, fast-breeder reactor technology, tidal power generation and hydrogen energy.

To sustain domestic demand, expand exports and modernize domestic energy industries, Russia needs at least $620 billion of investment over the next two decades, including $260-300 billion mobilized before 2010-2012. Most of these funds should originate from private sources and loans. This investment program should support energy infrastructure development, including the construction of new power plants and the modernization of existing facilities, as well as a broader re-orientation of the energy sector towards increased efficiency and added value. Between 2001 and 2020, the total amount of investment in the energy sector from all sources is projected to reach $660-810 billion (Table 9).

Table 9: Estimated Investment Requirements, 2002-2020 ($ billion)

	2001-2010	2011-2020
Oil		230-240
Natural gas (continental projects)		170-200
Coal		20
Heat production and use		70
Power generation, including		130-170
Power generation		110-140
Power grids		20-30
Nuclear power		40
Energy saving programs		50-70
Total	260-300	400-510

Source: Ministry of Energy

It should be noted that these figures are not astronomical in the context of worldwide energy industry needs. According to private energy companies, if world output grows by 3% a year, with energy demand increasing by 2% annually and the recovery of energy resources from

existing fields dropping by 4-6% a year, by 2010 about half of oil and gas consumption will have to rely on newly developed reserves. Most of these new reserves are located offshore, in deep-sea areas and/or in Arctic latitudes which are distant from consumption centers. The increasing complexity of recovery requires advanced technologies and huge start-up investment, estimated at about $1 trillion for the current decade alone. For example, the investment program of ExxonMobil, through 2010, is estimated to total $100 billion.

The investment to be directed in energy infrastructure development in Russia would potentially create large-scale business opportunities for equipment manufacturers. Investors could benefit from the construction of new power plants and the modernization of existing facilities, as well as a broader reorientation of the Russian energy sector toward increased efficiency and added value. More generally, the development of energy industries is seen in the context of technological advancement and research and development that would reduce project costs and enhance energy efficiency.

Balancing Europe with Asia?

European energy thinkers have made no secret of the fact that the E.U.'s increasingly high and growing energy dependence on Russia must be kept within certain limits.[27] Similarly, Russian energy planners propose to diversify energy exports, accessing new oil and gas markets in the Asia Pacific region, Northeast Asia in particular. The Russian government is proposing to diversify energy supplies to the "north, east and south," considering new projects aimed at oil and natural gas production in capital-intensive environments, including Eastern Siberia, the Far Eastern region, the Arctic and also the continental shelf of the northern and Caspian seas. The economies of Northeast Asia and possibly the U.S. are seen as supplementary markets. Recent policy trends may support these long-term intentions.

[27] *Energy: Let Us Overcome Our Dependence* (Luxemburg: European Commission, 2000), p. 13.

According to the *Energy Strategy 2020*, Russia is not planning to significantly expand its energy exports to Europe over the next two decades. Russian energy planners assume that in 2010-2020, oil exports could fluctuate between 2.8 and 6.2 million b/d depending on external and domestic circumstances.[28] In the upbeat projection by the Energy Ministry, oil output could increase to 9.9-10.5 million b/d in the course of the next decade or so, while domestic demand in 2010-2020 is estimated to level off at 4.0-4.3 million b/d.

On the other hand, the *Energy Strategy 2020* states that Russian oil exports to the Asia Pacific region could reach about 2 million b/d, including about 503,400 b/d produced by the Sakhalin offshore fields. This new export direction would leave about 4 million b/d for all other destinations, including CIS and European markets. Oil exports to CIS economies are expected to increase, reaching possibly to 704,800-906,100 b/d beyond 2010, thus leaving about 3.0-3.2 million b/d of crude oil for European customers.

In 2003, Russian oil exports to Europe and CIS consisted of 3.7 million b/d of crude oil, diesel (600,000 b/d), and fuel oil (523,600 b/d). Whatever change in the volume of exports takes place over the next two decades, it seems unlikely that these current levels will be exceeded. On the other hand, Russian exports of oil products are estimated to halve by 2020, falling from 1.5 million b/d in 2002, signaling a reduction in shipments to Europe.

The projections of the International Agency Agency (IEA) for natural gas production and exports significantly differ from the *Energy Strategy 2020* estimates. According to the IEA, Russia should reach a production volume of 710 BCM by 2010. This is above the averaged target set by the Russian government for gas output in 2020, including around 100 BCM extracted in Eastern Siberia and the Far Eastern region, mostly by independent producers.

[28] The projections presented by the IEA show that Russia's net oil exports would be lower than 5.4 million b/d in 2010-2030, while some Russian oil majors predict that about 6.5-7 million b/d could become available that would be surplus to domestic needs.

The IEA forecast that Russia would deliver about 200 BCM of gas to Europe as early as 2010, rising to 244 BCM by 2030.[29] The *Energy Strategy 2020* estimates that total gas exports will grow from 185 BCM in 2002 and 2003 to 235-245 BCM by 2020, rather than the 280 BCM proposed by the IEA. Russian gas exports to Europe are estimated at 160-165 BCM, up 22-23% from the 129 BCM exported in 2000, including 110 BCM delivered to member countries of the Organization of Economic Cooperation and Development (OECD).

On the other hand, the authors of the IEA *World Energy Outlook 2002* suggest that the share of gas in Russia's total primary energy supply will rise from 52% to 56% by 2030, when in fact the *Energy Strategy* recommends reduction of the gas share to 45% by 2020. The IEA also underestimates Russia's potential to export natural gas to maritime markets in the Asia Pacific region, including Japan, South Korea and the U.S. In fact, the Sakhalin 2 LNG project could export about 12 BCM of gas by 2015 or 50% more than the IEA outlook for 2030. Estimates for gas exports to China and the Korean Peninsula via pipelines are less dissimilar: 25 BCM by 2030 proposed by the IEA and about 35 BCM proposed by the *Energy Strategy 2020.*

Oil Prices

Prices for energy are likely to play a crucial role in defining the terms and conditions for existing and anticipated energy ties between Russia and Europe, as well as newly designed projects to open export links between Eastern Russia and Northeast Asia. The *Energy Strategy 2020* specifies that, with international oil prices staying close to $30 per barrel, Russia's energy exports could increase by 26-28% towards 2010 and 36-38% by 2020. If prices stabilize in the range of $18-20 per barrel, total energy exports are likely to rise by only 15-17% by 2010 and by 20-22% towards 2020, leveling off from 2005 onwards at 1990

[29] *World Energy Outlook 2002* (Paris: IEA/OECD, 2002), 118-119.

physical volumes. Obviously, moderate energy prices would reduce the feasibility of such proposed mega-projects as Trans-Siberian oil and gas pipelines.

The prospects for a reduction in oil prices in the aftermath of regime change in Iraq have been actively debated. Various research centers and private sector companies generally agree that an increasing supply of oil would lower prices. Experts, however, tend to disagree on how significant this reduction might be. OPEC officials consider a level of $25 per barrel to be reasonable, proposing to cut production quotas in order to avoid oversupply. On the other hand, the IEA has assumed that oil prices in 2020 will stay close to $25 per barrel at 2000 values. These projections have been criticized as being unrealistically low and based on rather inflated estimates of OPEC's output capacity of 57.5 million b/d by 2020. The argument is that OPEC's total maximum output cannot possibly exceed 40 million b/d.[30]

Some Russian oil experts have suggested that in the mid-term, $21-23 per barrel is a fair price for Russian crude oil and that $25-30 per barrel is too high, given that the production of alternative fuels as a substitute for oil would become feasible at the higher range.[31] According to the EIA, gas-to-liquid (GTL) technology could be an attractive marketing option at a certain price level for oil because the infrastructure for petroleum products is already in place. GTL technology also has enough versatility to accommodate smaller and/or stranded gas deposits economically. In addition, GTL offers a number of environmental advantages that may enhance its economic attractiveness. However, it would require a long time and massive investment before a sizable GTL production capacity could not just complement oil but constitute large segments of motor fuel supply.

[30] Ali Morteza Samsam Bakhtiari "2002 to See Birth of New World Energy Order", *Oil & Gas Journal*, January 7, 2000, pp. 11-19.
[31] Interview with Mikhail Khodorkovskiy, *Itogi*, December 17, 2002.

On the other hand, there are those in the energy industry who caution against wishful thinking with regard to falling oil prices in the long run. According to ExxonMobil, for example, resource additions in both oil and natural gas have dramatically lagged behind increases in demand during the last two decades. Advanced new exploration methods have somewhat checked the decline in newly discovered reserves, albeit in areas with a challenging operating environment.

The point made by ExxonMobil[32] is that, contrary to popular belief, the discovery of large volumes of oil and gas has not been related to price fluctuations but, rather, has been driven by the evolution of technology and geopolitical developments that have improved access to resources. In this context, the regime changes in Russia (1992) and Iraq (2003) serve as examples of "improved geo-political access," although in the case of Russia, it may take as long as 15-20 years for oil production to recover to its 1990 level. The good news is that the Russian oil sector is mainly privatized and oil companies could compete with OPEC suppliers at the lowest boundary of the projected price band.

Prospects for Natural Gas

The Russian Ministry of Economic Development and Trade has issued a forecast for increases in total natural gas exports from 186 BCM in 2002 to 231-248 BCM in 2007. Despite the rather upbeat projections for oil exports to the Asia Pacific region (about 2 million b/d in 2020) made in the *Energy Strategy 2020*, estimates for natural gas are conservative, reflecting various impediments and barriers to cross-border trade. There is no question that the energy-importing economies of Northeast Asia will significantly expand their reliance on natural gas. By 2020, demand for natural gas in Europe is due to grow by

[32] Harry J. Longwell, Executive Vice President, ExxonMobil, Remarks at the Offshore Technology Conference, Houston, May 7, 2002.

2.7% a year while in the Asia Pacific region the increase in gas demand is expected to reach 4.5% a year.

The problem is that market access for pipeline gas cannot be assured without adjustments to domestic policies in Japan, South Korea and China. In Japan, regional energy companies have enormous influence in determining the future of the power industry. If these companies, following global trends, reduce their emphasis on nuclear power, leveling off its current share in electricity generation, the market for natural gas will grow rapidly. Natural gas share in power generation could rise from the current level of 24% to 30% or more, which could justify the construction of a gas pipeline from Sakhalin to Sendai or Niigata, as is being proposed by ExxonMobil.

In South Korea, official projections assume that nuclear and coal-fired plants will account for about 80% of total power generation beyond 2010, with "expensive" LNG remaining a marginal fuel. A gas pipeline from Sakhalin, however, could allow the use of less expensive gas. On the other hand, given the current state of inter-Korean relations, an inland trans-Korea gas pipeline seems unlikely without firm political backing of all the members of the failed Korean Peninsula Energy Development Organization (KEDO).

As far as China is concerned, coal resources will remain the first priority in curbing Beijing's growing dependence on energy imports. The prioritization of the west-east domestic gas pipeline over imports may also have a negative impact on gas penetration. The west-east project is very expensive and the pipeline's capacity is comparatively low if the transportation distance involved is taken into consideration. These factors would inevitably result in very high prices for natural gas, deterring customers. In addition, imported LNG will also be expensive compared with pipeline gas that could be imported from Russia or Central

Asia. Both these factors are likely to hold back the development of the gas market in China, potentially curbing gas demand and opportunities for cross-border pipeline projects.

Finally, the predominant reliance of Japan and South Korea on LNG creates a barrier to most of the Russian natural gas that could be supplied from the heartland of Eastern Siberia and Yakutia via pipelines to Northeast Asia. By 2020, the global demand for LNG (excluding the U.S.) is expected to quadruple while the share of LNG in gas consumption will increase from the current 10% to 25%. A number of new technological trends and innovative marketing concepts could further enhance the advantages of LNG in the context of Northeast Asia.

So far, Gazprom has not taken part in the world trade in LNG, an increasingly attractive business that already accounts for around 26% of the global trade in natural gas. Given these circumstances, Russia need not rely on pipeline projects alone, as it does in Europe. Potential Russian independent gas producers should seriously consider LNG in combination with pipeline projects -- goals that the *Energy Strategy 2020* does not formulate. In this regard, the recently announced blueprint for natural gas transportation schemes in Eastern Russia, including two LNG terminals to be located in the vicinity of Vladivostok and Vanino and connected with both Sakhalin gas reserves and East Siberian gas reserves, could be a step in right direction.[33]

In addition to Northeast Asia, the U.S. market can be targeted. With demand growing, reserves heavily depleted and wholesale prices averaging at the levels of $140-180 per 1,000 cubic meters (KCM), the U.S. is becoming the world's most promising LNG market. According to the U.S. Department of Energy, by 2025, the U.S. demand for gas will grow by 1.8% a year, mainly as a result of the increasing gas use for electricity generation. This represents an additional annual demand of 130 BCM from 2001.

[33] See Alexey B. Miller, op. cit., Figure 5. Gas of the Russian East.

According to the industry publication *Petroleum Argus,* Gazexport (Gazprom's export arm) has commissioned Pace Global Energy Services to carry out financial and marketing analysis of LNG supplies to the U.S. Gazprom is keen to secure equity stakes or capacity rights in existing or projected U.S. LNG terminals. The company is aiming for a role in every stage of the supply chain, from Russian fields (the Shtokman offshore project or fields on the Yamal Peninsula) to the American customers. Furthermore, advanced GTL technologies could help moderate the region's high dependence on oil, using competitive sources of natural gas.

Natural Gas in Eastern Russia

The development of gas reserves in Eastern Siberia and the Far Eastern region is a long-term Russian goal yet to be achieved. Recently, however, this goal has became part of a number of official plans and programs, including *Economic Development Strategy for Siberia* (RP765-p, June 7, 2002), the Russian Ministry of Energy's *Program for Oil and Gas Projects in Eastern Siberia and the Far Eastern Region* (March 2003), Gazprom's *Draft Program on an Integrated system of Transport, Gas Supply and Gas Exports in Eastern Siberia and the Far Eastern Region* (March 2003), as well as the *Program on Gasification of Sakhalinskaya Oblast, Khabarovskiy Krai and Primorskiy Krai* drafted by Rosneft and approved by the Russian government in 1999.

In general, according to Gazprom, the huge gas resources of Eastern Russia can only be successfully developed and monetized if this is done in a comprehensive manner, with the following requirements being met:

- Delivery infrastructure for natural gas in Eastern Russia should be designed in such a way that it ensures the economic development and social advancement of eastern regions, energy security and supply stability.

- This infrastructure should also ensure the development of new reserves of natural gas, balancing production, consumption and exports.
- This infrastructure should be part of the nationwide gas transportation and delivery system.

The draft of the program proposed by the Russian Energy Ministry with participation of Gazprom includes the following components:

1. The option of integrating the route and coordinating the construction of oil and gas pipelines, using one infrastructure "corridor" for these purposes.
2. Assessments concerning safety, energy efficiency and environmental standards.
3. An economic analysis of the project, including gas prices, domestic demand scenarios, export options and market access, as well as various industrial applications to expand domestic demand.

Natural gas resources of Eastern Russia are significant in scale and their share in the total national gas resources is believed to be as high as 20%: known reserves (3,820 BCM in the categories A+B+C1, 2,970 BCM in C2 and 3,240 BCM in C3). These reserves are more or less equally divided between Eastern Siberia, the mainland of the Far Eastern region and the continental shelf of Sakhalin Island. The commercially available super-large reserves are concentrated in such fields as Kovykta in Irkutskaya Oblast (1,910 BCM in C1 and C2), Chayanda in Yakutia (1,240 BCM), Sobinsko-Paiginskoe (170 BCM) and Urubcheno-Takhomskoe oil-gas-condensate fields in Krasnoyarskiy Krai (690 BCM), as well as oil and gas fields offshore from Sakhalin (3,000 BCM).

The level of reserves' exploration is only 7.3% and estimated additional reserves to be confirmed before 2030 could be as large as 10,000 BCM, including 7,000 BCM in Eastern Siberia. According to Gazprom, an approach to development and transportation of these reserves should define scenarios for the optimal usage of gas for regional needs and exports, avoiding unnecessary competition between projects in terms of markets and investment requirements. These reserves can support about 54 BCM of gas production by 2010 and about 106 BCM of gas production by 2020. Thus far, domestic demand for natural gas in Eastern Siberia and the Far Eastern region is estimated at 22 BCM by 2010 and 38 BCM by 2020. At the same time, gas export projections approved by the Russian government do not exceed 40 BCM, which leaves significant volumes of production (28 BCM) not covered by domestic and external demand. This requires a special program for gas utilization, promotion and marketing, including large-scale production of LNG and synthetic fuel on the basis of GTL technology.

Moreover, the gas fields in Eastern Siberia contain methane, ethane, propane, butane and helium. The last is considered a strategic commodity by Russian law and must be utilized or stored, while the group of other hydrocarbons can serve as feedstock for the chemical industry.

The central goals in establishing an integrated gas delivery system for Eastern Russia are that it is linked to all major gas fields in eastern regions, adequately responds to the needs of both Russian and foreign gas users, is economically feasible and contributes to regional energy security, efficient use of energy, sustainability and environmental soundness.

These considerations were behind the proposal to build a Central Trunk Gas Pipeline in Eastern Russia linked with the existing gas transportation network in western regions. The

proposed system would ensure supply stability. Beginning with the northern areas of Irkutskaya Oblast, this pipeline can be integrated with the Taishet-Nakhodka oil pipeline in terms of routing and the coordination of construction activities.

As far as prices for natural gas are concerned, available estimates show that gas users in Eastern Russia with only few exceptions should be prepared to bear the full costs of gas, which, unlike in western regions of Russia, will not be subsidized through high export prices and other means. It is expected, for example, that consumer gas tariffs in Irkutsk region will be about $35/KCM), while in Krasnoyarsk region the rates could be between $42 and $52/ KCM. In Yakutia, gas prices could be twice as high compared with those in Irkutsk region, making consumer gas rates in southern Yakutia close to $45/KCM and in Amurskaya Oblast $84/KCM (a potential case for subsidies). In the coastal provinces (Khabarovsk and Vladivostok), consumer gas rates may be close to $50/KCM in the case of a larger, export-oriented pipeline being constructed, rising up to $65/KCM with the system built for domestic deliveries only.

These estimates obviously require a consistent long-term diplomatic strategy for marketing Russian natural gas to China, the Koreas and Japan. In this context, a branch oil pipeline to Daqing could be seen by the Russian government as a useful bargaining chip in negotiating with Beijing an access for natural gas from Yakutia to the Northeastern provinces of China.

Power Generation: Nuclear, Coal, and Gas

The *Energy Strategy 2020* envisages the construction of new Russian power plants, including coal-fired and hydroelectric power plants built in Eastern Siberia and hydroelectric, gas-fired and nuclear power plants constructed in the Far Eastern region. In total, the share of nuclear power in power generation should rise from the current 16% to 23% by 2020 (32% in

Western Russia). These power plants will be under the control of a unified state company and their competitiveness vis-à-vis thermo-power plants will be significant.

Yet another major priority for power generation is a very significant increase in coal production as a relatively inexpensive source of energy, including only modest investment requirements compared with other options for power plants. Inter-regional transportation of coal from production sites in eastern regions to consumption centers in western areas would double coal shipments to 130 million tons a year by 2020.

By 2020, both Eastern Siberia and the Far Eastern region should see the expansion of coal output to 40-50 million tons in each area, including 75-80% produced from open cast projects. Reduced production costs and improved quality of coal could potentially expand export prospects for Russian coal to Japan and South Korea. New generation coal mining equipment would allow the setting up of production cooperation schemes involving foreign manufacturers.

Currently, coal has to compete with natural gas as a fuel for power plants. The authors of the *Energy Strategy 2020* provide for major adjustments in natural gas pricing that change the coal-gas pricing equation in favor of coal. Currently, low domestic gas prices (62% of the level for coal) make Gazprom's revenues and investment programs almost entirely dependent on exports. This situation will change with increased gas prices (110% of the level for coal by 2006), improving further (from Gazprom's standpoint) during 2010-2020. By 2006, domestic gas tariffs adjusted for inflation should double compared with 2002 levels. By 2010, the domestic price is expected to be balanced by European gas market prices adjusted for transit

fees, import tariffs and other duties. As a result, gas prices will be tripled from the current level by 2010.[34]

Changes in gas pricing would obviously affect prices for Russian electricity and coal, which are expected to grow by half by 2006, doubling by around 2010. At the same time, the competitiveness of coal will increase, leading to a decrease in the share of natural gas in the total primary energy supply from the current 50% to 48% by 2010 and 45% by 2020. By 2010, the share of coal in Russia's total energy supply is projected to grow from the current 19% to 20%, with the share of nuclear power rising from 11% to 12%, replacing natural gas. Increased gas prices would enlarge the proceeds from domestic sales, making gas exports less attractive. Russian gas market reform and liberalization promise to make investment in new natural gas ventures more feasible. On the other hand, a design for the gas delivery infrastructure should prioritize domestic market.

Canada as a Model?

The *Energy Strategy 2020* envisages natural gas production in Eastern Siberia and the Far Eastern region climbing to 100 BCM under favorable conditions. It does not, however, offer a detailed concept for reserve development, infrastructure construction and gasification in these areas. As mentioned above, the Russian Energy Ministry and Gazprom[35] proposed building a Trans-Siberian high-capacity gas pipeline connecting the Kovyktinskoe and Chayandinskoye gas fields and other gas fields in Eastern Siberia and Yakutia in parallel with the Trans-Siberian oil pipeline.

Indeed, the largest cities in Eastern Russia are located along the Trans-Siberian railway. The total population of these cities is more than 4 million and at least another 4-5 million people

[34] Domestic gas prices, projected to rise from the current $23 per 1,000 cubic meters (KCM) to $40-41/KCM in 2006, $40-45/KCM in 2008, $59-64/KCM in 2010 and $60-65/KCM towards 2020.
[35] See Alexey B. Miller, op. cit., Figure 5. Gas of the Russian East.

live in smaller settlements located along the border with China. In addition, the same railway zone is a prime location for major industrial enterprises and power plants. This plan for gas transportation includes an extension of the pipeline from Vladivostok to the Korean Peninsula. It seems, however, that the "Canadian pipeline model" could be more realistic in policy terms and more fundable in regard to the project's implementation. Indeed, there are some similarities between Eastern Russia and Canada, with its "gas production in the west, consumption in the east" pattern.

In Canada, the single West-East transmission pipeline system moves gas across the country and along the U.S. border. Although there is considerable domestic consumption of gas, the 16 export pipelines deliver gas to U.S. markets. These pipelines are spread out along the border and their total annual maximum capacity is above 80 BCM.[36] Canadian gas infrastructure allows the number of users to be maximized with a number of export-oriented branch pipelines tailored to market needs. A similar approach adopted in Eastern Russia would serve to integrate the domestic use of natural gas with its export to neighboring cities in northeastern China.

Also, Canada offers another example of cross-border energy cooperation, promoting cross-border power grid interconnections. Access to U.S. markets is providing a profitable market for Canada's abundant energy resources. Interconnections improve the economics and security of electricity supply and reduce the level of capacity needed to meet peak loads. Interconnections also improve the flexibility of electricity supply. This makes it possible to minimize costs by replacing the highest-cost generation, such as oil-fired generation, with imported hydro-electric energy.

[36] *Natural Gas Pricing in Competitive Markets* (Paris: OECD/IEA, 1998), 64; *Energy in Canada 2000*, 60.

The *Energy Strategy 2020* proposes the interconnection of power grids in Eastern Russia between Western and Eastern Siberia and the Far Eastern region. The Federal Grid Company and the System Operator, both funded from federal resources and controlled by the state, will be the major players in the national grid's maintenance, expansion and management. Electricity prices are projected to double by 2020, reaching 4.0-4.5 cents per kilowatt-hour (kWh) as the average tariff for all groups of customers. Cross-border interconnection is also on the agenda, with optimistic forecasts of electricity exports reaching 75 per terawatt-hour (TWh) by 2020. European electricity markets and power grid interconnection are defined as the priority goals.

In Eastern Russia, there are many opportunities for hydroelectric power generation based on unique water resources and their geography. Low-cost energy can be generated by projects that are efficient both in economic and environmental terms. Electric power is now the only exportable energy resource in Eastern Siberia. The regional electric power systems in Krasnoyarskiy Krai and Irkutskaya Oblast have excess capacity, capable of producing about 16-18 billion kWh (TWh) of electricity. Annual power generation by all Far Eastern hydroelectric power plants is 11 TWh. After the completion of four new projects, power output will grow to a combined total of 23 TWh a year.

By 2010, the total newly commissioned hydro capacity in Eastern Siberia and the Far Eastern region is likely to reach 4 gigawatts (GW), including 1.5 GW and 2.5 GW of additional capacity commissioned in these two areas. During the following decade, new capacity is expected to total just 2.2 GW, including 1.4 GW in Eastern Siberia. After the completion of these projects, the hydroelectric power utilization rate in the Far Eastern region will be 6%.

The potential for electric power exports will be further enhanced with the commissioning of the Bureyskaya HPP, the top priority for the Far Eastern region. Its commissioning will reduce the demand for coal from distant sources and allow electricity exports to China and the Koreas. By 2020, if adequate investment is secured, the seven hydroelectric power projects currently under construction and those at the planning stage will generate up to 50 TWh of electricity at competitive prices. In the optimistic scenario, electricity exports from the eastern regions of Russia to neighboring countries may be estimated at 20-22 TWh by 2010 and 50-60 TWh by 2020. The Chinese market could provide an opportunity for electricity exports of about 15-25 TWh a year from Irkutskaya Oblast alone.

As of today, however, there are only 110 kilovolt (kV) and 220 kV power lines extending to Mongolia and Northeastern China, and these have a limited transmission capacity. Discussions are underway concerning the formation of cross-border electric power network infrastructure, with Russia playing the role of the electricity supplier. This is not an easy task, considering the distances and costs involved, not to mention access to neighboring markets. The practical steps proposed by electricity experts include a 2,600 km-long 600 kV "Bratsk-Beijing" 3GW (18 TWh) capacity line, and a 470 km-long 600 kV "Sakhalin-Japan" 4GW (22 TWh) capacity line.

Policies and Outlooks

Since 2000, the recovery of Russian oil output and political stabilization under President Vladimir Putin have been highlights of global energy developments. At the same time, China's continuing economic advances have led many experts to believe that growing Chinese energy use will affect the global energy demand-supply equation. In this context, the Chinese-Russian energy dialogue and a proposed oil pipeline project to be built from Eastern

Siberia to Daqing have became very important to both sides and also attracted significant international attention.

On the other hand, the official U.S. stance on Russia as a major oil producer and exporter has changed, responding to the geo-strategic challenges emerging in the aftermath of the September 11, 2001 terrorist attacks. In May 2002, the U.S.-Russia New Energy Dialogue was launched at a bilateral summit, leading to greater Japanese confidence of Russia's potential to supply oil and natural gas to the markets of Northeast Asia.

Japanese-Russian technical exchanges and preliminary discussions on the Angarsk-Nakhodka oil pipeline project began near the end of 2002, culminating in informal negotiations and several high-level meetings, including the January 2003 visit to Moscow by Prime Minister Koizumi. Both the Russian and Japanese governments published their long-term national energy policy outlooks in 2003, each for the first time focusing attention on Northeast Asia and prospects for cross-border gas projects, as well as an oil pipeline to Nakhodka. Japan proposed that the share of natural gas in the Asian giant's total primary energy supply should grow from the current 13% to 20% by 2020.

Moscow, on the other hand, proposed the eastward diversification of energy supplies, to the Asia Pacific region and Northeast Asia, in particular. The new plan for energy sector development -- the main provisions of the *Energy Strategy 2020* -- basically assumes that, under a favorable scenario, crude oil exports to the Asia Pacific region could reach about 2 million b/d a year, equivalent to one-half of the current oil exports or one-third of optimistically projected oil exports in 2020.

If Northeast Asia procures 10-15% of its imported oil from Eastern Russia, linking the oil pricing formula with the European market, some experts theorize that a reduction of the "Asian Premium" could be possible. Furthermore, a regional agreement on a scheme for multilateral oil stockpiling and the lease of oil stockpiling facilities could be an important step in providing additional security of supplies.

It is projected that Russian gas exports to China and the Korean Peninsula via pipelines could reach 25-35 BCM by 2020, but these volumes could be much larger, given that advanced natural gas transformation technologies could help to moderate the region's high dependence on oil. In total, the share of Northeast Asia in Russia's gas exports could reach 15-20% by 2020. Technically, a gas pipeline to South Korea could be routed via North Korea.

Towards the end of 2002, South Korea proposed a new initiative for the sub-region, including its potential to develop cooperative links in the energy sector. On the other hand, in 2003, the activities of KEDO were suspended in the aftermath of new uncertainties and suspicions with regard to North Korea and its nuclear program.

These important policy developments on both the domestic and international fronts were accompanied by progress in the practical field. For example, the West-East gas pipeline project in China entered the implementation phase. A trilateral Russia-China-South Korea feasibility study on a gas pipeline from Kovykta to China and South Korea has been completed. In South Korea, a country-wide gas transportation system has been constructed, stimulating enthusiasm for the Sakhalin-Khabarovsk-Vladivostok-Korea gas pipeline project. Also, ExxonMobil (Sakhalin 1) proposed a plan to export natural gas to Japan via a submarine pipeline built to Niigata or Sendai and Tokyo area. Funding for another north-south gas pipeline on Sakhalin was allocated by Sakhalin Energy (Sakhalin 2) to feed the

LNG plant with gas. A local Komsomolsk-na-Amure-Khabarovsk gas pipeline and an oil pipeline from Sakhalin to DeKastri port on the continent are in progress.

Finally, the Russian government announced its plans to support the construction of an oil pipeline from Angarsk to Nakhodka with a branch to Daqing.[37] Gazprom revealed its plans to build a Trans-Siberian gas pipeline, linking Eastern Russia with its giant network of pipelines constructed in Russia's western regions. The integrated West-East trunk pipeline plan steered by the Russian Energy Ministry envisages building a high-capacity gas pipeline (about 33 BCM per year) in parallel with the Angarsk-Nakhodka oil pipeline, connecting various gas fields in the area and a gas pipeline network in Western Siberia with the Pacific coast. However, a submarine gas pipeline between Sakhalin and Japan has been proposed by ExxonMobil. Moreover, the Sakhalin 2 LNG project will export about 12 BCM annually in the form of LNG by 2015 and these volumes could double, responding to the growth in demand. Eastern Russia's unique hydroelectric power potential presents an opportunity for cross-border projects that are efficient both in economic and environmental terms.

As far as international organizations are concerned, in 2002, APEC launched its Energy Security Initiative, urging joint exploration and development of oil and gas reserves, reliance on non-petroleum energy sources and the development of new technologies for alternative fuels, high-efficiency vehicles, and public transport. APEC leaders proposed adopting best practices in energy efficiency and conservation and coordinating energy sector development plans, particularly in regard to environmental protection.

[37] The adopted plan includes building an oil pipeline linking new oil-and-gas fields in Krasnoyarskiy Krai, Irkutskaya Oblast and Yakutia with the Trans-Siberian trunk oil pipeline. A west-east mega-pipeline system with an annual capacity of 1.8 million barrels a day should be built in the direction of Nakhodka. From Tynda, a smaller pipeline with a 0.6 million barrel a day capacity would turn south, crossing China's border.

In addition, between 2002 and 2004, the Russian Energy Ministry held consultations with its counterparts in Japan, China, South Korea and Mongolia. It is worth noting that Russian energy minister was invited to the 2003 IEA ministerial meeting as an observer. At the meeting, the Japanese and South Korean ministers stressed the importance of energy cooperation in Northeast Asia. The South Korean minister mentioned plans to establish an organization to contribute to sub-regional energy cooperation and urged the IEA to assist with this process. In summary, the sub-regional energy cooperation could be viable, if it meets the following criteria:

- Serves national interests in general
- Enhances energy security in particular
- Promotes competition in energy prices
- Supports international competitiveness
- Assists development of regional economies
- Provides benefits to local communities
- Facilitates environmental management
- Strengthens regional stability and security.

If adopted, these approaches would lead to an expanded intra-regional oil and gas supply, putting new sources in competition with existing, tried-and-tested channels. To make it all possible, however, the economies of Northeast Asia need more flexible and effective decision-making regarding cross-border infrastructure development and exploration efforts, as well as a major adjustment of energy policies.

Furthermore, the old-style price bargaining among energy consumers and producers should give way to comprehensive, supportive relationships based on mutual benefits and long-term interdependence. On the production and supply side, Moscow is expected to play a central

role. For the foreseeable future, Russia can only play such a role in a partnership with its neighbors. In this context, "geopolitical access" to Russian reserves of hydrocarbons must be complemented by "geopolitical willingness" on the part of the economies of Northeast Asia to rely on these reserves.

Conversely, the economies of Northeast Asia need Russia and its energy riches for their own sakes. Access to oil and gas reserves in Eurasia is a matter of vital importance. These reserves, particularly those located within reasonable proximity, could serve as an energy security device and a catalyst for fair pricing, as well as sub-regional economic integration. In the long term, region-wide energy infrastructure could become the foundation for a sub-regional system of stable, cost-efficient energy supply and environmental management.

Russia-Korean Peninsula

The problem of a stable electricity supply is central to the economy of North Korea. As long as this problem remains unsolved, North Korea will be unable to promote industrial modernization or carry out domestic and export-oriented projects, including joint projects with South Korea and other countries. Also, the energy crisis in North Korea has dire social and humanitarian dimensions.

Power Plants

While discussing bilateral economic and trade issues with Russia, representatives from North Korea consistently raise the question of reconstructing and modernizing the four key power plants built with the assistance of the FSU. Those power plants are the Pyongyang, the East Pyongyang and the Chongjing heat-and-power plants, as well as the Pukchang thermo-power station. In the meantime, the North Korean government is paying special attention to the construction of the East Pyongyang heat-and-power plant.

The commissioning of the second phase of the East Pyongyang heat-and-power plant appears to be the priority objective, opening up an opportunity for cooperation. Timely funding of this project is essential. The project could positively affect the economic climate on the Korean Peninsula and encouraging North Korea to treat other projects more constructively. In short, this project can help improve North-South Korean relations, as well as facilitate cooperation between North Korea and other countries. Technical aspects of the Pukchang thermo-power plant project have already been worked out, including equipment designs and delivery schedules. The list of projects under discussion includes the Pyongyang heat-and-power plant, the extension of the Chongjing heat-and-power plant and the construction of the second phase of the East Pyongyang heat-and-power plant.

Russian subcontractors and potential investors are well-positioned to build new industrial enterprises in North Korea and reconstruct existing ones, given that many of the latter were designed and built by Soviet experts. The experience accumulated potentially could help reduce the costs and the timeframes of the projects. Russia has made it clear to Pyongyang about its intentions to rely on external funding to finance such bilateral projects. This proposal was accepted by North Korea at a Moscow summit in August 2001 and reconfirmed on other occasions. However, the prospects for project financing will be determined in the context of the North Korea's debt repayments.

Electricity Supply

During an Economic and Social Commission for Asia and the Pacific (ESCAP) seminar held in Khabarovsk in October 2001 on power cooperation in Northeast Asia, a delegation from North Korea's Ministry of Energy and Coal Industry and representatives of "Vostokenergo"

discussed the possibility of forming a cross-border power supply system, involving North Korea and Far Eastern Russia.

This was followed by delegation from the Energy Systems Institute (ESI) of the Siberian branch of the Russian Academy of Science visiting Pyongyang in November. The purpose of the visit was to discuss the situation in North Korea's power sector and possible options for cross-border cooperation based on the understanding between North Korea's Ministry of Energy and Coal Industry and "Vostokenergo". As a result, the Russian delegation and the Institute of Automation of North Korea's Academy of Science signed a cooperation agreement. The ESI expressed its readiness to prepare a technical and economic assessment of the project, including the required funding estimate.

The North Korean side suggested the idea of power interconnection between the cities of Vladivostok and Chondjin to supply electric energy to the Far East in the morning and evening hours and to North Korea in the daytime. This proposal, however, was not accepted because the Far Eastern region does not need additional power supply. With the commissioning of the Bureyskaya hydroelectric power station, there will be an oversupply of electric power in the Far Eastern region.

However, the construction of an electric power line to the territory of South Korea via North Korea is possible. South Korea could receive cheaper electricity and cover its electric power shortages. The estimated cost of the design work and construction of this electric power line from Vladivostok to the border of North Korea (225 kilometers) and then to Chondjin (120-130 kilometers) is estimated between $300-500 million. Additional work would be needed on Russian territory itself, including at Khabarovskiy and Primorskiy krais.

Gas Pipeline Projects

There are two gas pipeline projects proposed for bringing natural gas to the Korean peninsula. One pipeline would come from Irkutsk and supply gas to China and South Korea, while another one would link Sakhalin with the Korean Peninsula via Khabarovsk and Vladivostok. The second pipeline option could become operational in a 2008-2009, providing gas to Korea five to seven years before the Kovykta (Irkutsk) pipeline.

Gas demand in South Korea is projected to exceed 40 BCM per year by 2015. Thus, there will be more than 15 BCM of new demand by the time the Irkutsk pipeline could become operational. South Korea's share of the Irkutsk pipeline could be about 7 BCM per year, leaving 8 BCM for Sakhalin gas. The initial estimate for construction cost of this pipeline is $3 billion.

Government support and involvement in negotiating project agreements is a necessary prerequisite to financing and construction of this pipeline. For South Korea, the Sakhalin gas delivered via a pipeline is the closest and least expensive option. The Russian government recognizes the value of this project for Russia, and has pledged its support. The U.S. Department of Energy has committed funding for the feasibility study of this project.

Conclusion

Environmental considerations, in addition to the energy security needs and overall stability of Northeast Asia, are likely to contribute to emerging trans-border energy links in Northeast Asia. Although the environmental impact of energy use seems to come in as a poor third to energy security and energy costs, the so-called "Three E's" – Energy Security, Economic Growth and Environmental Protection – must be seen together as the guiding principles for the energy policies of the economies of the sub-region. Japan and South Korea have formally

adopted this "policy triad" as members of the IEA, which is linked to the OECD. These two economies were joined in recognizing these principles by Russia and China as they adopted the Declaration of the 5th APEC Energy Ministers Meeting in Mexico in July 2002. This should serve as common ground for further cooperative steps.

Managing energy security at the national level involves policy choices and the setting of priorities. These choices are made by states, normally involving a balance between continuity and innovation in policy. The innovative solutions available within the Northeast Asian sub-region may not be free of risk (nor free of cost), but they could substantially ease existing burdens and irrationalities in securing energy supplies. Cooperation in the field of energy promises to reduce the cost of energy, enhance the efficiency of energy use and its sustainability, and promote economic and social development, thereby contributing to the wellbeing and overall security of the societies.

In the contemporary world, there is no region (or sub-region) without problems and contradictions. In this regard, Northeast Asia is not unique. The difference is in the capacity of the region's countries to manage multiple interests and what might be termed "historical problems," and find some innovative alternatives. In contrast to Europe and ASEAN countries, the economies of Northeast Asia have yet to acquire such a capacity.

In Europe, the Second World War provided the impetus for cooperation based on coal and steel. This gradually led to economic integration and unity. What could perhaps work for Northeast Asia is the concept of a competitive, efficient and region-wide energy sector that serves the needs of both consumers and national economies. Similar to Europe, the energy security of Northeast Asian countries could potentially serve as common ground for a dialogue, followed by adjustments in policies and economic and investment decisions.

Indeed, an interest in achieving energy security and competitive pricing could potentially be the catalyst for cooperative approaches in a number of fields.

Again, like Europe, the overall external dependence of Northeast Asia on hydrocarbons cannot be dramatically reduced; Russia can only play a somewhat balancing role as a supplier. Policies that promote new sub-regional energy links could, however, reduce energy security risks and the economic costs of managing those risks.

The cost of both imported and domestically produced energy influences the rate of economic growth, balance of payments and real incomes. By promoting energy cooperation within the sub-region, the leaders of Northeast Asia can create a path towards improving the investment attractiveness of the sub-region, enhancing the competitiveness of its economies, industries and enterprises.

On a number of occasions, Japan and South Korea have discussed the "Asian Premium" that exists for contract prices on imported Middle East crude oil imports to Asia versus the price of the same crude sold to the West. This higher cost must be absorbed by Asian industrial and individual consumers, as well as the public sectors. The economies of Northeast Asia combined pay about $10 million on a daily basis (about $1 per barrel of crude oil) more than oil importers in Europe and North America. Experts agree that sub-regional oil cooperation could improve the importing economies' bargaining power vis-à-vis the currently dominant oil exporters.

In contrast, an "energy mix" that optimizes the basket of fuels, lowering both the share of oil and its cost, could help to improve energy security. In Europe and North America, the share of natural gas in the energy mix is much higher than in Northeast Asia. Moreover, in addition

to the world's largest reserves of natural gas, Eastern Russia offers its neighbors unique hydroelectric power potential.

In other words, a cooperative approach to cross-border energy links in Northeast Asia should encompass the most significant components of energy security. These components include oil supply security and the cost of imported oil, natural gas supplies and their competitiveness with existing sources. Also important are new gas-based technologies including GTL, the enhancement of nuclear safety and cross-border power interconnection. Also important are the economic and environmental benefits of untapped hydroelectric power reserves and government-business partnerships in energy exploration and development.