

SAKHALIN II PROJECT

Sakhalin Island: General Background

Sakhalin Island, a former penal colony located off the east coast of Russia and to the north of Japan, holds vast hydrocarbon resources. Oil reserves in the area are estimated at almost 12 billion barrels, and natural gas reserves at approximately 90 trillion cubic feet. International consortia of energy companies have entered into production sharing agreements (PSAs) to develop the resources. Even though all of the consortia have extensive export plans (including to the United States) via LNG terminals and export pipelines to the mainland, there has been little progress except on the first two parts of Sakhalin Island: Sakhalin 1 and Sakhalin 2, which lie to the southeast of Okha (see map to the left, and for more detailed maps click on the project websites for Sakhalin 1 and Sakhalin II below).



Technical features

The two fields contain an estimated 1.2 billion barrels (190,000,000 m³) of crude oil and 500 billion cubic meters (18 trillion cubic feet) of natural gas, 9.6 million tonnes of liquefied natural gas a year and about 180,000 barrels per day (29,000 m³/d) of oil will be produced. The total project cost until 2014 was originally estimated by Shell to be between \$9 and \$11 billion US dollars. However, the costs turned out to be substantially underestimated and in July 2005 Shell revised the estimate upwards to \$20 billion, causing much consternation among analysts

and Russian business partners alike. There are six main phases to the project: field development in the Piltun-Astokhskoye oil field, field development in the Lunskeye gas field, upgrading infrastructure on the island (IUP — Infrastructure Upgrade Project) which includes building a pipeline to Prigorodnoye on Aniva Bay, building an onshore processing facility (OPF), building an oil export terminal (OET), and building a liquid natural gas (LNG) plant and terminal.

LNG

This will be the first ever LNG plant built in Russia. Royal Dutch Shell estimates that the LNG plant will have the ability to meet eight percent of the world's current LNG demand, 9.6 million tonnes of LNG per year, at the new plant, which will be in Prigorodnoye on Aniva Bay on the southern tip of Sakhalin, 13 kilometers east of Korsakov, on 4.9 km². Two trains will have an annual capacity of 4.8 million tones each. The consortium is examining the possibility of adding another train.

The LNG plant will have two LNG storage tanks of 100,000 cubic meter net capacity each and LNG will be exported via an 805-metre jetty in Aniva Bay. The jetty will have two loading arms and one boil-off gas return arm, with ship loading expected to take between six and sixteen hours depending on the size of the cargo.

The LNG plant construction consortium is awarded to two Russian companies, OAO Nipigaspererabothka (Nipigas) and the KhimEnergo consortium, together with two Japanese companies Chiyoda Corporation and Toyo Engineering.

Oil export terminal

Located on Aniva Bay, 500 meters east of the LNG plant, its total storage capacity will be 1.2 million barrels (190,000 m³) in two tanks (about six days pipeline throughput). A underwater pipeline to a tanker-loading unit (TLU), which is located about five kilometers offshore in the bay can load oil at a rate of 50,000 barrels per hour (8,000 m³/h).

Platforms

- The Molikpaq Platform (PA-A)
 - Originally a drilling rig from Arctic Canadian waters
 - Built to operate in severe ice conditions
 - 16 km offshore
 - 120 m wide
 - Weight 37,523 t
 - 150 personnel
 - Ballast 278,000 m³ sand
 - Temperatures offshore: down to -70 °C wind chill

- Piltun Astokhskoye Platform (PA-B)
 - Four legged concrete gravity substructure engineered and constructed by Aker Kværner Technology AS and Quattrogemini OY
 - Topsides designed by AMEC, construction by Samsung Heavy Industries, transported and installed by Saipem by float-over method. At 28,000 tonnes, one of the largest floatover installations ever.
 - Construction began - 4Q 2003
 - Start of production expected – 4Q 2007
 - Water depth 32 m
 - Living quarters for 100 permanent & 40 temporary personal
 - Capacity:
 - Oil approximately 70,000 barrel/d (11,000 m³/d)
 - Associated gas 100,000,000 ft³/d (2,800,000 m³/d)

- PA-B platform was installed by SAIPEM on 5th July 07 by float-over method.
- Lunskoye Platform (LUN-A)
 - Four legged concrete gravity substructure engineered and constructed by Aker Kvaerner Technology AS and Quattrogemini OY
 - Topsides designed by AMEC, construction by Samsung Heavy Industries, Transported and Installed by SAIPEM by float-over method.
 - Construction began - 3Q 2003
 - Start of production expected – 1Q 2007
 - 15 km offshore
 - Water depth 48 m
 - 90 permanent & 36 temporary personnel
 - Capacity:
 - Gas approximately 52 million m³/d (1,800,000,000 ft³/d)
 - Peak liquids and condensate about 8,000 m³/d (34,000 barrel/d)
 - Peak oil 2,500 m³/d (16,000 barrel/d)
 - LUN-A platform was installed by SAIPEM on 23rd June 06 by float-over method.

Onshore processing facility

- 7 km inland inline with Lunskoye
- Construction: BETS joint venture:
 - Technostroyexport (Russia)
 - Enka (Turkey)
 - Bechtel (US)
- Cost: \$250 million (US)
- Construction commenced 2nd half 2003
- Production start-up - Q4 2005 to Q4 2006.
- 100 MW power plant
- Capacity
 - Gas: 1,800 million standard cubic feet per day (51,000,000 m³/d)
 - Condensate/oil: 60,000 barrels per day (9,500 m³/d)

Pipeline

Phase two in the project is the construction of two 800 km pipeline systems from the fields on the north-eastern edge of the island to a Liquefied Natural Gas (LNG) and an Oil Export Terminal (OET) at the south end. The \$1.2 billion (US Dollars) pipeline was awarded to a consortium of two Russian companies Starstroi and LUKoil-Neftegazstroi together with two European companies Saipem SA and AMEC Spie Capag. The project is estimated to employ between 5,000 and 6,000 people from design to completion in December 2006.

- Stats:
 - 126 km of swamp crossings
 - 110 km over mountainous routes
 - 1,000-plus (mainly small) river crossings
 - 18 rail crossings
 - 10 road crossings.
 - Trench buried (with 0.8 to 1 m cover on top of pipe)
 - Block valves: 51 gas; 108 oil; 6 multiphase (all remotely operated)

Offshore pipelines

- Total overall length - 165 km
 - Two 42 km x 356 mm pipelines from Piltun-Astokhskoye B platform (PA-B) to shore.
 - Two 17.5 km x 356 mm pipelines from Piltun-Astokhskoye A platform (PA-A or Molikpaq) to shore.
 - Two 13.5 km x 114 mm pipelines from Lunskeye Platform (LUN-A) to the shore.
 - One 13.5 km x 762 mm pipeline from shore to LUN-A to provide gas to the facility.
 - One 5.5 km x 752 mm tanker loading line from the OET (Oil Export Terminal) to the TLU (Tanker Loading Unit) in Aniva Bay.