

*In the beginning of 2011, Sakhalin Energy Investment Company Ltd. celebrated the second anniversary of the inauguration of the first and only LNG plant in the Russian Federation. As early as in mid 2010 the plant already reached its full capacity. Today, it is the most advanced LNG plant, and the sixth world largest plant. It adds some 5% to global LNG capacity. With this plant in operation Russia has joined the club of reliable LNG suppliers. Stable deliveries of Sakhalin LNG are a clear evidence of success of what used to be one of the most complex and promising gas and oil projects in the Sub-Arctic environment.*



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For more than forty years the main target for export of the Russian gas has been Europe, where gas was pipelined to via transit countries. However, by the end of the previous millennium, Russia headed for development of new energy export markets and diversification of gas exports. Another strategic objective of the country's oil and gas industry was development of the offshore fields in the Far East and Arctic which required

construction of new production and transportation infrastructure.

Those were and still are large-scale objectives of geopolitical importance, which would seriously enhance global energy security. But the country has already gained a remarkable experience. The green field Sakhalin-2 shelf development opened energy markets of the Asia-Pacific Region for Russian hydrocarbons allowing to export gas in the form of LNG.

#### Yesterday

Decision on LNG production was made when a feasibility study was developed in the 1990s. The decision was dictated primarily by LNG

properties that make its transportation at long distances convenient and enables supply to any country with re-gasification terminals available. A substantial argument in favour of LNG was proximity of the APR markets, primarily Japan, whose energy demand by 85% is satisfied by imported LNG.

Before the implementation of the Sakhalin-2 project Russia had neither technology for offshore gas development available nor technology for LNG commercial production. For this reason, before the LNG plant construction started, rigorous work was done to obtain all necessary approvals from various Russian agencies. Also it was necessary to obtain consent from po-

# INTO TOMORROW



tential buyers to supplies of LNG to be produced at a plant, whose construction had not started yet, the LNG plant whose front end-engineering was underway.

Successful work done enabled commencing, in 2003, of construction of the required infrastructure, including first Russia's Lunskeye-A gas production platform, a system of offshore and onshore pipelines, OPF (where gas is treated for further transportation), Booster Station, and the very LNG plant with LNG jetty.

All facilities of the Sakhalin-2 infrastructure have been constructed with high seismicity of the region taken into account and can stand large magnitude earthquakes.



## Today

On 19 February 2009, in a ceremony attended by President of the Russian Federation Dmitry Medvedev, other top foreign and Russian officials the LNG plant was inaugurated.

In the first 10 months of operation, Sakhalin Energy LNG complex produced 5.3 million tonnes (47% above the initial target). It was an unprecedented world-class achievement, especially taking into account that the production process was parallel with start-up and commissioning of

the Project facilities. The next year the LNG plant reached its nameplate capacity and – thanks to successful debottlenecking – even exceeded it. The 2010 production performance was significantly beyond the planned targets with slightly over 10 million tonnes produced.

The gas liquefaction process in the LNG Plant uses a Shell-licensed Double Mixed Refrigerant (DMR), which was purpose-tailored to ensure maximum production effectiveness during severe cold seasons in Sakhalin.

Sakhalin Energy's LNG plant has two LNG trains where gas is treated and liquefied. Each LNG train includes Acid Gas Removal Units (CO<sub>2</sub> and H<sub>2</sub>S), molecular sieve gas dehydration plants, Mercury Removal Units with activated carbon, Fractionation Units for production of refrigerants and stabil-

sed condensate and gas liquefaction units.

Liquefied gas is directed to two isometric storage tanks with a capacity 100,000 m<sup>3</sup> each. The LNG is kept in the tanks prior to uploading to LNG tankers. The tanks are designed as two-wall structures 37 m high and 67 m in diameter. The internal tanks for LNG storage were made of cold resistant 9% nickel steel, whilst pre-stressed concrete awes used for external tanks. Heat insulation between the internal and external tanks limits heat penetration and maintains the required temperature in the internal tank.

LNG is offloaded at a special jetty. Its length is 805 m; the LNG jetty has four arms, including two offloading arms, one dual purpose arm, and one vapour return arm. The LNG jetty can accommodate LNG carriers ranging from 18 to 145

thousand cubic meters of tonnage. The loading takes six to sixteen hours depending on the vessel tonnage. The jetty can service up to 160 LNG carriers per year.

Sakhalin-2 has encouraged emerging of LNG transportation market in Russia. Three "Grand" class vessels – Grand Elena, Grand Aniva and Grand Mereya – were purpose built in the Japanese yards. All three vessels are owned and operated by Russo-Japanese consortia, comprising Sovcomflot and Prisco, well-known Russian shipping companies. Grand Elena and Grand Aniva – are owned by the consortium of Sovcomflot and Nippon Yusen Kaishiki Kaisha (NYK) companies. Grand Mereya is owned by the consortium of Prisco, Mitsui O.S.K. Lines, Ltd (MOL) and Kawasaki Kisen Kaisha, Ltd (K Line). These LNG carriers were chartered by Sakhalin Energy on a long-term basis, short-

Первая российская морская газодобывающая платформа «Лунская-А» (ЛУН-А)



term chartered vessels are also available.

98% of the annual LNG plant capacity is contracted on a long-term basis. About 65% of the overall LNG volume produced is supplied to Japan. The rest is supplied to South Korea, and other destinations including India, Kuwait, China, and Taiwan.

### Tomorrow

No successful project can help moving further, resting satisfied with what has been achieved. Neither can Sakhalin-2. Sakhalin Energy is currently exploring various options for the Project expansion, which is driven by the need for development.

Gazprom Chairman Alexei Miller said that "whilst the 20th century was the age of oil, the 21st century will be the age of gas." For Russia it means development of immense gas reserves of Russia's Arctic as well as oil and gas fields of other regions, including those located offshore the Sea of Okhotsk.

The current Russian Energy Strategy provides for maintaining of stable relations with traditional con-

sumers of Russian energy resources in Europe and establishment of equally stable relations with players of new energy markets. Furthermore, the Strategy states that "the share of fuel and energy resources export to Europe will be steadily going down due to diversification of the Eastern energy export markets (China, Japan, the Republic of Korea, the APR countries). It should be noted that by the end of Stage 3 of the Energy Strategy implementation the share of the energy export to the Eastern markets will increase to 19–20%". Development of immense gas reserves of Russia's Arctic and difficult fields of other regions, including those located offshore the Sea of Okhotsk, are also on the agenda.

It is obvious that successful implementation of first Russia's LNG project by Sakhalin Energy contributes to putting these plans through. No doubt that Sakhalin Energy's experience in construction in harsh climate, offshore development, providing of seismic safety, transportation by sea, and many other best practices of Sakhalin-2 will be essential for future development of many prospective projects.

Sakhalin Energy Investment Company Ltd is the operator of the Sakhalin-2 Project. The Project comprises the development of two oil and gas fields in northeastern Sakhalin offshore, approximately

**15 KM** off the coast Sakhalin island.

The sea depth in the area ranges from

**28 to 48 m**

The shareholders in **Sakhalin Energy** are major global companies which have acquired and are successfully using their vast knowledge and expertise in construction and operation of oil and gas infrastructure, production and transportation of hydrocarbons. The Company's current shareholders are **Gazprom, OAO** (50% + 1 share), **Royal Dutch Shell plc.** (27.5% – 1 share), **Mitsui and Co. Ltd.** (12.5%) and **Mitsubishi Corporation** (10%).

As for Russia's first LNG plant, Sakhalin Energy is currently exploring various options for the Project expansion, which is driven by the need for development. Non progre di est regredi – not to move forwards is to move backwards, says a Latin proverb. Any successful project cannot help moving further, being satisfied with what has been achieved. Neither can Sakhalin-2. We will see soon how it will happen, what the Company will undertake to move forward.

### Sakhalin Energy and Skhalin-2 Project

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*Sakhalin offshore fields were discovered in the 1980s. Development started at the Astokh area of the Piltun-Astokhskiye field in 1996. In 1999, Sakhalin Energy began producing oil at the field from the first offshore platform in Russia. In 2003, Sakhalin Energy launched Phase 2 of the Project. The Phase 2 development resulted in building one of the largest oil and gas infrastructures in the world, designed for extraction of hydrocarbons, their transportation, and production and marketing of LNG.*

*In addition to the first offshore platform Molikpaq (PA-A), installed in Russia in 1998, two other production platforms were designed and constructed within a short time, the Piltun-Astokhskiye-B platform (PA-B) and the Lunskoye-A platform (Lun-A), the first offshore gas production platform in Russia; transSakhalin pipeline system was put into operation that includes 300 km offshore and 1,600 km onshore oil and gas pipelines; the Onshore Processing Facility was built, the Booster Station, the Oil Export Terminal, with a Tanker Loading Unit installed in Aniva bay 5 km from the shore; the first and still only in Russia liquefied natural gas plant. The LNG plant with the LNG export terminal and the Tanker Loading Unit are part of the Prigorodnoye facility complex, the first-in-Russia specialised marine port for shipping oil and gas. All Company facilities are certified as being compliant with requirements of the Environmental Management Systems standard ISO 14001:200.*

*Under the Project, LNG and Vityaz crude oil blend are produced and supplied to international markets. The long-term LNG SPAs have been concluded for 20–25 years and LNG is delivered not only to the APR countries, but to Kuwait.*