HSE Challenges for Construction and Operation in the Sakhalin Offshore Climate

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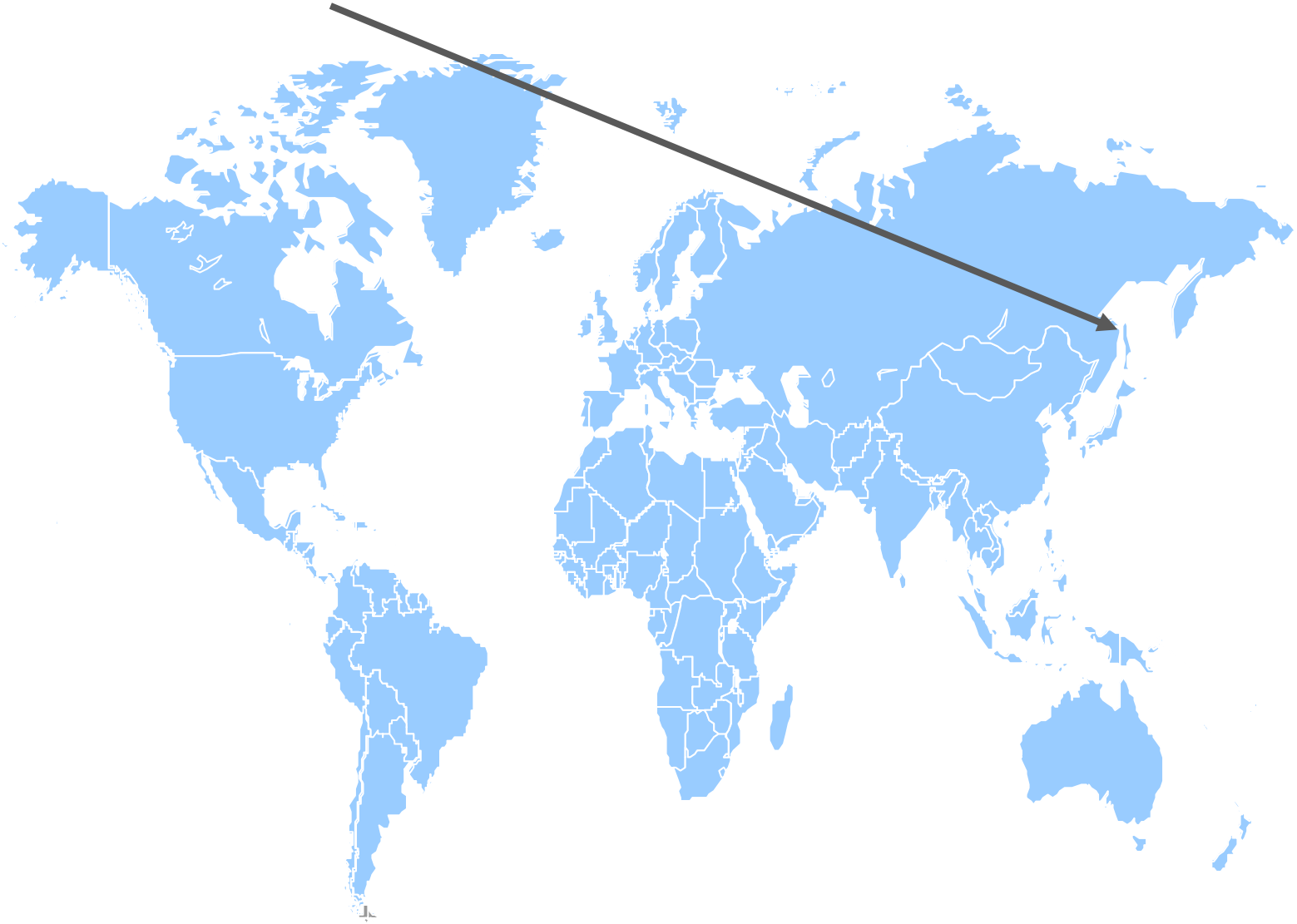
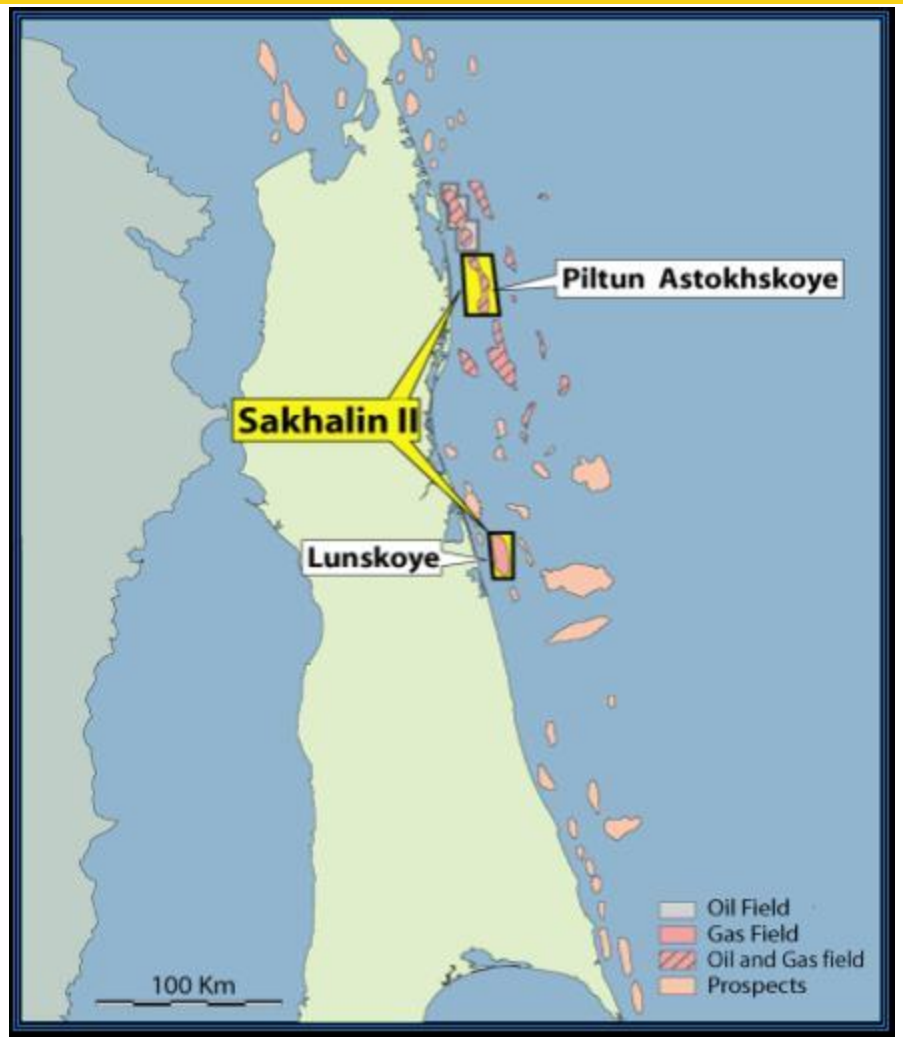
SAKHALIN ISLAND



THE ASSETS: A HUGE RESOURCE



Sakhalin II oil reserves equate to more than one year of current Russian crude oil exports (2.5 million barrels per day).

Sakhalin II gas reserves represent nearly five years of Russian gas exports to Europe, enough to supply current global LNG demand for four years.

CLIMATE - SAKHALIN ISLAND

Remote

Lack of infrastructure

Low population density – 600,000

Seismically active area

Rich onshore and offshore wildlife

Territory: 87,100 km^2

Length: 948 km

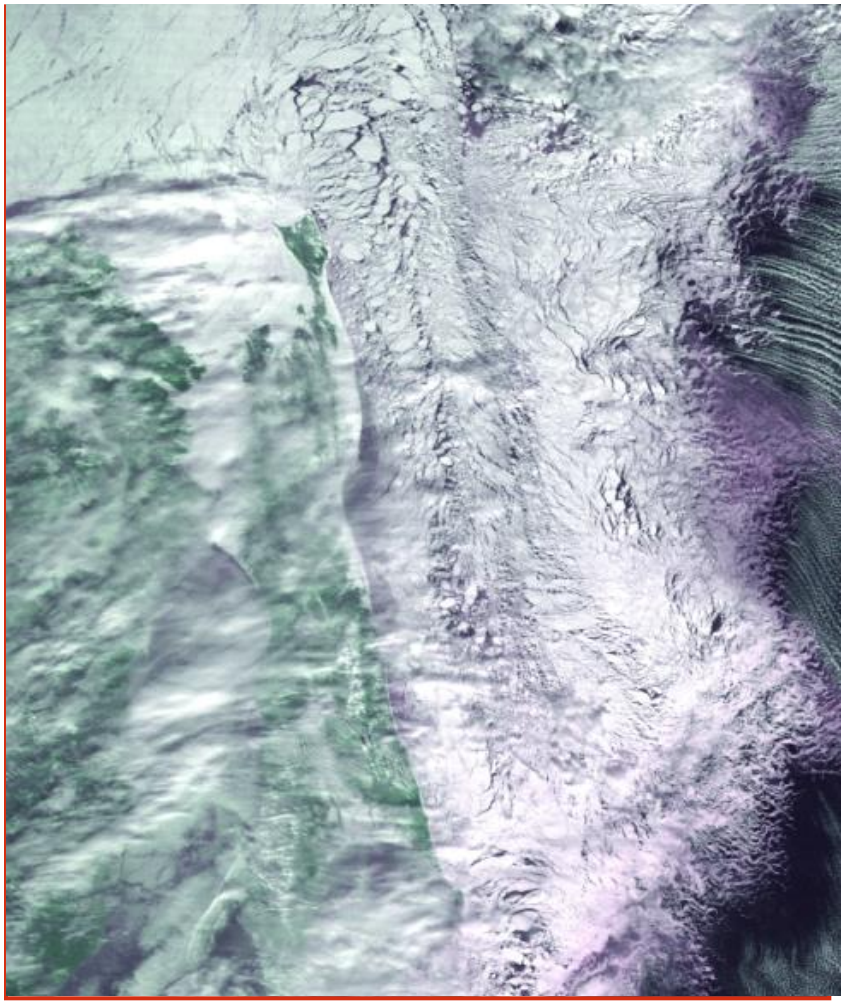
Min. width: 30km

Mountain areas 66%

Extreme Climate

Regional center: Yuzhno-Sakhalinsk

Military Activity



SUB ARCTIC OFFSHORE HSE CHALLENGES

Sea-Ice

Cold Water

Fog

Special HSE measurements

Temperature Contraction & expansion

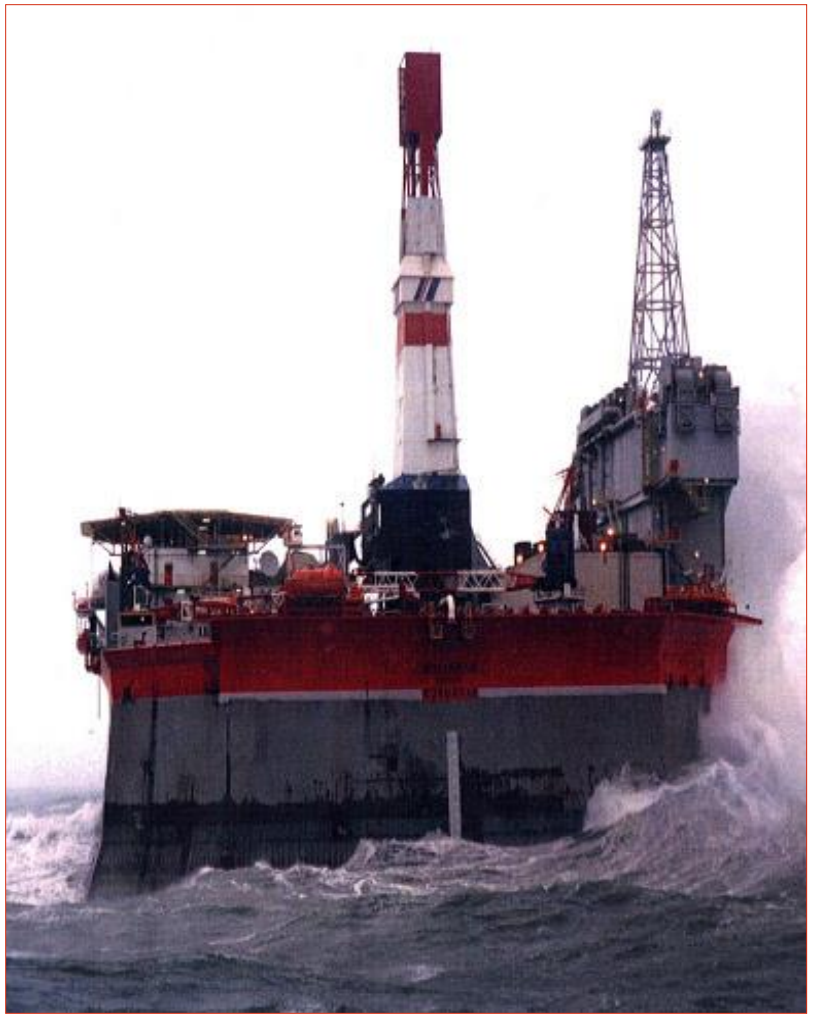
Snow & Ice accumulations

Remoteness

Cyclone Storm & Currents

OFFSHORE CONDITIONS IN THE SEA OF OKHOTSK

- Temperatures range from +25 to –40 degrees
- Offshore ice from December till June
- Waves up to 10 metres significant
- Temperature offshore can drop to –40 degrees with wind chill
- Frequent fog in spring and summer
- Strong currents in summer
- Earthquake zone



SOME SPECIFIC HSE MEASURES

With fleet of Ice class vessels and offshore workforce of 500+, numerous HAZIDs/HAZOPs, RA's and SIMOPS meetings were held to agree :

- ✓ **Clear Communication plans**
- ✓ **Agreed Adverse Weather procedure**
- ✓ **Personnel transfer plan incl Rescue**
- ✓ **Marine Operations manual**
- ✓ **Vessel Inspection & Certification**
- ✓ **Personnel Travel briefing pack**
- ✓ **Emergency Response Plan incl Medivac / Test**
- ✓ **Oil Spill prevention and response plan**

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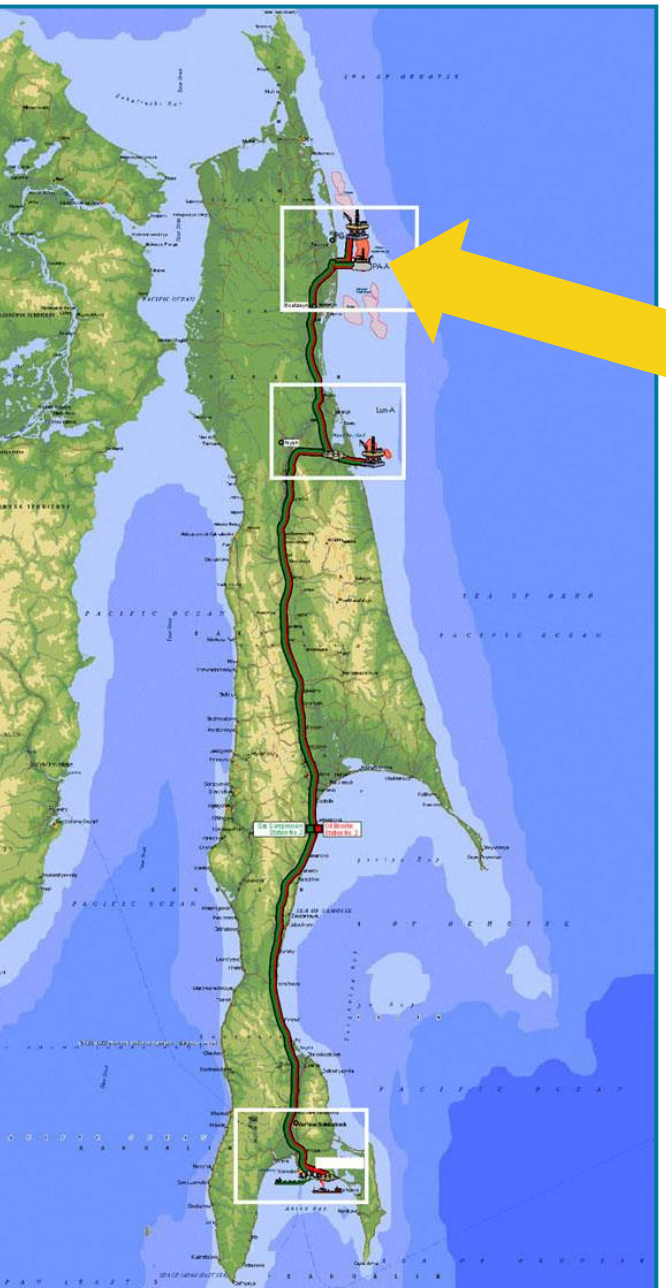
PHASE 1

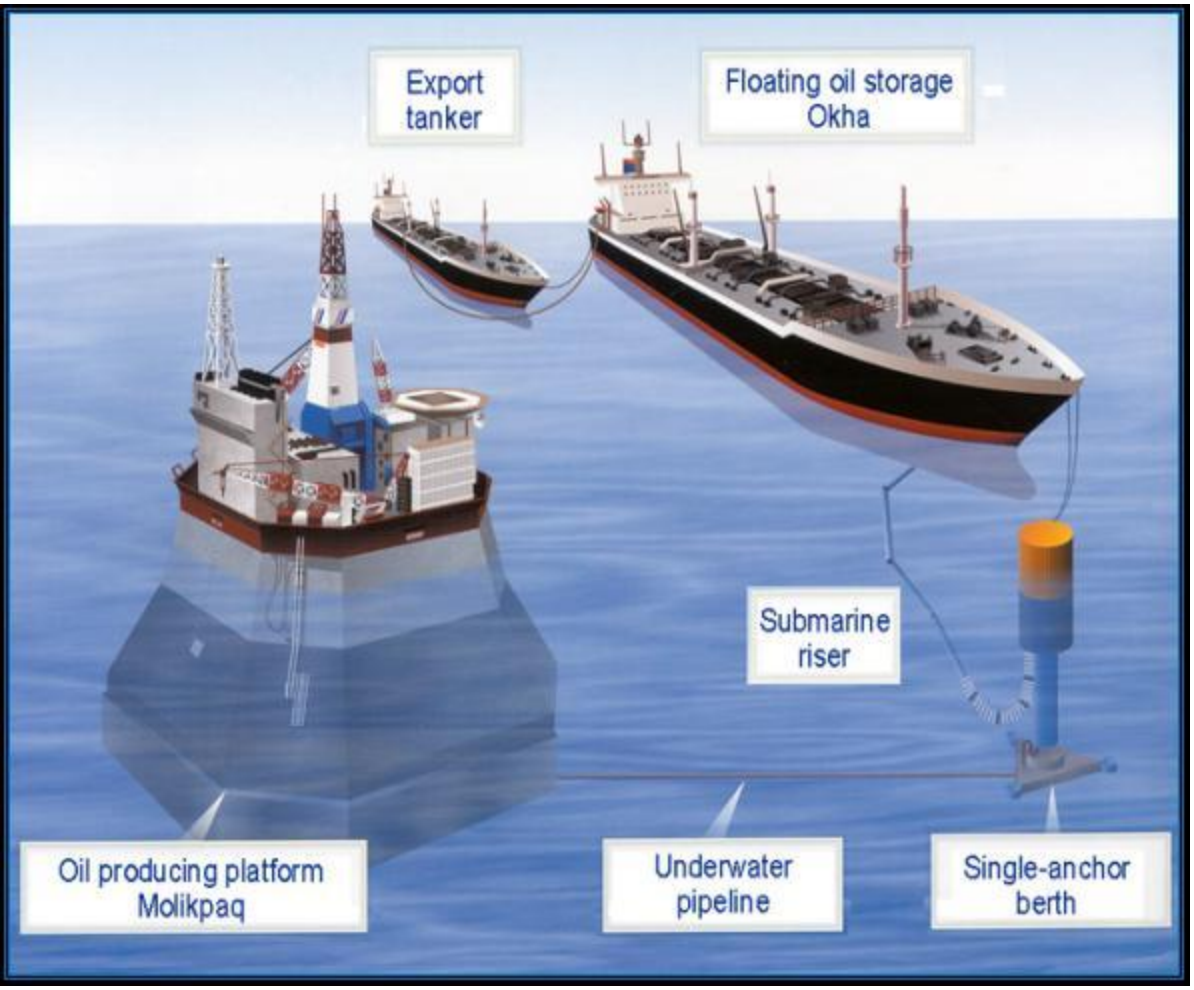
SAKHALIN II Phase I Project



Overview of Offshore production Operation

1999 – Jan 2009

VITYAZ COMPLEX



- First offshore oil production in Russia, July 1999.
- Output up to 92,000 barrels/day (11,000 tonnes/day).
- World class safety and environmental performance.

MOLIKPAQ PLATFORM

Converted drilling rig first used in the Canadian Arctic.

Means ‘big wave’ in the Inuit language.

Molikpaq is 120 metres wide, weighs 37,523 tonnes and it is ballasted down with 278,000 cubic meters of sand.

FSO AND SALM

FSO Okha was ice classed D0 with ABS and was especially modified for Sakhalin conditions. It had a large hose reel on the stern to keep the export hose out of the water. It had an “Ï” tube running from the keel to the focsle which was trace heated to allow the import hose to remain clear of ice

OFFSHORE SUPPORT AND SUPPLY

Offshore platforms require continuous supply of equipment and marine cover.

It is achieved by the use of ice class Pacific supply boats.

Standby boats Smit Sakhalin and Smit Sibu carry ice notation Lloyds 1A super, Canadian Arctic Class 4.

They performed year round standby and oil response duties at the platforms, one at the Northern two fields and one at Lunskoye.

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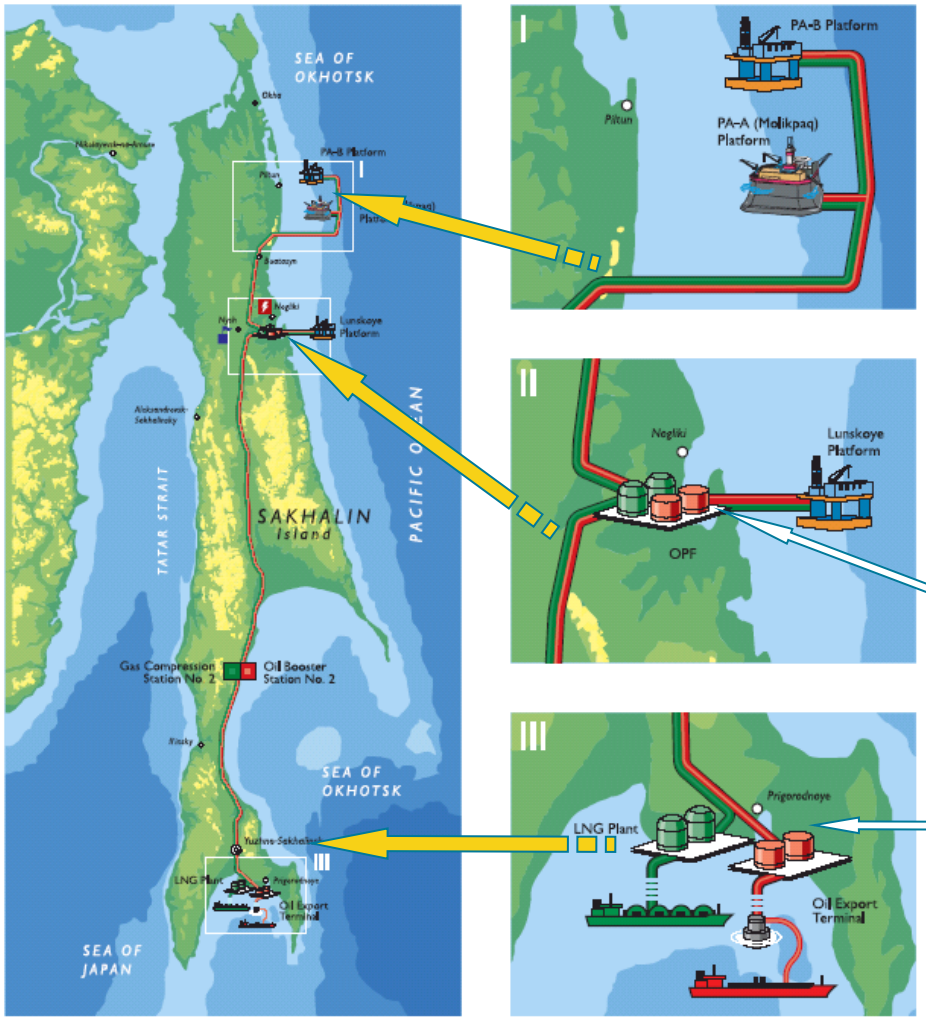
PHASE II

SAKHALIN PHASE II – PROJECT OVERVIEW



- Piltun-B platform
- Piltun-A year round production
- Lunskoye-A platform
- Onshore processing facility
- Oil and gas (multiphase) pipelines
- Booster station
- xport terminal

OFFSHORE PLATFORMS

Lunskoye - A

- Gas production 1800 mmscf/d
- Possible oil rim
- 30 well slots
- 4 leg concrete gravity base
- Topsides 22,000 tonne
- Installed August 2006

OFFSHORE PLATFORMS

Piltun-Astokhskoye-B

- Oil production 70,000 b/d
- Gas production 92 mmscf/d
- 45 well slots
- 4 leg concrete gravity base.
- Topsides 28,000 tonne
- Installed June 2007

PRIGORODNOYE LNG PLANT AND EXPORT TERMINAL

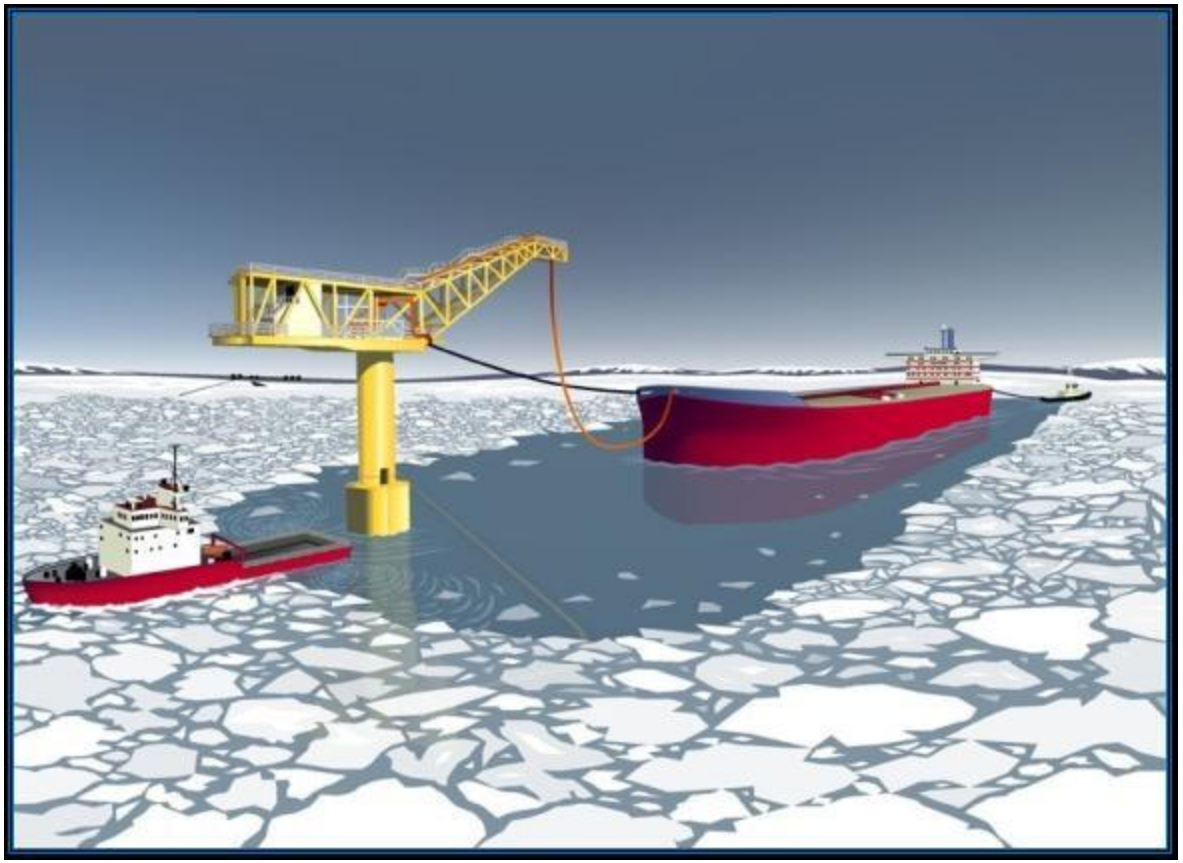
- First LNG plant in Russia
- Built on a 490 hectare site at Prigorodnoye on Aniva Bay
- LNG plant receives, treats, processes and liquefies gas from the Lunskoye field and associated gas from the Piltun-Astokhskoye field.
- OET supports the storage and export of 170,000 barrels of crude oil per day, along with 5,000 barrels per day of condensate from the LNG facility.

LNG TANKERS FOR SAKHALIN PROJECT

The 145 000 m³ LNG carrier Grand Elena shown here is an Ice Class 1C vessel purpose built for the project. It is one of 5 purpose built vessels for the project.

To increase the safety of navigation an additional escort ice breaker will be deployed during winter months to assist vessels in safe passage through Aniva Bay.

TLU OPERATIONS IN ICE



The export tanker moors up to the TLU and an ice breaker tug fitted with the Aquamaster propulsion system positions itself updrift from the TLU.

By spreading the Aquamasters at approximately 80 deg.

the tug maintains position and the propeller wash creates a wide swath of open water, the technique has been used and proven in Vityaz operations.

3.0

HOW SEIC OPERATED

Vityaz Complex successfully operated in ice 1999 - 2008

With the help of an Ice Management Team crude oil production and exports continued until ice reached 30 cm of thickness or was no longer manageable. The platform supply vessels were utilized for ice management duty. Equipped with Aquamasters the boats could keep station while providing open water work environment for the FSO and the SALM laydown operations by angling out the Aquamasters, using high power and blasting the ice away. For this to be effective the ice had to be pre-broken.

END OF SEASON OPERATIONS

The vessels engaged in the SALM laydown were normally supported by an ice breaker from the FESCO fleet.

The ice breakers provided long range ice scouting as well as close range ice breaking and protection support.