

SUSTAINABLE DEVELOPMENT OF OIL & GAS PROJECTS IN EASTERN RUSSIA (YAKUTIA)

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Introduction

The Sakha Republic (Yakutia), located in Northeastern Siberia, is one of the richest regions in Russia, with 95% of Russia's diamonds, 40% of Russia's gold, vast coal fields, enormous gas fields, and many smaller oil & gas deposits, many yet unexplored. While development of diamonds, gold and coal occurred under Soviet direction, now the Republic is developing its oil and gas reserves, primarily to satisfy local needs and to contribute to economic development.

Prospected recoverable gas reserves in Yakutia are estimated to be more than one trillion cubic meters, with a South Korean team estimating total reserves at over 12 trillion cubic meters. Recoverable oil reserves are more than 200 million tons, with at least 25 million tons of gas condensate reserves. In total 30 gas, oil and gas-condensate bearing fields have been discovered to date, with more expected as western companies get involved. To date, however, development has proceeded slowly, due to lack of hard currency, harsh weather and construction conditions, and caution by the government in dealing with foreign energy companies.

Since May, 1992, the authors have been working with officials in the Sakha Republic (Yakutia) to initiate several major development projects, with the involvement of American companies. Now a number of projects are moving forward, including geophysical studies, exploration, extraction, pipeline projects, and small oil refineries. While development of energy reserves for export could greatly contribute to economic development, satisfying local needs for gas and refined oil products is a higher priority. It is intended that these projects will involve foreign investors and participants, based on established partnering and contracting practices in the world.

Just as important as the economic issues involved, however, are the environmental concerns. Much of the Sakha Republic is covered by permafrost, which is extremely sensitive to damage and destruction from construction projects. Local officials don't want to repeat the environmental destruction which occurred under soviet dominance. In addition, more democratic political processes in the region have allowed for the rise of environmental interests among the citizens and politicians in Yakutia, so that environmental protection and sustainable development are of growing concern there, as they are in other areas of the world. While this introduces new

constraints on development, it emphasizes the opportunities they have to develop Yakutia's natural resources in a controlled and more environmentally sensitive manner than elsewhere in Russia, where oil & gas development is well underway. In addition, the Sakha Republic offers many opportunities for western experts and companies to participate in these developments.

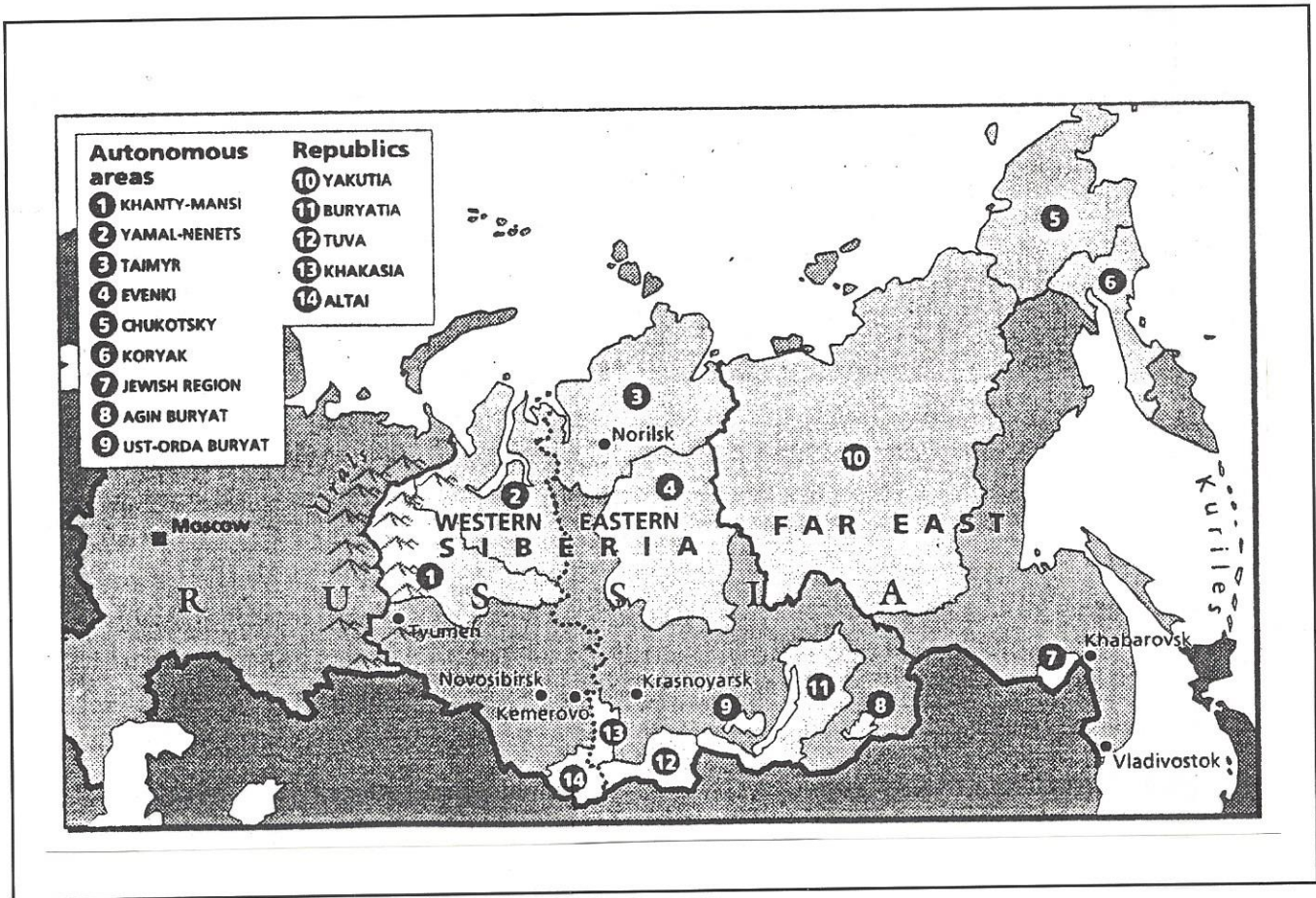
Introduction to Sakha Republic (Yakutia)

The Sakha Republic is the largest of Russia's semi-autonomous republics. In size it is 3,103,000 square kilometers, approximately 1/5 of the territory of the Russian Federation and 1/3 the size of the United States. (See Map in Figure 1) Like many other regions in far eastern Russia, it has become more and more independent of central Moscow control over the past two years. While the Sakha Republic intends to remain a part of Russia, in December, 1991, a president was elected, a new regional government was formed, and the name "Sakha Republic" was officially adapted. In 1992 that government set out to bring Yakutia into the modern world, initiating infrastructure and industrial projects, soliciting investment from the West, and establishing new and proactive relationships with neighboring regions and countries.

Within Russia, Yakutia is well known for several characteristics. First and foremost is that Yakutia is rich in diamonds, gold, silver, coal, oil, gas and other mineral. Secondly, however, the area is famous for its cold weather and harsh living conditions. The average winter temperature in Yakutsk, the capital, is -35° C. In the far north temperatures plunge to -50° and -60° each winter. Although outside construction work does proceed during the winter, these temperatures add new complexities to work related to oil & gas processing. For instance, equipment and systems must be designed to withstand extreme low temperatures, in some cases requiring special metals and insulations. In addition, winter work can be dangerous. Finally, environmental protection becomes more difficult, due to the permafrost and the wide differences between winter and summer geology, water and soil characteristics.

Overview of Sakhanephtegaz

The Sakha State Oil and Gas Company, Sakhanephtegaz, was established in 1992 to plan, direct and manage development



of Yakutia's oil and gas reserves. In addition to Sakhanephtegaz, however, several other government organizations are responsible for various aspects of energy resource development, including the Ministry of Industry and Energy, the State Committee on Geology and Mineral Reserves, the Ministry of Ecology and Nature, the Ministry of Finance, and the Committee on Economy and Prognostification of the Sakha Republic. Each of these organizations has a set of responsibilities and is involved in key decisions related to exploration, extraction, production and transportation of oil & gas products.

Sakhanephtegaz, however, is responsible for most implementation and operational activities associated with Yakutia's oil and gas reserves. The following major objectives have been established for Sakhanephtegaz:

1. To increase the base of oil and gas reserves for the Republic
2. To organize and increase extraction and processing of oil and gas, primarily aimed at satisfying local needs of consumers in the Sakha Republic for products and by-products

3. To deliver oil and gas exports outside the Republic

To accomplish these objectives, Sakhanephtegaz has been made responsible for the following major activities:

- Organization of licenses for usage of oil and gas reserves
- Oil and gas exploration and characterization
- Oil and gas extraction
- Regulations of oil and gas pipelines
- Control of production and delivery of oil and gas products
- Preparation of agreements with foreign investors and energy companies
- Foreign investment into the oil and gas complex of the Sakha Republic

- Investing state capital into oil and gas development and production
- Management of state oil and gas properties
- Contributing to the development of regional oil and gas joint-stock companies
- Implementing the privatization of state enterprises in the oil and gas industry
- Arranging and coordination of visits by foreign investors, on behalf of the state

Oil & Gas Reserves In The Sakha Republic

30 fields of hydrocarbon raw material have been discovered in Western Yakutia, 19 fields in the Southwest of the Republic (Nepsko-Botuobian oil-bearing Region), and 11 fields in the Central part of the Republic (9 in Vilyuian, one in Predpatomian, and one in Predverkhovyanian oil and gas-bearing regions). All these fields have been studied to different degrees. Ten fields have been prospected in detail, 15 fields are under evaluation, and the rest have yet to be assessed.

In January, 1993, proven gas reserves were estimated at 1,307 billion cubic meters, including 789 billion cubic meters in the Botuobian gas-bearing region, 506 billion cubic meters in the Vilyuian gas-bearing region, and 12 billion cubic meters in the Berezovsk depression. Oil reserves were evaluated as 1092 million tons, with 255 million tons immediately recoverable. All of the oil reserves evaluated to date are in the Botuobian oil-bearing region.

Other oil and gas prospecting activity is underway in known and also unexplored areas of the Republic, some with the involvement of American, Austrian and Canadian energy companies. Information concerning quantities and characteristics of oil and gas reserves in the various fields is available from Sakhaneftgaz. In general, according to reports developed by Sakhaneftgaz, large oil and gas-bearing territories of commercial interest, both known and prospective fields, occupy nearly half of the Sakha Republic.

Oil & Gas Projects In Yakutia

Exploratory drilling for identifying and characterizing oil and gas fields in Yakutia began in the 1930s. To date, 912 wells have been drilled over a total area of 2183.7 thousand square meters. Those wells include 9 stratigraphic, 115 parametric, 286 prospecting, and 502 exploratory wells. Average density of deep drilling is 1.6 m/square km. As a result of geological

prospecting 216 areas are considered deeply drilled, with deep drilling proceeding in 33 areas. The Nepsko-Botuobian and Vilyuian gas-bearing regions have been the most studied. Many regions of the Republic have had no drilling, with many areas insufficiently studied.

Now the main target of geological prospecting is for development of raw materials for oil and gas processing, in areas where commercial reserves are already known. Emphasis and investment are now on extraction and processing of those commercial reserves. Eleven oil-gas-condensate fields with estimated recoverable reserves of 156,746,000,000 tons can be the source of oil. Four fields can be used for initial oil production and refining. The following projects are now in process or planned.

Srednebotuobian Field Development

The Srednebotuobian Field is located 130 km southwest of Mirny and 140 km northwest of Lensk. This project is intended to set the oil-gas-condensate field into test production, with a target to produce 300,000 tons of oil per year by the year 2000. Additional wells will be drilled and processing/refining will be established for local needs. In 1994 an oil-bitumen refining unit, produced by the Krasnokamsk Plant in Perm, will be placed into production. It will produce 30,000 tons/yr of road asphalt. During 1994-95 equipment will be added for producing benzene, with plans to install refinery equipment for producing helium.

Irelyakh Field Development

The Irelyakhian oil-gas condensate field is located very near Mirny, partially occupying part of Mirny's industrial zone. The plan is to begin commercial production of the Irelyakh Field with production of 400,000 tons of oil per year. It is necessary to refine oil from the Irelyakh Field to meet the demands for light oil products, heating fuel and asphaltum, for the diamond-extracting industry in West Yakutia. In 1994, a refinery purchased from the American company Synara, with the production capacity of 200,000 tons/yr, will begin operation. During the first stage only diesel, heating oil and asphaltum for civil construction needs will be produced. In 1997 additional equipment will be procured for production of benzene A-76 and A-93, with capacity of 400,000 tons/y.

Talakan Field Development

The talakanian oil-gas condensate field is located 250 km southwest of Lensk, in southwestern Yakutia. This project will be to complete the exploration of the field and technical (project) planning for development during 1993-95. Development goals are for commercial production of 2 million

tons or oil per year by the year 2005. The project will include extraction, pipelines and refineries. The Takakanian Field is in the final stage of exploration, and is the largest field currently discovered. In 1994, it was planned to set up a small oil refinery for 20-40,000 tons/year.

Talakan & Verkhnechonian Fields Development

In 1995 a Feasibility Study is planned for the joint development of the Talakan field and the Verkhnechonian Field, near the border with Irkutsk. Oil from those fields will be refined at the Angarks Refinery.

Opportunities for Western Energy Companies

Western investment is needed by Yakutia in nearly all aspects of its oil and gas industry. While some purchases of small refineries were made during 1992-94, the budget of the Republic now requires outside capital for further development of extraction and processing of oil and gas. To support foreign investment, the Sakha Republic has passed a law entitled "Foreign Investment Law in the Republic of Sakha (Yakutia)". Formal treaties and agreements between the Sakha Republic and the Russian Federation make all mineral resources located in Yakutia the property of the people living on that territory. Yakutia's foreign investment law is therefore the governing law for investments in the Sakha Republic. The main point of the law is that foreign investments are protected, and the investments will be governed by laws and agreements in place at the time of the investments, for a period of ten years. Copies of the Foreign Investment Law of the Sakha Republic are available from Sakhanephtgaz.

In addition, western technical and management consultants are also needed in Yakutia. This is an area where energy companies with project management and environmental management capabilities are in high demand. The major difficulties are associated with payment for services, but if Russian roubles are acceptable, a great deal of consulting work could be performed. Project management training is also an area of need and interest.

Infrastructure development is also a major need in the Sakha Republic. Roads, communications, power and support services and supplies for remote areas, intended for oil and gas development, will all be needed. These could all represent commercial opportunities for Western companies interested in doing business in Eastern Russia or Yakutia.

Environmental Issues & Concerns

Indigenous Sakha peoples have a long history and culture closely tied to nature. Directly related to the peoples of

northern Canada and Alaska, the Yakuts had a religion based on shamanism and spiritualism tied to Mother Nature. Now, as the region has become self governing, those old values are resurfacing. There is a great concern for the environment, to stop the pollution which was common under Soviet direction, and to control development so further damage to the land and rivers is minimized. Major environmental issues in Yakutia include the following.

Depletion of Natural Resources

New leaders of the Sakha Republic are developing strategies and laws intended to benefit their children and future generations. Of major importance is the issue of self reliance. Further depletion of natural resources such as diamonds, oil and gas, are now being planned carefully. The future value of these resources is clearly understood.

Degradation of the Permafrost & Soil

There is already plenty of evidence of damage to permafrost and the upper soils in Yakutia. People and officials in the Sakha Republic fully understand how important it is to maintain the natural conditions and balance. The world's leading Perma-Frost research and educational institution, the Sakha Permafrost Institute, is located in Yakutsk. The permafrost must be considered and addressed for all construction projects in Yakutia, as well as many other commercial activities. This is therefore a major aspect of project planning, especially for oil and gas projects.

Water Pollution

Yakutia contains thousands of lakes and streams, many home to unusual fish and wildlife. Some past mining activities in the Sakha Republic have heavily polluted rivers and streams. This is now a major concern, and must be considered for all projects, especially in remote regions. In addition, drinking water normally comes from surface and underground water, frequently untreated in remote areas. Water pollution has a direct and major impact on health in Yakutia, as it does elsewhere in Russia. The leaking of hydrocarbons into the drinking water, for instance, is a serious problem in some areas.

Impact on Geology

The impact on the land, land formations, and other mineral or geological conditions must also be considered, during the planning and implementation of construction and energy-related projects.

Impact on Animal Habitat

This is a normal aspect of Environmental Impact Analysis in Western countries, but is a newly regulated concern in Russia. In Yakutia, however, where hunting and fishing are still important livelihoods for many rural people, this is an important consideration. In addition, the far north is also home for many fur-bearing animals which have been a major element of the commerce and life styles of Yakut people for hundreds of years. In the south and the far north, reindeer grazing areas must be protected.

Public Health and Safety

Public health and safety should be considered during the planning and implementation of every project. In Yakutia, special emphasis is also placed on the health and safety of future generations. It is a very positive and special feature of the current leaders of the Republic, but places additional responsibilities on project planners and project managers today.

Sustainable Development Approach

The Sakha Republic is in the unique position in that many of its oil and gas industry developments are just beginning. Economic development strategies, regulations and project plans can all be developed with the benefit of today's knowledge about worldwide resource depletion, environmental consequences of uncontrolled industrial development, full resource costing and other sustainable development issues. In that regard, the following suggestions are provided for leaders of the Sakha Republic, Sakhanephtegaz, and western energy companies who might become involved in projects in Yakutia.

Environmental Impact Analysis

Thorough Environmental Impact Analysis (EIA) should be required of every major project, maybe every project, in the oil and gas sector. This analysis might be required by law, but should be included in project plans and requirements. Impact on land, water, animal habitats and public health should all be examined, and made public.

Start Small

In order to control environmental impact or damage, projects should be phased so there is a demonstration stage, small first stage, or first phase which can be used for developing the infrastructure needed to control environmental impact, to perform necessary environmental impact analyses, to fully test technologies or equipment, and for adequate training of personnel. This also can allow sufficient time for project

planning and decision making, before crises or accidents occur. This implies full understanding and usage of "Project Life Cycle" concepts, issues and methodologies.

Offer Incentives

The Sakha Republic could reward organizations and contractors which develop and maintain the best environmental record/performance. While penalties are also commonly used in the West, they are often just seen as additional project costs, and paid rather than avoided. Positive incentives, even written into contracts, reinforce positive performance and are often more motivational to both individual companies and managers.

Promote Newest Technologies

Many new environmentally-friendly processes, equipment and technologies have been developed in the West, where environmental regulation is high. In addition, many new systems and equipment are much more energy efficient than before, further reducing depletion of nonrenewable resources. Usage of newest technologies should be utilized to the greatest degree possible.

Full Environmental Costing

The cost of environmental impacts should be considered in project cost analysis and project funding, by government authorities and Sakhanephtegaz officials. In many cases, any environmental impact represents a future cost which will have to be paid by the organizations involved at some future time. These costs should be considered in the beginning.

Manage Environmental Protection

Environmental management should become a widely accepted management function among all state and commercial enterprises and organizations. It should be highly visible, and incorporated into government project planning and management procedures and practices.

How Project Management Experts Can Help

Project management experts have a great deal of expertise which could be very helpful in planning and managing projects in the oil and gas industry in the Sakha Republic, with sustainable development goals in mind. Several main areas of expertise include the following:

Comprehensive Project Planning

Experienced project managers are able to see the "big picture", that is, all elements of a project or program. They are usually

able to develop very comprehensive project plans, covering all aspects of a project, including environmental impact, public health, project safety, stakeholders, legal and many other aspects of international projects.

Project Organization/Contracting/Partnering

Project management experts understand how to find and organize the necessary resources to accomplish all project objectives. Based on current information and expertise on contracting, teaming and international partnering, experienced project managers can organize project teams which can accomplish any necessary environmentally-sound development activity, including analysis of any aspect of the environmental impact of the project. This organizing ability also can enable newest technologies and expertise to be included in the energy development projects in Yakutia.

Project Life Cycle Management

Project managers know how to start small, how to plan and initiate projects systematically, and how to manage projects according to the stage, or life cycle, of the project or program. This can help control the development of large oil and gas programs so environmental issues can be planned and addressed properly.

Strategic Project Management

Project management experts know when and how various project planning and management methods, techniques and systems should be utilized during project initiation. This can include determining who needs project management training, staffing various positions, utilizing proper communications systems and procedures, and manual or automated methods for planning and reporting.

More Comprehensive Planning

Project management experts can help ensure that all aspects and phases of a project or program are planned properly, including environmental aspects of the project. It is much better to address potential problems during the planning stage than after problems occur. This can easily include relations and interfaces with the general public or political entities.

Contract Management Expertise

Project management experts are also experts on most aspects of contracting and subcontracting, including determining appropriate incentives for promoting better performance, cost savings or environmental management. These skills should be of critical importance on oil and gas projects, in developing economies like Yakutia's.

Productivity Increases & Cost Savings

Perhaps most importantly, project management experts know how to accomplish projects for the least amount of money, with the fewest and best resources, in the shortest amount of time. These skills have always been at the heart of professional project management. Applying well established cost estimating, scheduling, planning, value engineering, project control and management principles, experienced project managers should be able to save the Sakha Republic millions of dollars and many years during development of their resources.

Implications for Other Regions of Russia

All of the above, of course, have implications for other regions of Russia, and in countries with energy resources and plans to develop those resources. Many other regions have many of the same environmental and economic conditions as found in Yakutia. The basic requirements for sustainable development are the same. Project management experts can help in every case.

Conclusion

This paper has discussed oil and gas development in a remarkable area of the World, a region with an unbelievable wealth in natural resources but also beautiful rivers, lakes, mountains and forests. The leaders of the Sakha Republic have launched a development program, primarily to support the needs of their citizens, but also to support economic growth. Development of oil and gas reserves is now beginning. There is an opportunity now to plan and manage that development in a sustainable manner, controlling environmental damage and limiting the depletion of nonrenewable resources. The authors have suggested topics to be addressed by both Yakutia government officials as well as western energy company project managers, who might work on oil and gas projects in the region. Finally, some areas where project management experts might really help in the development process were identified. Sustainable development needs political attention, technology and project management expertise.

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