

Development of Sakhalin Energy; Can the Barriers be Overcome?

Judith Thornton
Professor of Economics
University of Washington
Seattle WA 98195
thornj@u.washington.edu

April, 2000
Draft; Do not cite

Development of Sakhalin Energy; Can the Barriers be Overcome?

Judith Thornton
Professor of Economics
University of Washington
Seattle WA 98195
thornj@u.washington.edu

For at least two decades, energy experts have talked about the coming energy boom in Asia. Here is the most rapidly growing region in the world, a region with a large energy deficit, adjacent to Pacific Russia, a region with a tremendous potential stock of oil, gas, and electricity. Each of the countries of Asia experienced its own problems with rising economic and environmental costs of energy use. However, Asia lacked access to the clean, low cost piped natural gas that has been the major source of cost saving and pollution reduction in Western Europe, the US, and Russia.

Between 1989 and 1997, the National Pipeline Research Society of Japan, established by the Mitsubishi Research Institute, studied existing pipeline systems and undertook the design of a major gas trunkline system for Japan. Today, a separate Asian Pipeline Forum continues to study the potential for construction and operation of natural gas pipelines throughout Asia.¹ At the same time, in Russia, the L. A. Melent'ev Energy Systems Institute in Irkutsk was estimating mammoth multi-level, multi-sectoral models for 18 sectors of four regions, modeling the potential benefits from development and export of Siberian energy to Asia.²

Yet, few of these paper plans were realized. During the 1990s, Western multinational energy companies undertook joint projects with newly privatized Russian oil firms and purchased ownership shares in some Russian energy producers. But few of the early projects fulfilled the hopes of producers and investors. Some were financial

¹ Kengo Asakura, Chief Researcher, Mitsubishi Research Institute, "Concept for a Natural Gas Pipeline that will Support Asia's Symbiosis," *Energy* (November 1998).

² Iu. D. Kononov, E. V. Gal'perova, O. V. Mazurova, V. V. Posekalin. *Energoemkost' ekonomiki i tseny na energonositeli: global'nye tendentsii*. Irkutsk: Institut Sistem Energetiki im. L. A. Melent'eva SO RAN, 1999.

disasters. In the case of natural gas, most development remained in the hands of Gazprom. However, Gazprom's plans were oriented westward toward Europe.

In the decade following economic reform, the Russian economy received a trickle of foreign direct investment. In 1999, only \$4 billion of foreign direct investment was committed to Russia, while capital flight leaving the country was running at \$1.5 billion per month. Even more surprising, Russia's two largest export sectors, oil and gas, received little of this foreign capital. Of the modest investment flowing to industry, only 15 percent went to the oil and gas sector.

Investor Perceptions of Risk

Investors, themselves, had no difficulty explaining their reluctance to commit resources to Russia. They pointed to the high levels of political and economic risk, corruption, and illegal activity, fuzzy property rights, weak rule of law, and weak corporate governance as some of the major impediments to investment. In the case of natural resources, which are owned and controlled by the government, they found particular problems in defining and enforcing rights of access. Managers of domestic resource firms operate within a network of informal institutions linking Russian financial industrial groups and government regulators. However, foreign investors lamented the lack of a "level playing field." In the absence of a clear, enforceable framework defining ownership, taxation, and regulation, there is a high risk of expropriation, either by administrative intervention or by "creeping expropriation" through unpredictable changes in laws, taxation, and administrative regulation.

There is a large economic literature that considers how the risk of expropriation impacts the behavior of investors and host countries. An investor who invests capital investment into a host country may be held hostage once the capital is sunk. These papers ask to what extent implicit, self-enforcing agreements can provide a framework for cooperation. The problem with self-enforcing agreements is that each party must have the means to punish a partner who deviates from the *ex ante* agreement.

Elsewhere in the world, partners use many different mechanisms to provide incentives to abide by agreements and to penalize deviation. Agreement is possible if

both partners' benefits from continued agreement are greater than the potential gains to either from deviation.

Reputation is a powerful mechanism for enforcing contracts between partners, for a country, which gains a reputation for default or creeping expropriation loses much of its access to the capital market. Sometimes partners will find a way to "post a bond" or hold each other's assets hostage to guarantee their partner's good performance. Investors may commit resources gradually, anticipating that the host-country's short-run incentive to expropriate will be offset by the long-run incentives to gain access to future finance, technology, or know-how.

Energy projects present particular problems of accountability because the investor provides technology and capital before output can be produced. Large natural gas projects, extending across national borders, are the most difficult projects to realize because both demanders and producers must commit to long-term guarantees even when future states of the world--future costs, prices, and technologies--are highly uncertain. Thus, although there are great potential benefits to the development of Russia's energy, there are significant obstacles as well.

Sakhalin's Energy; A Test Case

A case study of development of the offshore oil resource of the Sakhalin shelf provides a test of attempts to build a contractual framework for investment when both the domestic and international frameworks for contract enforcement are weak. In the early years of Russian economic reform, many attempts of Western oil companies to undertake commercial projects in Russia proved to be financial disasters. Investment into development of Sakhalin's offshore oil and gas resource is a crucial exception.

In September 1999, I visited Sakhalin to interview local government officials, academic specialists, and executives of Western energy firms and subcontractors. I asked: How were Sakhalin projects able to move forward at a time when other investment was postponed? What benefits did the Russian Federation, the local governments, and the local community expect to receive from the projects? What strategies did investors adopt in order to minimize the risk of outright or creeping expropriation?

In the Soviet era, Sakhalin Island was a heavily subsidized military outpost, but, with the advent of economic reform, jobs were few and population fled to more prosperous regions. Moscow and local officials alike had strong incentives to reverse the decline of Russia's periphery.

Development of the oil and gas resources of the Sakhalin shelf promised to serve as a catalyst, generating new investment and lowering energy costs in Northeast Asia. Although Sakhalin was officially designated a special economic zone, it received its first significant oil investment only in 1995, when a consortium, which included Saudi Arabian investors, committed resources to the rehabilitation of damaged on-shore oil fields and constructed a small, local oil refinery. Then, the territory saw a ten-fold increase in foreign investment as exploration began on the first two of several proposed projects on the Sakhalin shelf. Between 1996 and 1999, two of these projects, called Sakhalin-1 and -2, invested more than \$1 billion in exploration, field development, and construction of infrastructure on the island.

Western involvement in the Russian energy sector was delayed by the need to put in place a legal structure for production sharing agreements similar to those used in most other countries. However, the original Russian Federation Law on Production Sharing Agreements, signed by the Russian parliament in December 1995, was a seriously flawed document. The law provided that international contracts were subject to parliamentary approval. It limited the number of production sharing agreements and mandated strict domestic content conditions. Moreover, directives in the law conflicted with instructions in other existing resource legislation, there were few safeguards for the foreign investor in the event of a dispute, and the Russian government reserved the right to make unilateral changes in the regulations in response to changes in world markets.

Even with production sharing, the Sakhalin shelf seems to offer few technological advantages. The island has little port or transport infrastructure. The offshore reserves are located in Arctic conditions and are subject to fierce storms, iceberg damage, and high seismic risk. They can be accessed by sea only five or six months of the year.

Although the development of oil and, especially, natural gas, offers substantial economies of scale, the Russian government chose not to offer resource rights in a single commercial tender. Instead, they tendered rights to individual reservoirs separately,

usually offering joint access to sites, which, they believed, based on early exploration, included one oil reservoir and one natural gas reservoir. They hoped, in this way, to benefit from potential competition among firms. They expected that early extraction of oil by each producer would fund longer-term development of natural gas, but the fragmentation meant that no single natural gas site was large enough to justify construction of a large, high capacity pipeline network by itself.

Sakhalin's Oil and Gas

The history of oil and gas on Sakhalin goes back to the beginnings of the Soviet era. Today, nineteen on-shore fields still operate, although they are nearing the end of their commercial life. In 1974, a Japanese consortium, called Sodeco, organized around Japan's national oil company, and multinational oil company, Exxon, undertook exploration of the Sakhalin shelf. Under terms of the agreement, Japan advanced credits of \$176 million, to be repaid only if a sufficient resource was discovered and extraction was deemed profitable. In this case, Japan was to receive half of the output. Between 1976 and 1982, the project discovered two fields, Chaivo and Odoptu, but neither field was considered profitable at the lower fuel prices of the 1980s and so development was postponed. Subsequently, Russian efforts identified several additional offshore fields. In 1988, the Soviet Ministry of Oil and Gas received authorization to develop two of these, but their lack of experience in a difficult offshore environment meant that foreign participation would be required.

In May 1991, Russia invited competitive international bidding for a feasibility study of two large deposits in northeastern Sakhalin, called Piltun-Astokhsky and Lunsky. On the basis of preliminary exploration, one of these was believed to be primarily an oil resource, the other a natural gas resource. After intense competition between six investment groups, a consortium, which included Marathon Oil, McDermott, and Mitsui, was chosen to undertake exploration, and a company, Sakhalin Energy Development Company was established. Later, McDermott withdrew and Mitsubishi and Royal Dutch Shell joined the consortium.

The resource stocks that had attracted such intense interest were large, but not giant. They are located in a region of energy deficit, although the Sakhalin shelf presents

Arctic conditions and high seismic risk. Their estimated reserves were more than half the size of reserves in Alaska's Prudhoe Bay (1 billion tons of crude and 3.6 trillion cubic meters of gas), but almost three-quarters appeared to be natural gas, consumption of which would require expensive investment in pipelines or facilities to process and transport natural gas, LNG.

The four large fields under current development are:

- Odoptu - 15-20 kilometers offshore, 22-40 meters depth. Oil is found at 1200-2000 meters deep in 13 layers.
- Chaivo - 12-15 kilometers offshore, 18-32 meters depth. Oil is found at 110-2800 meters deep in 10 layers.
- Lunsky - 112-15 kilometers offshore, 40-50 meters depth, 5 blocks.
- Piltun-Astokhsky - 12-15 kilometers offshore, 26-33 meters depth. Oil is found in 14 layers.

Piltun-Astokhsky and Odoptu were expected to provide the primary stocks of oil and gas condensate, while Chaivo and Lunsky are primarily gas fields.

Project Governance

Foreign projects on Sakhalin are designated by their signing dates, Sakhalin-1,-2, etc. Except for Sakhalin-2, which is foreign-owned, all projects are required to have joint ownership with a Russian partner. Moreover, some recent licensees have agreed to assign an additional ownership share to a commercial firm owned by the Sakhalin Oblast Administration.

The Russian partners in these projects are Rosneft-Sakhalinmorneftegas and Sakhalinmorneftegas (SMNG). Rosneft is a government oil holding company, which controls a miscellaneous assortment of assets, which were not integrated into the vertically integrated closed joint stock companies formed after the break-up of the former Soviet Union. Rosneft serves as the exclusive exporter of the government share in oil sector production-sharing arrangements and runs a vast sales network for refined products. It controls the Komsomsk-na-Amure oil refinery in Khabarovsk Oblast, which receives Sakhalin crude oil by pipeline and processes it.

Sakhalinmorneftegas is a medium-sized oil producer, formed on the basis of a former government production association. It currently produces about 1.5 million tons of oil and 1.78 billion cubic meters of natural gas annually, delivering both to the Russian market by pipeline. It was partially privatized in 1994 when an 18.36 percent stake was sold at a voucher auction and another .31 percent was sold at a cash auction. In 1995, it was amalgamated with Rosneft, which now holds a 51 percent stake in it.

Recently, a new subsidiary of Rosneft was created, AO Dalneftegas. It will represent Russian interests in the development of Sakhalin's natural gas. More than half of its shares will belong to Rosneft and its subsidiary Sakhalinmorneftegas. The other 49% will be distributed equally between AO Rosgazifikatsiya (the gas pipeline construction contractor) and the Administrations of Sakhalin, Khabarovsk and Primorskii Krays. These are the major potential domestic natural gas consumers. The agreement forming the new subsidiary stipulates that the Rosneft and SMNG shares of gas production must be delivered to the domestic market. It is an open question on what terms domestic consumers would be supplied.

In March 2000, Sakhalin, Khabarovsk, and Primorye further announced the formation of a regional company, Daltrans, which intends to construct pipeline capacity between Sakhalin Island and the Russian mainland. The company, which is jointly owned by the State Property Committees of the three territories, received an allocation of 97.5 million rubles (\$3.4 million) from the Federation government to begin construction. In October 1999, President Putin promised Federation support for an extension of existing pipelines to southern cities in the maritime region. However, the fact that Rosneft and the Khabarovsk Oblast government have more than a year of payment arrears with existing energy suppliers raises fears in Sakhalin that energy producers might be obligated to deliver oil and gas without compensation.

Western participants in Sakhalin's existing and potential projects are major international oil companies together with Sodeco, a consortium organized around the Japanese national oil company. Sakhalin-1 brings together Exxon Neftegas (30 percent), Sodeco (30 percent), Rosneft-Sakhalin (17 percent) and SMNG (23 percent) in a project to develop Chaivo, Odoptu, and Arkutun-Dagi fields. A production sharing agreement was signed in 1995, and work has been underway since 1996, with about \$400 million

committed to the project by 1999. However, the project is still in the exploration phase, meaning that the partners have yet to determine commercial feasibility. Exploration revealed potential commercial stocks of natural gas rather than oil, but development of gas would require long-term contracts with users before international capital markets would provide financing for a pipeline network.

Exxon has signed an agreement with a Japanese company to evaluate the feasibility of a gas pipeline to Japan. This company, Japanese Sakhalin Pipeline Study Consortium, has participation from Japex, Itochu, and Marubeni. The group is investigating both an underwater pipeline to Hokkaido and a land route to China. Exxon believes that pipeline gas could be delivered to Japan at about one-third of the cost of liquefied natural gas.

The Sakhalin-2 consortium was more fortunate in its initial exploration when drilling revealed commercial quantities of oil. To date, they are the only group to undertake commercial development. In July 1999, Sakhalin-2 began production of early oil under a production sharing agreement. The operating company, Sakhalin Energy Investment Company, (SEIC) brings together Marathon (37.5 percent), Mitsui (25 percent), Mitsubishi (12.5), and Shell (25 percent) in developing the Piltun-Astokhsky, and Lunsky fields. The project began slowly in 1991 and accelerated after signing of a production sharing agreement in 1994. SEIC proposed a phased development of the Piltun-Astokhskoye field starting with Astokhskoye, which was approved, in principal, in 1996.³ In July, 1999, production started at SEIC's Vityaz complex which consists of the Molikpaq offshore drilling rig and an adjoining offshore oil storage tanker from which oil transport tankers offload product for transport to the Asian market. In September, the first tanker of oil was shipped to Korea, after a brief dispute in which the Far Eastern Customs Authority denied the company the right to export. With export rights affirmed, SEIC announced plans to undertake production for approximately 6 months of 2000, at a rate of 90,000 bpd to produce a total of 1.4 million tons of oil (worth considerably more than \$200 million at current high prices for oil.)

³ Sakhalin Energy Investment Company Ltd. Development Plan for Phased Development of Piltun-Astokhskoye Field. (Processed draft.)

Sakhalin-2 has taken the lead in the proposed construction of a natural gas pipeline to the south of Sakhalin with the intention of building a liquefied natural gas (LNG) plant with an eventual capacity of up to 8.9 million tons per year. In March 2000, they announced a tender for an engineering and specification study for this facility. Consortium partner, Shell, produces and distributes LNG throughout Asia. If this option is implemented, LNG could be shipped to Japan, South Korea, Taiwan, and coastal China, or elsewhere in Asia.

In the case of LNG, too, there are constraints on both the investment and demand sides. Funding of an LNG plant at a port site in south Sakhalin, Prigorodnyi, would require guaranteed long term commitments to purchase at a price sufficient to justify investment. However, until its economy begins growing again, Japan is unlikely to be interested in large increases in its rate of purchase of LNG. Its existing, fragmented distribution system delivers LNG to electric power stations at extremely high prices, but it lacks the infrastructure to deliver gas for district heating, the highest value use. The coastal provinces of China are growing but, so far, have little LNG infrastructure. In that market, Sakhalin will compete with highly competitive Southeast Asian suppliers. In the short-run, only South Korea seems to have the existing pipeline infrastructure and high economic growth to want to commit to rapidly increasing consumption of natural gas.

Originally, the Sakhalin-3 tender involved two Western groups: Mobil and Texaco with Rosneft-SMNG, in a project called Pegastar to develop the Kirinsky field and Exxon, with Rosneft-SMNG and SMNG, to develop the Ayashsky and East Odoptinsky fields. Subsequently, Exxon merged with Mobil, so these projects might move forward together. However, the Kirensky field, with an estimated 450 million tons of oil, 970 billion cubic meters of gas, and 62 million tons of gas condensate received approval for production sharing but the Ayashsky and East Odoptinsky fields (114 million tons of oil and 513 billion cubic meters of gas) are still pending.

Sakhalin-4, a collection of two offshore and three on-shore fields was licensed to Rosneft-SMNG and SMNG. Initially, they formed a joint project with Arco, but, in January 2000, when the project failed to get approval of production sharing, Arco withdrew. Rosneft-SMNG intends to finance exploration drilling in the summer of 2000, using its own drilling rig, currently being refurbished in Japan.

Sakhalin-5 would tentatively involve British Petroleum and Sakhalin-6, Pegastar (Exxon-Mobil-Texaco) in joint exploration with Rosneft-SMNG. Thus, policies toward current projects have a large potential impact on other potential projects in the region.

Production Sharing and Taxation

Production sharing legislation was intended to simplify the complex and changing tax structure that businesses face. Without production sharing, a conventional resource project in Russia would pay royalties (6-16%), geology fund payments (10%), VAT (20%), and excises (approx. 14%) on production or sales; profit tax (38%) on profits; payments to pension fund (28%), state employment fund (2%), social insurance (5.4%), medical insurance (3.6%), education fund (1%), militia fund (2%), and transport fund (1%), plus excess wage tax (38% less deduction) on wages bill. On imports there would be customs duty, excise, VAT, and customs clearance. Then there would be property tax (2% of assets), land use payments, and, in the case of oil, payments for loss of fish.

Production Sharing Agreements also simplify the legal framework. The original Russian Federation Law on Production Sharing Agreements, signed in 1995, allowed the Federation government to enter into an agreement with an investor granting the investor exclusive rights to prospect for and extract mineral raw materials from a designated site.⁴ A license was to be issued jointly by the Federal Agency for State Mineral Resource Management and the territorial administration. However, international contracts were subject to parliamentary approval, and there were strict domestic content conditions (set at 70 percent of costs.) Moreover, the Russian side reserved the right to make unilateral changes in arrangements in response to changes in world markets. There were few safeguards for the foreign investor in the event of a dispute. The Production Sharing Law explicitly exempted the investors, their contractors, and subcontractors from taxes, fees, excises, and other obligatory payments except for profits tax, royalty payments, bonuses, exploration payments (levied on the user of subsoil resources), land use payments, and insurance coverage of Russian employees.

⁴ Russian Federation Law No 224-FL on Production Sharing Agreements, Moscow, 30 December '95; Passed by the State Duma on 6 December, approved by the Federation Council on 19 December '95 (Cited in Rossiiskiya Gazeta, 11 January '96, 3-4.

A number of enabling laws and regulations followed.⁵ In addition, the Federal Duma passed the Law on the List of Fields Eligible for Development under Production Sharing Terms, controlling and sharply limiting the number of projects that would be eligible for PSA. The Duma placed a cap of 30 percent on the share of sites that could be developed under PSA in any individual region. For "strategic resources" (such as the shelf) the ceiling was 10 percent.

At present, Russian tendering of resource stocks is based on a set of model Production Sharing Agreements. Tenders for offshore fields are conducted by the Committee on Geology and Sub-Soil Resources of the Russian Federation (Goskomnedra) and the Sakhalin Administration after authorization by a Federation decree. For each round, a tender committee of federal and territorial officials considers the bids. Interested firms receive a copy of a model Production Sharing Agreement (PSA) and submit sealed bids by a specified deadline. Submitted bids must include a minimum guaranteed commitment of exploration activity for each of the first five years as well as any proposed changes to the PSA.

The PSA for Sakhalin-4 is an example. It includes a royalty of 8 percent on production and profit tax of 35 percent.⁶ There is a cost recovery limit of 80 percent. Production shares depend on the company's accounting internal rate of return after payment of profit taxes. At a rate of return lower than 22 percent, the split is 70 percent to the company, 30 percent to the Russian Federation. For rates of return 22-26 percent, there is a 60-40 split. Above that point, the production split changes by 10 percent for every 2 percent increase in rate of return. Based on long-run projections of production and cost, the model PSA provides a company-Federation division of 55-45.

The Sakhalin-1, -2, and -3 contracts additionally provide bonus payments to the Federation government upon reaching certain milestones, such as initial signing and the

⁵ The President's Decree on Measures for Enforcement of the Federal Law on Production Sharing Agreements, issued in 1997, allowed the Ministry of Finance and State Tax Committee to establish taxes. The Federal Law on Amendments and Additions to the Russian Federation Legislative Acts following from the Federal Law on Production Sharing Agreements amended other, conflicting legislation. The Enabling Law for Production Sharing Agreements, passed in February, 1999, made changes in 12 other federal laws to eliminate conflicts with the PSA. Then, in April, 1999, a federal law "On Gas Supply in the Russian Federation" provided a legal framework for natural gas development, pricing, and marketing.

⁶ The tax data provided by Jack Holton, "Sakhalin--giant reserves and hungry markets," *Petroleum Economist*. Gas in the Former Soviet Union, 1993.

start of production. Under the PSAs, each consortium contributes to the Sakhalin Development Fund after a commercial discovery is announced and annually for 5 years after that.

Negotiations between federal authorities and the territorial government determine the division of payments between the Federation and territorial governments. The Federation Treaty and Federation Law on Sub-Soil Resources specify a division of the royalties for extraction of hydrocarbons, which gives the federal government 40 percent, territory 30 percent and local government 30 percent. Under an agreement negotiated between the Sakhalin administration and the federal government, Sakhalin is to receive the following income shares:⁷

	(%)
Sakhalin Development Fund	100
Royalties	50
Bonuses	60
Profit oil	50

Out of the 32% profits tax on investor income, Sakhalin receives 22%.

The Sakhalin Energy Investment Company's Development Plan for the Piltun-Astokhskoye Field provides the following estimates of Russian government revenues for Phase I of the project (prior to development of natural gas reserves.) They project Russian government income of \$2.7 billion dollars, including \$470 million received by 2005.

Estimated Russian Income

	(\$ Mil)
• Royalties	417.
• Profit Shares	1137.5
• Sakhalin Development Fund	100.
• Exploration Reimbursement	160.
• Bonuses	30.

⁷ Interview with Galina Nikolaevna Pavlova, Head, Department on Development of Mineral Resources of Sakhalin Shelf 15 September, 1999.

- Profit Tax 854.9
- TOTAL RUSSIAN INCOME 2699.3
- CUMULATIVE REVENUE TO 2005 470.

Galina Pavlova, Head of the Department on Development of Mineral Resources of the Sakhalin Shelf said that she expects the Sakhalin-2 project to generate government revenue of about \$500 million by 2005.⁸

The financial projections of Pegastar for the South Kirensky portion of Sakhalin-3 are similarly optimistic.⁹ If South Kirensky contains a recoverable reserve of 450 million tons of oil plus 720 billion m³ of gas, then the Russian government would receive prior to production:

- PSA signature bonus \$25 million
- Exploration bonus 10 million
- Discovery bonus 5 million
- Sakhalin Development Fund 100 million

During peak production, the Russian government would receive about \$1 billion per year from royalties, taxes, and sale of profit oil. This would total \$20 billion over the life of the project, consisting of royalties, taxes, and sale of oil:

- Royalties and taxes \$12 billion
- Sale of government oil share 8 billion

Although, in theory, introduction of Production Sharing Agreements should represent a breakthrough, in practice, their implementation remains chaotic. The PSA legislation contradicts many existing laws, and it will take considerable time before conforming legislation is put in place that recognizes the exceptions and provides a framework of conforming decrees, regulations, and instructions.

⁸ Ibid., 15 September, 1999.

In 2000, Russia has a new parliament, which seems much more likely to support policies of the president than was the case in the past. Within the Duma, an inter-factional group organized by Viktor Chernomyrdin, called Energiya Rossiya, is likely to lobby for an industry-wide extension of production sharing arrangements and a simplification of the tax regime, so the regulatory environment may soon become more supportive of investment.

What Makes Sakhalin Different?

What were the characteristics of the Sakhalin shelf projects that made the Russian government willing to offer its resource for foreign development and made foreign multinational oil companies willing to bid when other resource projects were frozen? Moscow's concern at a dwindling population on its periphery provided a context.

Both sides recognized that the Russian industry could not undertake the projects immediately itself. The Russian Ministry of Oil and Gas had extracted energy from 19 on-shore fields on Sakhalin for many decades. However, they lacked the technology and experience with offshore drilling in an Arctic environment to initiate development independently. The domestic oil industry faced severe capital constraints. Investment in the sector was inadequate even to maintain existing wells, so oil production was declining steadily.

The natural gas stocks of Sakhalin, although potentially large, were separate and distant from Gasprom's vast network linking West Siberia to Europe. International financing for either a network of gas pipelines or a gas liquefaction facility would require firm, long-term contracts with a potential user, possibly Japan, South Korea, or China. However, there were significant demand side constraints in each of these markets in the short -run.¹⁰

⁹ Sakhalin Administration. Neft i gaz Sakhalina. 1998, p. 172-173.

¹⁰ Of the three potential energy demanders in North East Asia, South Korea appeared to have the strongest interest in potential energy projects, based on its high economic growth and existing physical infrastructure. Japan, which pays extraordinarily high prices for LNG deliveries to its electric power stations, lacks the physical infrastructure to deliver pipeline gas for district heating, the highest value use. With low growth and little competitive pressure, its energy bureaucracy was unlikely to invest, even for substantial cost saving. Natural gas accounts for less than 2% of current Chinese energy consumption. There was likely to be a growing market for LNG in Chinese coastal provinces, but there was a highly competitive supply in southeast Asia as well. China and Russia are exploring the possibility of delivery of natural gas to

There were other factors as well. In the Soviet era, the Ministries of Oil and Gas had a weak record in insuring the long-term life of existing fields and in protecting the environment. Of course, competitive markets for rights to resources were missing to signal what energy stocks would be worth under optimal development. Moreover, there was little monitoring of the long-run consequences for life of a reservoir or total recovered stock of technological decisions that, in effect, maximized the current yield to inputs by trading off the unpriced value of future stocks. In consequence, by comparing the time paths of production in similar reservoirs in Russia and the West, economists discovered that approximately 40 percent of the total economic value of resource stocks was lost in Russia.¹¹ So policy makers expected foreign development to provide a larger total flow of rents, and they expected, through strict domestic content rules, to create incentives to upgrade the technology of domestic oil equipment.

Environmental costs were similarly high. (In 1999, the head of a Western environmental-remediation firm who traveled to Komi to clean up a major oil spill reported that he counted 16 other leaks in the pipeline in the space of 30 kilometers.)¹² Thus, policy makers believed that offshore drilling by the domestic Ministry would pose a significant danger to their important Pacific fishery, worth approximately \$4 billion per year to the Russian fishing fleet and the marine communities of the Russian Far East. The Russian fisheries industry and the regional local governments had blocked offshore development for many years on environmental grounds and they remain a vital interest group.

In spite of environmental concerns, measures to slow the population exodus favored immediate development. In the Soviet era, Russia had maintained a substantial military presence in its maritime provinces. At the beginning of economic reform, as central support for military and security forces fell, more than 100,000 people left Sakhalin. Official unemployment was high among the remaining 609,000 residents as the employed population dropped from 362,000 to 254,000. For many of those who were on the government payroll, "employment" provided a scant subsistence, often many

Northeast China from the Kovytko field, but financing of a pipeline network across Mongolia would require long-term agreement of all parties.

¹¹ James Smith, "Cost of Lost Production in Russian Oil Fields," *Energy Journal*, Vol 16, No 2, 25-33.

¹² Interview Sakhalin Island, September, 1999.

months overdue.¹³ It was unlikely that fishing, logging, and farming could support more than a small share of the existing households, but workers could find neither jobs nor housing elsewhere in the country. Moreover, there were strategic considerations; a continued outflow of population threatened Moscow with the possible loss of its Pacific gateway.

Western Interest in Sakhalin's Oil

From the point of view of Western oil producers, interviewed in September 1999, investment in Russia offers some unique challenges. A Western multinational has experience in many other countries offering a range of institutional frameworks. In industrialized countries, the oil producer finds well-developed physical and institutional infrastructure, developed financial markets, an effective legal framework, and strong networks of suppliers and services. But such markets also present many strong competitors.

In less developed economies, the oil producer finds weak infrastructure and capital markets, an incomplete legal framework, and little local industrial support. In these markets, firms must be prepared to construct everything from scratch. But policy makers are often open to modernization, and the formation of strong relationships can create a relatively stable business environment for the individual firm and provide some barriers to competition.

The Russian environment represents a third situation in which there is a large and politically powerful domestic oil and gas industry in place that has incentives to block foreign competition. There is also a large body of administrative regulation and practice, much of which is unproductive in a modern, competitive business environment. New legislation, reflecting world practice, contradicts past regulation and practice.

Western producers expected that existing domestic energy producers would not oppose their activity on the Sakhalin shelf because of its remoteness and difficult technical characteristics. In the main, this expectation has proved correct. Resources leaving the small, declining domestic industry sought employment in prospective Western-funded projects.

¹³ Goskomstat. Sakhalin v 1999.

More importantly, Western firms saw Sakhalin as a location in which their production could have direct access to the world market, where they would not be held hostage by Transneft, the government owned pipeline monopoly. They hoped that the government's interest in fostering production and promoting employment on Russia's periphery would generate government commitment. They expected Western-style production-sharing legislation to establish a secure framework of taxation, eliminating some of the opportunities for creeping expropriation of potential rents. On this score, their hopes appear to be over-optimistic.

Western producers appear to have the ability to impose some potential penalties in the face of outright expropriation. Their centralized technological resources, skilled personnel, and support services could be transferred to numerous other projects elsewhere in the world. In the case of Sakhalin Energy Investment Company, even their offshore production facilities have some limited physical mobility. If production were terminated they could physically remove their oil storage facility, a tanker, and even their oil-drilling platform, the Molipaq (although, in another project, Mobil reports that it took 10 ships seven days to tow a 600,000 ton platform about 325 km.)¹⁴

Russia, too, has access to audited company accounts to monitor against cost inflation on the side of the multinationals. Current Russian rules require each project to have a Russian partner. Only Sakhalin Energy Investment is fully Western owned, but it works closely with the oblast government of Sakhalin.

Implementation Issues

Interviews with oil company executives, subcontractors, and officials in the government administration in September 1999 brought up frequent examples of what might be called "hold-up" problems. However, companies anticipated many of these problems and were prepared to deal with them—albeit at a considerable cost. They maintain personnel to work through administrative and legislative hurdles, seeking support from territorial government agencies, which are committed to the projects, when necessary. In some ways, the Sakhalin environment is like a "tragedy of the commons," with each regulatory agency trying to hold up the project for a piece of the rent. One

¹⁴ Sakhalin Oblast Administration. *Neft i Gas Sakhalina*, 1999

executive of a company drilling an exploratory well listed 32 permits and licenses that were required before drilling could start. "None of these permits is trivial," he said. "Each requires reports, fees, and negotiations. Each agency can shut down everything." Often, the problem was competition between three or four agencies with overlapping jurisdictions, which had conflicting requirements. On environmental issues, Goskomekologiya, the environmental agency, the Committee for Sanitary-Epidemiological Oversight, and the Oblast Shelf Department often have three conflicting views that need to be reconciled. There are cases in which federal authorities at the center hassle both the territorial branch of the same federal agency and Sakhalin's own regulatory agency. For example, both the local branch of the Ministry for Emergency Situations and the Coast Guard Agency of the Ministry of Transport have been involved in developing a system for oil spill response, so they objected when federal authorities came in insisting on a totally new, centrally directed program.

Regulatory over-kill provides significant amounts of government employment and raises project costs. (More than 40 percent of the employed population of Sakhalin is in government service.) For example, the Director of Environmental Programs for one project estimated the annual extra costs of getting approvals and permits at approximately \$500,000. However, this is a relatively minor impediment compared with other sources of uncertainty. In many cases, the oil companies simply accept that their projects have to bear the costs of certain hypothetical impacts. So, for example, they work with the scientific research institutes in fisheries to provide measures of impact. Based on those, they subsidize fisheries enhancement and scientific research.

Although the 1995 production sharing law specifically exempts project equipment from the Russian value added tax, the Customs Authority levied VAT on all equipment imports, appeals to central authorities notwithstanding. By mid-1999, more than \$80 million in illegal VAT had been collected. The Tax Authority promised that investors would be allowed to add VAT to the eventual capital cost of the project before calculating profits, but this capture of taxes up-front before the projects produced any income sabotaged the timing of bonuses and payments to the Sakhalin Development Fund. These had been set up to guarantee that the territorial government would enjoy a steady flow of revenue of at least \$20 million per year for the life of the project. Now,

there would be a delay before Sakhalin would eventually share in profits. (In March 2000, the federal government announced that Customs would cease charging value-added tax on equipment imports under PSAs.)

Collapse of the Russian banking system in August 1998, further disrupted project accounts. All of the foreign companies lost the balances in their local hard currency accounts. One company, which had just transferred \$10 million in payments into a Russian bank, lost the full amount when the bank went bankrupt.

In 1999, the State Environmental Agency issued a regulation requiring that all companies barge their drilling fluid to shore and deposit in a waste disposal site. "The drilling fluid contains salt water and bentonite," one engineer explained. "This is normally discharged at sea, for example, in the North Sea. But dumping salt water on land is certainly harmful. We will prepare a safe, well-designed disposal pit, but this will double our direct costs of drilling and raise the total project costs about 10 percent." Another engineer alleged, "One project paid SMNG to barge their drilling mud away, so SMNG barged it to a different location and dumped it in the sea." Exxon, which had two drilling rigs waiting, had to cancel one year's exploration. (In the spring of 2000, Exxon is still trying to gain approval of a drilling procedure from a committee of experts appointed by Goskomekologiya.)

On September 21, 1999, the tanker, Seamaster, loaded the first 81,000 tons of Sakhalin oil to transport to Korea. However, before they could set out, the Far Eastern Directorate of the Customs Authority issued a letter ruling that, since SEIC was not a joint venture, it did not have the authority to export oil. Again, the Customs ruling was directly contradicted by production sharing legislation, which guarantees the right to export product. After considerable consultation with government agencies, the oil was shipped.

Then, a week later, while SEIC president Alan Grant was meeting with consortium members in Houston, both lines on the oil storage tanker, Okha, broke loose at midnight in moderate seas. Automatic sensors shut down the oil flow and separated the oil delivery hose from the tanker.

Oil spill response teams began working immediately, collecting about a barrel of the approximately two and one-half barrels of oil that escaped. Since no further oil could

be found, calls for additional spill response resources were cancelled. Nevertheless, a week later the State Ecological Committee ruled that three and one-half tons of oil had been spilled, imposing a hefty fine on SEIC.

Although it would be an exaggeration to call this experience "creeping expropriation," still the Russian government regularly imposes unanticipated taxes, fees, and regulatory burdens on foreign investment. Multinational companies, anticipating this environment, prudently restrict their investment.

The strategy that SEIC uses is to try to assure that the government, and especially the territorial government, derives a substantial, predictable income from the project in every period beginning well before the project itself generates a flow of income. The implicit possibility of withdrawal comes up each time a serious problem arises. The withdrawal of Arco from Sakhalin-4 in the winter of 2000, combined with a slowdown in exploration by the other companies, led the Russian government to announce in March that they would no longer charge value added taxes on equipment imports.

Ownership Issues

Resource projects are considerably more complicated when there is joint foreign-Russian ownership. Rosneft-SMNG and SMNG, which are obligatory partners in most current projects, have claimed they were not able to contribute to project costs. Difficulties sometimes arose when SMNG wanted to function as project subcontractor, receiving payment from Exxon. Such a dual role makes it difficult to enforce cost and quality constraints on work, particularly when the PSA mandates high local content.

A future ownership issue is the request by the Sakhalin Shelf Development Department that their closed joint stock company, called Sakhalin Oil Company, should be given a 5 percent ownership share, deducted from the foreign partner's ownership share, although SOC would not contribute to the cost of investment. SOC expects to market the territory's profit share as well.¹⁵

Northeast Asian Demand for Natural Gas

¹⁵ Interview with Galina N. Pavlova, Head, Department on Development of Mineral Resources of Sakhalin Shelf, Sakhalin Administration, 15 September 1999.

No energy project can succeed without a market. Market access, which is a minor issue in the case of oil, is a major barrier for sale of natural gas. There is an active world market for crude oil and petroleum products, even in periods in which the OPEC cartel of petroleum producers succeeds in restricting production and raising prices. For Russian oil producers, the relevant constraints on production and profitability are not international; they are the regimes of taxation and regulation imposed by the Russian government. Exporters of oil face variable export taxes, which rise directly with world prices. (They are set at 20 ecu per ton when oil price is \$25 per barrel.) Transneft, the government pipeline monopoly, controls access to the export market, imposing high transport fees. Federal regulations further restrict access to the foreign market, requiring refiners to sell most of their output on the domestic market at low, internal prices.

Still, entrance into the oil market is child's play compared to the design and implementation of a successful natural gas project. The production and transport of natural gas involves enormous economies of scale. A promising resource stock becomes an economic asset only if there is a firm, long-term demand for the natural gas at a price and location that will justify the high cost of constructing a pipeline or facilities to liquify natural gas. In order to invest in natural gas projects, capital markets require firm, long-term contracts between demanders and producers, supported by a strong legal framework. For, without a strong legal framework, either side of an exclusive, bilateral agreement might be held hostage by their partner. Otherwise, neither side can make a believable commitment to abide by the terms of their initial agreement. Moreover, in industrial economies, construction of a pipeline requires legal rights of eminent domain, giving the energy producer a right of way to transport gas from a reservoir to the user.

Where are the markets for Sakhalin's natural gas? Located just 60 kilometers from Hokkaido, Japan, Sakhalin is well situated in Northeast Asia, an energy deficit region enjoying impressive rates of economic growth. Its closest neighbor, Japan, pays the highest energy prices of any industrial country, although, with recent low rates of growth, Japan has had weak incentives to seek new energy sources. In contrast, China's growth has exceeded 9 percent per year for the past decade. It pays heavy environmental costs for the high share of coal in its current energy balance. With natural gas accounting for less than 2 percent of total energy consumption, China's has strong economic and

environmental reasons to increase the share of gas in its expanding consumption of energy. South Korea, too, seems to be returning to a rapid growth track after the Asian financial crisis. Its focus on production of heavy industrial products means that several of its industries are energy-intensive. In the past, Korea has tried to foster growth by providing industry with access to low cost energy, so it is particularly well prepared to make use of Russia's natural gas.

The Russian Far East economy, itself, is a potential market for energy. In the Soviet era, when the relative prices of energy products were one-tenth or less of world prices, the region was a heavy consumer of energy for metallurgy, military machine building, fishing, and timber, importing 46 percent of its energy. Producers faced high fixed costs for district heating in a severe climate. Today, the region's industries seek access to energy on heavily subsidized terms, but they are unable or unwilling to cover its costs. Their presence increases the likelihood that Russia would have incentives to require producers to deliver energy to domestic consumers at low prices after the fixed capital was in place, contributing to the risk that investors foresee.

Sakhalin's natural gas could flow to one or more of these potential demanders, but there are barriers to be overcome in each case. In the case of Japan, Hikaru Yamada and Arlon Tussing argue that the most serious obstacle to introduction of piped gas (or even expanded use of LNG) is Japan's lack of an internal gas transmission and distribution network together with the high level of stranded costs that their existing energy utilities would bear if more efficient, lower cost energy suppliers were to emerge.¹⁶ Currently, they claim, Japan is at a serious, competitive handicap, with LNG imported at 20 widely dispersed and unconnected terminals. A network of open-access gas pipelines could link the LNG import terminals with one another and with industrial and population centers. Without such links, Japan lacks the flexibility to shift supply from high-value district heating to interruptible industrial uses. With such flexibility, Japan might lower its energy costs to half of present levels.

Between 1989 and 1997, the Mitsubishi Research Institute organized the National Pipeline Research Society of Japan to study the feasibility of a pipeline system. The

¹⁶ Hikaru Yamada and Arlon Tussing, "Japanese Gas Pipeline Grid Mapped Out: Seeking US Help," *Natural Gas Journal* (May 1998).

society, whose corporate members included Japan's main gas and electric companies and energy equipment manufacturers, drafted the design of a major gas trunkline system for Japan. This plan could serve as a blue print, allowing Japan to improve its gas transmission system. Without transmission infrastructure, Japan will have difficulty profiting from access to Sakhalin's natural gas, whether that gas comes in the form of pipeline gas, as Exxon assumes, or as LNG, as Sakhalin Energy plans.

Accessing the Chinese market presents slightly different problems. China's energy balance is still heavily influenced by Chinese central plans and by the policies of China's energy monopolies, China National Petroleum Corporation (CNPC), China Petroleum Corporation (Sinopec), China National Offshore Oil Corp (CNOOC), and (recently) China National Star Petroleum Corp (CNSPC). CNPC, with 1.5 million employees, produces 90 % of China's oil and gas. It has been attempting to cut its costs and has signed dozens of onshore oil contracts with foreign partners. Sinopec, the flagship of China's petroleum industry, has been upgrading its existing refineries and petrochemical plants, but potential joint ventures with foreign partners have moved forward slowly.

Currently, Prime Minister Zhu Rongji is promoting a program to import LNG into Southern China. Construction has started on a 3 million ton per year import terminal in Guangdong, which is to be linked to the cities of Shenzhen, Dougguan, and Guangzhou by a 400 km pipeline. Sakhalin governor Igor Farkhudinov and his staff visited southern China in the fall of 1999 to begin a dialogue on possible future links. Royal Dutch Shell, a partner in Sakhalin-2, is expected to play a lead role in finding markets for Sakhalin's LNG.

Meanwhile, Sakhalin-1 is also studying the potential of pipeline gas, delivered to the Russian mainland and, from there, to Northeastern China and/ or South Korea and Japan. South Korea is clearly the country in the best position to make use of natural gas in the short-run. It already has a natural gas grid with two loops--one surrounding Seoul and the other in Southeastern Korea.¹⁷ Although Korea's industry is undergoing major restructuring in the wake of the Asian financial crisis, its rapid economic growth and

¹⁷ Arlon Tussing and Samuel Van Vactor, "South Korea's Thirst for Gas," *Financial Times Energy Economist* (March 1998).

specialization in relatively energy-intensive industries makes it a strong potential customer for Sakhalin. For all of the major customers in Asia, Japan, China, and South Korea, Sakhalin's natural gas could be supplied sooner and at lower cost than alternative sources from Irkutsk (including Kovyntinsk), the Vilyusk Basin of Sakha, or the Sobinsk field in Krasnoyarsk.

If strong institutional infrastructure were in place to support long-run international energy contracts, then Russian producers and Asian consumers could enjoy major benefits from access to low cost energy. Northeast Asia could enjoy something of an energy boom. However, until the legal framework is strengthened, these projects may remain pipe dreams and Pacific Russia will remain a symbol of untapped potential.

Conclusion

Pacific Russia has suffered a decade of decline and exodus of population, a trend that is likely to continue. Yet, both the Russian Far East and East Siberia hold a wealth of energy resources that could fuel an energy boom in the rapidly growing countries of Asia.

The development of Sakhalin-1 and -2 on Sakhalin Island shows that it is possible to undertake major investment projects even in Russia's high-risk environment. The early indications that Russia's new Duma will support the executive branch in providing a stronger legal framework for investment in the coming year provides additional grounds for cautious optimism. Clearly, it is not resource constraints or technological barriers that impede development of Russia's energy. Rather it is institutional barriers that present investors with unacceptably high risks. Russia's energy wealth could be an extremely valuable asset if levels of political and economic risk could be reduced. Today, Russian policy-makers remain badly divided on whether to develop their energy sector as part of the international market. So Russia's current high levels of political and economic risk remain a difficult barrier.