



PROJECT

YUZHNO-SAKHALINSK 2010

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#### **ACOUSTIC MONITORING**

Through fixed monitoring stations, Sakhalin Energy monitors the ambient sound levels of the Western Gray Whales in the sea of Okhotsk. Sakhalin Energy implemented the programme starting in 2006, following recommendations of the Western Gray Whales Advisory Panel and in accordance with the Marine Mammal Protection Plan. **See also** Marine Mammal Protection Plan, Western Gray Whales and Western Gray Whales Advisory panel.



AEA

A UK-based energy and environmental consultancy. As an independent consultant to the potential lenders of the Sakhalin-2 project, AEA wrote a comprehensive report in 2007 on Sakhalin Energy's compliance to Sakhalin's Health, Environment and Social Action Plan. The AEA's conclusions were positive, and the report cited examples of laudable best practice. The full report is available in the library of Sakhalin Energy's website, at **www. sakhalinenergy.com. See also** Health, Safety, Environment and Social Action Plan.

#### **AERIAL SEEDING**

A technique used to sow seeds over large tracts of land by plane or helicopter. Because of the mountainous terrain of Sakhalin Island and the sinuous route of the Right of Way (RoW), the area cleared for the TransSakhalin pipelines, a helicopter was used. Seed was loaded into a hopper on the helicopter and then released over the required area, sprayed from vents located on the base of the vehicle. Aerial seeding was used to provide temporary vegetation cover until permanent reinstatement was achieved, and for biological

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reinstatement of the RoW. **See also** Right of Way and TransSakhalin pipelines.

#### AFRAMAX

Four Aframax tankers deliver oil to Sakhalin Energy's customers. The tanker gets its name from AFRA (average freight rate assessment), a system Shell Oil developed. As a relatively smaller vessel with a deadweight of between 80,000 and 120,000 tonnes, Aframax tankers transport oil from harbours that are too small to handle Very Large Crude Carriers (VLCC).





#### **ANIVA BAY**

Aniva Bay is the location of Sakhalin Energy's liquefied natural gas (LNG) plant and oil export terminal (OET) in Prigorodnoye, the southern part of Sakhalin Island. The area is ice free in winter. It is also a popular fishing and recreation area. **See also** Korsakov.

#### APPROVALS

A system of permits and licenses for different activities of a company required by Russian legislation. It includes preparing documents according to a legal process, for submitting to State regulatory authorities for review and approval. Design, procurement, and construction of Sakhalin Phase 2 required some 10,000 approvals from local, regional, and federal bodies in Russia.

#### **ARCHAEOLOGICAL DISCOVERIES**

An archeological project Sakhalin Energy sponsored to find, identify, and protect items of historical and archaeological interest along the Right

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of Way (RoW) for the TransSakhalin Pipelines. The project found 185 objects of significant cultural heritage during excavations for the Sakhalin-2 project from 1998 to 2007. 10 archaeological sites within the RoW borders were excavated from 2004 to 2006. More than 35,000 artifacts were collected and then stored permanently in museums. Today, these objects are housed in the Sakhalin State Regional Museum and the Museum of Archaeology and Ethnology at Sakhalin State University. **See also** Right of Way and TransSakhalin pipelines.

ASSOCIATED GAS

Gas, which is dissolved in the reservoir at reservoir pressure and then released during production.

#### **AUGER-BORE METHOD**

One of two techniques, such as trenching, that Sakhalin Energy used while installing the Trans-Sakhalin pipelines to cross ecologically fragile areas without disturbing the land surface. The company used the method mainly to install pipes under roads and railway lines without disturbing infrastructure. It involves using a large diameter auger bit to drill a horizontal hole under the specified area. As the auger bit advances, a section of pipe gets pushed through the hole. **See also** Dry-cut crossing, TransSakhalin pipelines and Wetcut crossing.



#### BARREL

A unit of volume traditionally used by the oil industry to measure oil. Cubic metres and metric tonnes are also used. A barrel (bbl) of oil equals approximately 159 litres, or 0.159 cubic metres. To convert in the other direction from cubic metres into barrels, the factor is about 6.29. Converting to metric tonnes depends on oil density, which varies between 820 and 905 in Russia, or 5 kilogrammes per cubic metre. For Sakhalin-2 Vityaz crude, a light oil, a conversion factor of 7.4 can be used for approximate values: 7.4 bbls equal one tonne.

#### BIG BORE GAS PRODUCTION WELLS

The Lunskoye gas wells, the largest producing gas wells in Russia, are big bore wells, designed



so that tubing 244 millimeters in diameter can be installed in the reservoir. Because of the very wide tubing, big bore wells significantly reduce operating costs and capital expenses and increase flow area, so a higher gas flow rate can be achieved. Each Lunskoye well is designed to produce 9–10 million m<sup>3</sup> of gas per day. **See also** Lunskoye-A.

### **BIODIVERSITY** ACTION PLAN (BAP)

Biodiversity comprises all plants and animals and their habitats and ecosystems. Sakhalin Energy finalised its Biodiversity Action Plan in 2009. The plan complements the Environmental Monitoring Project (EMP) and acts as a basis for Habitat cd

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Action Plans (HAP) and Species Action Plans (SAP). **See also** Biodiversity Group and Environmental Monitoring Project.

#### **BIODIVERSITY GROUP**

Formed in 2007 under the auspices of the Ecological Council, an advisory body of the Sakhalin Oblast Government, made up of delegates from Sakhalin Energy and representatives from environmental groups, and non-governmental and scientific organizations from Japan. The Group reports to the Ecological Council, and serves in an advisory role on biodiversity strategy, with the aim of applying biodiversity planning principles more widely on Sakhalin Island. The Group's role may eventually include research and monitoring. **See also** Biodiversity Action Plan.

#### **BIOLOGICAL REINSTATEMENT**

The last stage of the reinstatement process to promote the growth of vegetative cover on the Right of Way (RoW) of the TransSakhalin pipelines. Several methods of biological reinstatement can be used. For Sakhalin-2, seeds were sown along the RoW by aeriel seeding, hydro seeding or manual seeding, and through tilling the soil, applying fertilizer and laying erosion matting. Biological reinstatement minimises surface erosion, returns the landscape to productive life after construction for use as farming or pastureland, promotes the return of natural soil processes, and improves the aesthetics of the RoW for local communities.

Although seeding was used along most of the RoW, ecological surveys identified a number of wetlands where seeding was not an option. Natural colonisation of local species was used to reestablish vegetative cover in these areas. Technical reinstatement of these areas was critical to make sure the right physical conditions were in place for natural colonisation to occur. Sakhalin Energy is monitoring these wetlands to identify any further remedial actions needed to ensure recovery of these sensitive ecosystems. See also Technical reinstatement.

#### **BLOCK VALVE STATIONS**

An integral part of the management and safety practices of the TransSakhalin pipelines, block valve stations transmit online monitoring information from an instrument shelter to the control room of the onshore processing facility (OPF). Operators in the remotely-based control room at the OPF can isolate, and if necessary, shut down any part of the pipeline or the entire route in an emergency. **See also** Onshore processing facility and TransSakhalin pipelines.

#### **BLOCK VALVES**

Block valves allow sections of a pipeline to be shut for maintenance or in an emergency. These valves are placed about every 30 kilometres along a pipeline. Additional valves are placed on each side of



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an important watercourse or river along the oil pipeline route and near each side of most fault crossings. The oil pipeline has 104 valves, the gas pipeline has 47 valves, and four valves are placed along the multiphase pipeline between the onshore processing facility (OPF) and the Lunskoye-A platform. See also Block valve stations, Fault crossings and TransSakhalin pipelines.

#### **BOARD OF DIRECTORS**

The Board of Directors oversees the business activities of Sakhalin Energy. Shareholders appoint 10 directors, four principal directors and six principal non-executive directors. **See also** Shareholding structure.

#### BOOM

Sakhalin Energy takes an integrated approach to oil spill response (OSR) that uses different booms for strong and sturdy containment. Marine, river, and shore seal booms are kept close to the spill source for immediate deployment. **See also** Oil spill response.



#### **BOOSTER STATIONS**

Pumps and compressors allow booster stations to increase the pressure of gas or liquids in a pipeline between the onshore processing facility (OPF) and the liquefied natural gas (LNG) plant. Booster station 1 (BS1) is at the OPF and booster station 2 (BS2) is at Gastello. **See also** Onshore processing facility and TransSakhalin pipelines.



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#### CAISSON

A caisson is a watertight chamber, from which water is kept out with air pressure, and is used in laying foundations under water. A caisson is installed on the Molikpaq (PA-A) platform, the liquefied natural gas (LNG) jetty, and the oil export terminal (OET). **See also** Molikpaq, Liquefied natural gas jetty and Oil export terminal.





#### **CENTRAL CONTROL BUILDING**

Pipelines and gas processing are managed from the central control building at the onshore processing facility (OPF). **See also** Onshore processing facility.

#### COMMENCEMENT DATE

A term which generally refers to the date when work started on the Sakhalin-2 project. The commencement date, announced in June 1996, was preceded by two years of preparations to fulfill conditions stipulated in the production-sharing agreement. **See also** Production Sharing Agreement.

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#### COMMISSIONING

The overall process of bringing into service a new or modified facility. The main purpose of commissioning is to ensure all the facilities function according to design. The commissioning phase involves final system checks, initial startup, performance testing, and stabilisation.

#### COMMITTEE OF EXECUTIVE DIRECTORS

The Executive Committee is responsible for the direct management of the company. The Chief Executive Officer heads the committee, which sets the daily activity of Sakhalin through strategies,

business plans, and decisions on implementation. In 2009, the Committee was made up of eight directors: the CEO, deputy CEO, and the Production Director, Technical Director, Commercial Director, Human Resources Director, External Affairs and Government Relations Director.

### COMMUNITY GRIEVANCE PROCEDURE

Developed by Sakhalin Energy to provide an independent channel for staff, suppliers, contractors, employees, joint venture partners, or community members to raise concerns or make suggestions, if they believe the company's business practices or its development of Sakhalin-2 are causing harm to the environment, the community, or quality of life.

Grievances are documented and resolved in a specific time frame and can be registered by phone, mail, e-mail, in person, or at a confidential website (http://www.seicconfidential.com/ default.htm)

#### **COMMUNITY LIAISON OFFICERS**

A network of officers throughout Sakhalin Island, established by Sakhalin Energy in the districts affected by the construction and operational activities of the Sakhalin-2 project. CLOs are based in north, south and central Sakhalin Island and in



Yuzhno-Sakhalinsk. CLOs are the eyes and ears for the project. They provide a conduit for the company to communicate with the municipal government and other stakeholders, and provide a means for stakeholders to contact the company. They maintain records of project impacts on communities, and relay changes in a community profile to key Sakhalin Energy audiences. In addition, they support and assist local project functions and provide the main administrative support for the grievance process.

#### COMPASS

A new development in liquefied natural gas (LNG) information technology, Compass software is used to schedule crude oil and LNG cargoes. It can be customised for LNG customers, and aligns actual LNG production with the business plan for Sakhalin Energy through a statistical function, which can adjust for ambient temperatures. A stochastic model allows the software to factor in a disruption or delay in a ship's arrival due to bad weather. An additional embedded feature predicts the quality of each cargo to be loaded according to the business plan, which takes into account a mn op qr st uv

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time lag caused by a delay in a cargo's passage through the long pipeline.

#### CONCRETE GRAVITY BASE STRUCTURES

The foundations of the Lunskoye-A (Lun-A) and Piltun-Astokhskoye-B (PA-B) platforms are made of concrete gravity base structures (CGBS) that consist of four massive legs for each structure, which are used to support a platform's topsides. Aker Kvaerner Technology AS of Norway and Quattro Gemini OY of Finland carried out the engineering and construction of these structures, the first of its kind constructed in Russia at a purposebuilt dry dock in Vostochny port near Vladivostok. **See also** Lunskoye-A, Piltun-Astokhskoye-B, Sakhalin-2 records and Topsides.



#### CONDENSATE

Condensate is separated from free gas light hydrocarbon liquid. At standard conditions it is made up of mostly methane, ethane, propane, butane and pentane.

#### CORPORATE PHILANTHROPY 2008

Russia's foremost corporate charity ranking system for identifying the best charity programmes designed and implemented by companies. Corporate Philanthropy in turn promotes these programs in business and government circles. The system is organized by the Vedomosti newspaper, PriceWaterhouseCoopers consultancy, and the Board of Donors. Sakhalin Energy received a Corporate Philanthropy ranking in 2009.

#### **CRYOGENIC HEAT EXCHANGERS**

There are two main cryogenic heat exchangers installed on each liquefied natural gas (LNG) processing train at the LNG plant at Prigorodnoye. Cryogenic heat exchangers are the final cooling step in the liquefaction process, taking gas from approximately  $-50^{\circ}$ C and liquefying it at  $-160^{\circ}$ C



so that LNG can be efficiently transported by tanker to customers. Two associated pre-cooling cryogenic heat exchangers are also in place on the processing train. The two main units are coilwound heat exchangers. They made of aluminum and stand 40 metres high and weigh 133 tonnes each once installed. Pre-coolers are 32 metres tall and weigh about 180 tonnes. **See also** LNG processing trains.

#### CUTTINGS RE-INJECTION

At the Lunskoye-A (Lun-A) and Piltun-Astokhskoye-B (PA-B) platforms, reinjection wells have been drilled to safely dispose of drill cuttings and oil-based mud. These platforms operate according to a zero drilling discharge policy, meaning drill cuttings and drilling muds are never discharged overboard. **See also** Zero drilling discharge. cd

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#### DERRICK

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A tower-like structure, which forms part of a drilling rig and is used to support drilling equipment, including bits and pipes.



#### **DEVELOPMENT DATE**

The date when Sakhalin Energy began developing licensing areas, a term that comes from the Sakhalin-2 Production Sharing Agreement. The development date for Piltun-Astokhskoye license area was declared in 1997 and for Lunskoye license area in 2003.

#### DISPERSANT

A liquid hydrocarbon used as a back-up method in tandem with mechanical recovery to respond to an oil spill. Dispersants are capable of removing large amounts of some oil types from the sea surface by transferring the oil to the water column. The Russian Federation allows only three dispersants for use in the country. Approval is required before their use. Dispersants are sprayed by boat or aircraft. **See also** Boom and Oil spill response.

#### DOUBLE MIXED REFRIGERANT PROCESS

A liquefied natural gas technology licensed by Shell for use in cold climates, such as Sakhalin. In this process, natural gas is cooled in two cycles:



the Precool Mixed Refrigerant cycle (PMR) and the Mixed Refrigerant Cycle (MR). The new technique involves use of the PMR cycle, a mixture of light hydrocarbons, mostly ethane and propane. To take advantage of the cold Sakhalin winter, LNG production is maximized by modifying the composition of the refrigerant in winter and summer.

#### DREDGING

To provide foundations for a jetty and ensure a water depth so LNG vessels could operate safely in Aniva Bay, Sakhalin Energy carried out dredging operations in a prescribed part of the bay from 2003 and 2005. The dredging was in full compliance with the requirements of Russian authorities. In line with international best practice, the dredging spoil was removed to an approved disposal site 24 kilometres offshore and evenly distributed in a 200-metre radius at a depth of 65 metres. Dredging was completed successfully and ahead of schedule. The impact of the dredging was less than a 2003 Environmental Impact Assessment had predicted. Monitoring studies have shown the impacts from the operation have been minimised, local, and short term, with no permanent effects on fishing in Aniva Bay or elsewhere. **See also** Aniva Bay and Environmental Impact Assessment.



#### **DRILL CUTTINGS**

When a drill bit is used to drill a well, the cutting process produces ground rock coated with drilling

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fluid, which is removed from the hole and carried to the surface by the fluid.

#### DRILLING ADVANCED RIG TRAINING (DART)

The drilling advanced rig training (DART) simulator teaches drilling techniques from a safe environment onshore. Equipped with three-dimensional graphics and sound effects, DART is also used to test well-drilling methods. Sakhalin Energy operators in Yuzhno-Sakhalinsk are trained using this method.

#### **DRILLING FLUID**

Drilling fluid is also known as the "mud system". It is an essential element of drilling a well. The most common drilling fluid is a mixture of clay and other minerals with water and chemical additives, but wells can also be drilled by using oil-based mud as drilling fluid. The mud is pumped down the drill pipe and then returned to the surface around the outside of the drill pipe. The main functions of drilling fluid are: cooling and lubrication, removal of cuttings and maintaining the well under pressure to control the influx of liquid and gas.

#### DRY-CUT CROSSING

A technique used to install a pipeline under a small watercourse that minimises available water and reduces sediment displacement. Water is contained upstream of the crossing point and diverted to an area downstream with a flume pipe or a pump, creating a dry section. Once the water is diverted, a trench is dug through the dry bed of the watercourse and a pipe is laid. After the operation is finished, the riverbed is restored and the water flow resumes. During construction of the TransSakhalin pipelines, the dry-cut crossing method was used for small watercourses in ecologically sensitive areas. **See also** TransSakhalin pipelines and Flume pipe.



compliance with environmental legislation. For more details, visit www.sakhalinenergy.com

#### **ENVIRONMENTAL** IMPACT ASSESSMENT

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See Social Investment

**ENVIRONMENTAL ACTION PLAN** 

EDUCATIONAL GRANTS

**ENERGY TV PROGRAMME** 

Launched in 2004, the Energy TV show keeps

stakeholders informed about milestones and other

significant events on Sakhalin-2. The program airs

The Environmental Action Plan documents Sa-

khalin Energy's responsibilities for river crossings, fishing areas, land management and erosion cont-

rol, and lists mitigation measures. The Russian environmental authority, RosPrirodNadzor (RPN)

approved the plan in 2006. Russian Federation

Minister of Natural Resources, Yuri Trutney, in

2008 cited Sakhalin Energy as a role model of

on ASTV (local TV channel) every Thursday.

In 2003, global environmental consultants carried out an independent Environmental Impact Assessment of the Sakhalin-2 project. The evaluation was in keeping with corporate requirements and international best practice. An addendum was published in 2005. The report is available at the Sakhalin Energy website, www.sakhalinenergy. com

## **ENVIRONMENTAL** MONITORING PROJECT (EMP)

Developing and implementing Environmental Monitoring was a condition set by the State





Environmental Expertise Review in 2003. The EMP is required by Russian federal law and covers surveys and environmental monitoring of industrial sites and offsite locally.

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### ENVIRONMENTAL PROJECT OF THE YEAR 2008

The Russian Natural Resources Ministry in 2008 created an award for best environmental project of the year. In December of that year, Sakhalin Energy won the inaugural award "Environmental Project of the Year" for its Western Gray Whales protection programmes. A Sakhalin Energy contractor, Starstroi, received a diploma by the Ministry for implementation of the Sakhalin-2 onshore pipeline system.

#### ENVIRONMENTAL, SOCIAL, HEALTH IMPACT ASSESSMENTS (ESHIA)

Sakhalin Energy has conducted three Environmental, Social, and Health Impact Assessments (ESHIA), based on industry best practice, international standards, and Russian regulatory requirements. The ESHIA was finalised and published in 2003. The report reflects Sakhalin Energy's commitment to maximise the benefits and minimise all the potential negative effects from the development of Sakhalin-2 on people and the environment, and to identify all potential threats and find ways of reducing them to an absolute minimum.

#### **EXTENDED REACH DRILLING**

Extended reach drilling (ERD) allows wells to be drilled in subsurface locations distant from existing platforms. Some hydrocarbon reserves are located around 8 to 10 kilometers from all three Sakhalin Energy platforms, which means these outlying reservoirs, which would be unprofitable to bring onstream with conventional drilling equipment, can be profitably exploited using ERD from an existing platform.





#### FAULT CROSSINGS

A fault crossing is made at an optimum angle to a fault line, also known as a planar rock fracture. to allow free movement of a pipe so it does not break or come under extreme stress in an earthguake. To allow the required movement of the pipeline during an earthquake, trenches dug through the fault crossing are constructed differently and other backfill materials are deployed. Beads of clav are used as backfill for the trench and surrounding the pipes, and special sand is used in some places. The trenches are designed to drain freely and are lined with special waterproof material, a geomembrane, preventing early water entry and ensuring water does not settle and freeze around the pipe in winter, which would inhibit movement and place stress on the pipe during an earthquake.

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The TransSakhalin pipeline system crosses 19 fault lines. **See also** TransSakhalin pipelines.

#### **FIBRE OPTIC CABLE**

A fibre optic cable (FOC) connects all of Sakhalin Energy's main onshore facilities by an undersea FOC link to the Lunskoye-A (Lun-A) platform. The onshore cable, a bundle of glass threads encased in an armoured cable, is buried underground. Information is converted into light waves for transmission over the fibre cores. The FOC was manufactured in St Petersburg and Moscow. Towns and



villages throughout Sakhalin benefit from the FOC because a local telecommunications company uses part of the FOC network to provide internet access in many areas.

#### FLARING

A way to dispose of produced associated gas or relieve produced gas pressure. The gas is burned safely when there is no way to transport or use it for any other purpose.

#### **FLOAT-OVER**

To place the Lunskoye-A (Lun-A) and Piltun-Astokhskoye-B (PA-B) topsides' onto their concrete gravity base substructures, the float-over method



was used. The topsides were transported by specially constructed barges and positioned between the legs of the substructure. As the barge was ballasted, the topsides were gradually allowed to float over to the correct position. **See also** Concrete gravity base structures and Topsides.

#### FLOTEL

A flotel is a vessel converted into an accommodation facility so more staff can be deployed than on a drilling rig or production platform. Sakhalin Energy used three flotels during the commissioning works on Sakhalin-2 platforms.

Safe Astoria was built in 1983 as a semi-submersible drill platform and converted to a flotel

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in 2005. It provided acommodation for up to 245 personnel from the Lunskoye-A (Lun-A) platform during the construction period in 2008.

Safe Bristolia is a retrofitted semi-submersible drilling rig that is now a flotel, with accommodation for up to 600 offshore personnel. Operated by Consafe, it was deployed at the Lun-A platform in July 2006 as a flotel for the hook-up crew and at the Piltun-Astokhskoye-B (PA-B) platform for topsides installation and hook-up.

The Sanko Angel is a multi-purpose vessel which operated as an accommodation vessel at the Lun-A platform for construction work in 2007. The ship is 76 metres long with 700 m<sup>2</sup> of workable deck space and accommodation for 130 personnel.



#### FLUME PIPE

A length of pipe used to channel water across the Right of Way (RoW) for the TransSakhalin pipelines. Sakhalin Energy used flume pipes during the construction of river crossings, to temporarily channel water flow downsream, allowing crossing work to be carried out in virtually dry conditions, called the dry-cut crossing method. **See also** Dry-cut crossing.

#### **FOUNTAIN SYSTEM**

Fountain is a data, information and knowledge system that simplifies and improves reporting, analysis, and learning, an essential tool for Sakhalin Energy's effective functioning and development. Modules of the system have been custom designed for use by business functions.

#### FRAC-PACK

Frac-Pack is a form of massive hydraulic fracturing used for sand control that combines hydraulic fracturing with a gravel pack treatment. The fracture is generated in the same way as a massive hydraulic fracture, but to stop the proppant, sized particles are mixed with fracturing fluid to hold fractures open after a hydraulic fracturing treatment. To stop sand from being produced after fracturing, a sand screen is set in the well across the fractured interval. Sakhalin Energy used this technique for three oil producers in the Astokh area of Piltun-Astokhskoye field at the Molikpaq (PA-A) platform.

#### **FREE GAS**

Gas occurring above oil in a reservoir. Free gas is present when more gas is available than will dissolve in the associated oil under existing reservoir pressure and temperatures.

#### FRICTION PENDULUM BEARINGS

Friction pendulum bearings are installed below the topsides of the Lunskoye-A (Lun-A) and Piltun-Astokskoye-B (PA-B) platforms. The bearings allow the topsides to move during an earthquake, thus protecting the topsides from damage, while the concrete gravity base structure remains firmly anchored to the seabed. The bearings have been manufactured to withstand the freezing temperatures in the Russian Far East thanks to use



of specialty steel produced in the USA. The bearings also help reduce ice and wave loads on the platform and its equipment. Sakhalin Energy is the first oil and gas company worldwide to use friction pendulum bearings on its platforms and it is the first time the bearings have been used offshore in Russia.

#### FROG

The FROG is a personnel transfer capsule with a capacity of three or six people, developed by UKbased Reflex Marine Ltd. It was deployed on all three offshore platforms for moving staff from accommodation vessels to the platform. The FROG

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is lifted by crane from one deck to the next. It protects against the major hazards of marine personnel transport such as falling, whiplash, and lateral and vertical impacts through robust seats and seat harnesses. It is capable of righting itself and floating on water.

#### **FSO OKHA**

The floating storage and offloading unit (FSO) Okha was part of the Vityaz production complex and used during seasonal oil production. Crude oil was pumped into the FSO from the Molikpaq platform and stored until a tanker arrived and connected to the FSO to offload oil. The FSO left Sakhalin at the end of 2008 when year-round oil production began from the Molikpaq. The FSO was named after the northern Sakhalin town of Okha. **See also** Molikpaq and Vityaz production complex.







#### GAZPROM

Gazprom, the world's largest energy company, became Sakhalin Energy's majority shareholder in 2007. The government of the Russian Federation holds a controlling block of Gazprom shares – 50.002%.

Gazprom produces 20% of the world's natural gas and around 85% of Russia's. Gazprom exports gas to 32 countries. Under a commission from the Russian Federation, Gazprom coordinates activities to create a unified system of gas production, transportation and supply in Easterm Siberia and the Russian Far East with a view to exporting gas to China and other countries in the Asia Pacific, which is known as the Eastern Programme. **See also** Project history and Shareholding structure.

#### GAZPROM TRANSGAZ TOMSK

A well-established western Siberia gas transmission company with some 30 years of experience in pipeline servicing. In 2008, Sakhalin Energy and Gazprom Transgaz Tomsk signed a five-year contract for operations and maintenance of the Sakhalin-2 pipeline system. In addition to assuring the safe and reliable operation of Sakhalin Energy's 1,670 kilometers of oil and gas onshore pipelines, Booster Station 2, and 104 block valve stations, OAO Gazprom Transgaz Tomsk will also service and maintain all support assets, using four pipeline maintenance depots strategically placed along the pipeline corridor at Nogliki, Yasnoye, Gastello and Sovetskoye.



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#### **GENERAL BUSINESS PRINCIPLES**

Sakhalin Energy conducts its business according to a set of general business principles. The company's core values of honesty, integrity and respect for people are the foundation of these principles, displaying responsibility towards shareholders, the Russian Party, customers, employees, with those it conducts business, and society. The principles cover economics, competition, business integrity, political activities, health, safety, security and the environment, local communities, communities and engagement, and compliance. More information is available on Sakhalin Energy's website at www.sakhalinenergy.com





#### **HEADS OF AGREEMENT**

A Heads of Agreement (HoA) is an important step leading up to signing a full contract or Sales and Purchase Agreement (SPA). A legally binding document between two parties, an HoA outlines the general terms and conditions of a deal, to be further developed in a full SPA. Part of the marketing activity of Sakhalin Energy's liquefied natural gas (LNG) project included signing an HoA with customers.

#### HEALTH IMPACT ASSESSMENT

Sakhalin Energy conducted a Health Impact Assessment (HIA) with the support and participation of the Sakhalin Island health community. The HIA addresses the impact on the health of the island population of construction and operation of the project. Sakhalin Energy's objective is to ensure the health of its workforce and promote health improvements in the community.

### HEALTH, SAFETY AND ENVIRONMENT POLICY (HSE) AND COMMITMENTS

Sakhalin Energy introduced in 2001 a new Health, Safety and Environment (HSE) Policy and Commitment as part of the HSE Management System, mainly to show HSE plays a leading role in the company's business. The policy also demonstrates how seriously the company takes its approach to environmental protection and the health and safety of its staff and contractors.

#### HEALTH, SAFETY, ENVIRONMENT AND SOCIAL ACTION PLAN

The Health, Safety, Environmental and Social Action Plan (HSESAP) details around 800 obligations for Sakhalin Energy to carry out. The plan was drawn up in 2005 and revised in 2007. Regular monitoring of how the HSESAP is being implemented is done to determine the efficiency of the measures and as required by Project lenders. Through this process, the company determines



whether its commitments must be strengthened, more clearly defined, or changed. Some mitigation measures may be found redundant as the relevant activity such as construction has been completed. Regular reviews and audits are conducted by Health, Safety, Environment and Security (HSES), Social Assessment and Project teams and by shareholders and lenders.

#### **HOOK-UP**

Hooking up wells on an offshore platform to the vessels, equipment and control systems involved in processing. The procedures involve installing pipe works from the wellhead to the inlet separation vessel and hooking up systems to control and monitor the well.

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#### HORIZONTAL DIRECTIONAL DRILLING

Horizontal Directional Drilling (HDD) is similar to the drilling technique used for constructing oil and gas wells. HDD minimises impacts on the aquatic environment. Sakhalin Energy used HDD during construction of the TransSakhalin pipelines to drill bedrock underlying watercourses and completely avoid contact with the water. The Company used HDD when crossing six of the largest rivers with the greatest potential for commercial fisheries. **See also** River crossings and TransSakhalin pipelines.

#### **HURRY UP FOR GOOD DEEDS**

**See** Social Investment – Employee Charitable Support Programme

#### **HYDROCARBONS**

Compounds of hydrogen and carbon in various combinations present in petroleum products and natural gas.

#### **HYDRO-SEEDING**

A biological reinstatement technique that uses specialised equipment to apply a slurry mix of seed, mulch, water, tackifier and fertiliser over bare soil. The slurry mix is prepared in an agitator tank and sprayed over prepared ground in a uniform layer. Hydroseeding is an effective alternative to manual seeding, especially in difficult areas such as slopes. It also promotes rapid germination and growth of the plant species used in the slurry mix compared with other seeding methods, which in turn reduces the potential for soil erosion. **See also** Reinstatement measures.





#### **ICE SCOUR**

A geological term for long, narrow ditches in a seabed created by the collision of fast ice and pack ice. Ice scouring data obtained during the Sakhalin-2 project contributed to scientific knowledge and allowed Sakhalin Energy to model safe and reliable pipeline laying techniques.

The data also contributed to Sakhalin Energy's decision to reroute its pipelines. Deeper trenches were required to prevent excessive noise during construction.

#### IMPACT ASSESSMENT

The process of predicting the health, social, and environmental consequences of a current or proposed action and managing these through project design, mitigation and enhancement.



#### INDIGENOUS PEOPLE

Four main groups of indigenous minorities live on Sakhalin Island: Nivkh, Uilta (previously known as Orok), Evenk and Nanai. Traditionally, the Nivkh

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culture is based around salmon fishing, dogbreeding and hunting, while the Nanai culture relied on salmon fishing and hunting. The economies of the Uilta and Evenk peoples revolve around fishing as well as breeding and herding reindeer. **See also** Sakhalin Indigenous Minorities Development Plan.

### INDIRECT VERTICAL FRACTURE (IVF)

A special technique used for well completion that allows the rate of oil or gas produced from a formation of either hydrcarbon to be increased or restored. The high-permeability layer above the perforated interval is indirectly connected with a vertical fracture. IVF is widely used by Shell but is new to Russia. Sakhalin Energy used this technique for most of the producers in the Astokh area of Piltun-Astokhskoye field at the Molikpaq (PA-A) platform.

#### **INFORMATION CENTRES**

Sakhalin Energy successfully completed the challenging 20 information centres project in 2009, opening centres throughout Sakhalin Island near



company assets. Each centre works on the premises of a local library, and is equipped with new offices, internet access, and a fire and security alarm system.

The information centres are spread evenly across the Island, in the regional centres of Dolinsk, Smirnikh, and Kholmsk and in rural locations with populations of only a few hundred.

In addition to providing Sakhalin's residents with a new means of communication, the centres also make information available on the Sakhalin-2 project and Company activities.

#### INFRASTRUCTURE UPGRADE PROJECTS

Sakhalin Energy runs extensive, ongoing infrastructure upgrade projects totalling \$500,000 of improvements to Sakhalin's railways, bridges, roads, ports and airports, and health care, telecommunications and waste disposal facilities. Work began in 2002 on the infrastructure upgrade projects. In 2005, hospitals in Nogliki, Proronsky and Yuzhno-Sakhalinsk started receiving new medical equipment and six district hospitals were getting emergency response ambulances.



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#### **INJECTION WELL**

Wells into which fluids (water, gas) are pumped into the reservoir formation to maintain reservoir pressure and displace oil, used on the onshore platforms for the Sakhalin-2 project. Separated gas from production wells may be reinjected into the upper gas section of the reservoir. Water injection wells are common offshore where filtered and treated seawater are injected into a lower water-bearing section of the reservoir.

## INTEGRATED SAFE SYSTEM OF WORK (ISSOW)

Also known as the electronic permit to work system, Sakhalin Energy trialed the Integrated Safe System of Work (ISSOW) for the first time in Russia, for possible approval for use by the oil and gas industry operating in the Russian Federation. Monitored by RosTechNadzor, the Russian technical safety authority, the ISSOW is the first of its kind management system to ensure activities are carried out safely by identifying risks, control and mitigation measures before work begins.

#### INTERNATIONAL FINANCE CORPORATION (IFC)

IFC is a member of the World Bank Group, that invests in the private sector. In addition to compliance with the Russian Federation and PSA regulations, Sakhalin Energy and its engineering, procurement, construction, and operation contractors and sub-contractors execute their activities in accordance with IFC social, health, safety and environmental requirements. IFC standards are designed to ensure economic and financial efficiency and effective solutions in these four domains.

#### INTERNATIONAL ORGANIZATION FOR STANDARDISATION (ISO)

An international accreditation programme that includes ISO 14001, an international standard for environmental management systems. ISO awarded ISO 14001 to Sakhalin Energy's Vityaz production complex in January 2004 and renewed it in January 2007. ISO certified two new offshore platforms, Lunskoye-A (Lun-A) and Piltun-Astokhskoye-B (PA-B), with ISO 14001 in May 2008, and Prigorodnoye complex in September 2008. The onshore processing facility (OPF) and Pipeline Operations were certified in March 2009 as compliant with ISO's Environmental Management Systems standard 14001:2004, marking the final stage in the certification process for all of Sakhalin Energy's facilities and operations.

The laboratory at the liquefied natural gas (LNG) plant received ISO 17025 in 2007, which specifies general competency requirements to carry out calibrations, including sampling.

#### JAPAN BANK FOR INTERNATIONAL COOPERATION

Formed as a result of a merger in 1999 between the Export-Import Bank of Japan (JEXIM) and the Overseas Economic Cooperation Fund, Japan (OECF). JEXIM was a significant lender to Sakhalin Energy during Phase 1, and JBIC followed suit,



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contributing \$116 million to Sakhalin-2 in 1997. Sakhalin Energy secured \$3.7 billion from JBIC for Phase 2 in 2008.

The Joint Committee was set up to ensure a high level of participation by Russian industries

JOINT COMMITTEE

in the implementation of the Production Sharing Agreement (PSA).

It comprises six members, two each from Sakhalin Energy, the Ministry of Energy of the Russian Federation, and the Department of Oil and Gas Complex of Sakhalin Oblast. **See also** Production Sharing Agreement.







#### **KHOLMSK SUPPLY BASE**

Located at Sakhalin's western seaport, the Kholmsk supply base is the main port supporting Sakhalin Energy's three offshore production platforms. The base has facilities for storing and handling cargo. Through Sakhalin Energy's infrastructure upgrade programme, Kholmsk was transformed from a struggling fishing port into a thriving supply area. It now provides catering for vessels from the projects Sakhalin-1 and Sakhalin-2. Sakhalin Energy also upgraded ancillary works including offices at Kholmsk, as part of the infrastructure programme. **See also** Infrastructure upgrade projects.

#### KORSAKOV

The nearest town to the liquefied natural gas (LNG) plant and the oil export terminal (OET) at Prigorodnoye, Korsakov is on the northern edge of Aniva Bay south of Sakhalin Island. Fishing is its major industry, and its major resource area is Aniva Bay, where crab, salmon, scallop and pollock are plentiful. Korsakov is a major recreation area for Sakhalin residents on the southern part of the island. **See also** Aniva Bay and Resettlement Action Plan.



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guickly and safely evacuated from the plant

through a tall vertical pipe (the flare stack) for

immediate ignition by a pilot flame. While the

plant is operating the pilot flame at the top of

the flare stack is constantly kept alight – confirming normal operations. The pilot flame en-

sures that should gas need to be guickly vented

from the plant it will always ignite at the top of

the flare stack. This ensures there is less impact

on the environment compared to releasing un-

ignited gas.

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include the Piltun-Astokhskoye license area, located approximately 12 miles from the northeast coast of Sakhalin Island, and the Lunskoye license area, located approximately 8 miles from the northeast coast of Sakhalin Island.

#### LIQUEFIED NATURAL GAS

Liquefied natural gas (LNG) is natural gas in its liquid form. Natural gas is primarily made up of methane, and also contains low concentrations of other hydrocarbons, water, carbon dioxide, nitrogen, oxygen and some sulphur compounds. During the liquefaction process, natural gas is cooled to minus 160 degrees Celsius. Before the gas is cooled, water vapour, carbon dioxide and



heavy hydrocarbons are removed from the gas in various processes. During the subsequent cool down, the gas becomes a clear, colourless, odourless liquid. The density of LNG is less than half the density of water so it floats if spilled on water. In this aqueous state, natural gas reduces in volume 600 times, so it can be transported by sea in LNG tankers. It is returned to a gaseous state at re-gasification terminals after delivery to customers. LNG is not corrosive or toxic. It can be used for heating and cooking as well as to generate electricity and for other industrial uses. LNG can also be kept as a liquid to be used as an alternative source of transportation fuel. Natural gas is the cleanest burning fossil fuel and LNG is a price-competitive source of energy that could help meet the future energy needs of many countries. It also offers unrivalled flexibility of delivery compared with gas supplied via pipeline.

#### LIQUEFIED NATURAL GAS FLARE

The flare at Sakhalin Energy's liquefied natural gas (LNG) plant at Prigorodnoye is a crucial element of the plant's safety system. Flaring is the process by which excess gas from the plant is

### LANDSLIDES

Landslide risk along the TransSakhalin pipeline is mostly confined to a very mountainous section of the pipeline corridor that passes through the Makarov Mountains. Information gathered from many geological and geo-hazard studies of both existing and potential landslides was taken into account when designing the pipeline. In addition to re-routing the pipeline factoring in landslide risks, Sakhalin Energy uses industry best practices to mitigate the risk to as low as reasonably practicable, ensuring the safety and integrity of the entire TransSakhalin pipeline system in operation.

#### LICENCE AREAS

The sub-soil areas specified in the Production Sharing Agreement. For Sakhalin Energy, these



#### LIQUEFIED NATURAL GAS IMPORTS

Sakhalin Energy imported three cargoes of liquefied natural gas to help accelerate the start-up process for its LNG plant. Deliveries were made in July 2007 by the Granosa from Botang, Indonesia (130,000 m<sup>3</sup>), in October 2007 by the Arctic Sun from an LNG terminal in Alaska, (85,000 m<sup>3</sup>) and in June 2008 by the Dewa Maru (114,000 m<sup>3</sup>) from an LNG facility in Japan.

The LNG delivered by the carriers was used to cool loading lines, equipment and LNG storage tanks. The imported LNG was also used during commissioning for the flaring system, gas turbine generators, boil off gas compressors and other major elements of the process trains.

#### LIQUEFIED NATURAL GAS JETTY

Liquefied natural gas (LNG) is loaded onto tankers from an 805 metres long LNG loading jetty. The jetty is fitted with four arms – two loading arms, one dual-purpose arm and one vapour return arm. The jetty's trestle consists of 10 supports and 11 metal truss spans creating two levels – nine 80 metres trusses and two trusses with lengths of 40 metres and 45 metres. The upper deck is designed for electric cables and a road bed four metres wide. The lower deck is used for the LNG pipeline, communication lines and a one-metre-wide footpath. LNG is pumped from the storage tanks into the parallel loading lines, which are brought to the LNG jetty. At the jetty' head, the pipelines are connected with the jetty's four loading arms. The water depth at the tail of the jetty is 14 metres. The jetty services LNG tankers that have capacities of 18,000 m<sup>3</sup> to 145,000 m<sup>3</sup>. Loading operations take from six to 16 hours, depending on vessel capacity. The jetty will load around 160 LNG carriers per year.





#### LIQUEFIED NATURAL GAS LABORATORY

The laboratory of the liquefied natural gas/oil export terminal (LNG/OET) received ISO 17025 accreditation in 2007. Eight staff are employed in the laboratory, equipped with state-of-the-art instrumentation to analyse oil, gas, chemicals and water streams produced at the site. The laboratory also analyses sea samples from the platforms.

#### LIQUEFIED NATURAL GAS MEASUREMENT METHODOLOGY

A special methodology developed by the Russian Meteorology Institute, VNIIR, at the request

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of Sakhalin Energy, based on the international standard of liquefied natural gas (LNG) measurement. The main difference with a crude oil measurement is an LNG measurement performed onboard ship using the Custody Transfer Measurement System and verified by an internationally recognised entity.

#### LIQUEFIED NATURAL GAS PLANT

The Sakhalin-2 liquefied natural gas (LNG) plant is the first of its kind in Russia. Located in Prigorodnoye in the south of Sakhalin Island, it receives, treats, processes and liquefies natural gas. A special gas liquefaction process was developed for the plant, for use in cold climates such as Sakhalin's, based on the use of a double mixed refrigerant (DMR). This advanced technology was adapted to ensure maximum production efficiency during the extremely cold winters in Sakhalin.

In November 2007, Shell's then CEO, Jeroen van der Veer, presented Sakhalin Energy's LNG project team with a special safety award, for achieving a record 20 million man-hours free of lost time incidents (LTI). The award was also a record for the Shell Group for a greenfield construction site.

The LNG plant is one of Sakhalin's most popular visitor attractions. Russian Federation President, Dmitry Medvedev, inaugurated the LNG plant in February 2009.



The complex includes the following equipment and infrastructure:

- two 100,000 m<sup>3</sup> storage tanks;
- an LNG jetty;
- two LNG processing trains, each with a capacity of 4.8 million tonnes of LNG per year;
- two refrigerant storage spheres with a gross capacity of 1,600 m<sup>3</sup> each for propane and ethane storage;
- a diesel fuel system;
- a heat transfer fluid (HTF) system to supply heat to process consumers;
- five gas turbine-driven generators with a total power capacity of around 129MW;
- utility systems, including instrument air and nitrogen plants and diesel fuel systems;
- a wastewater treatment plant to treat both sewage water and coil-containing water.

The treated water complies with the highest international standards and follows the most stringent Russian and international design codes. The plant was designed to prevent a major loss of containment in the event of an earthquake, meaning no major loss of LNG, and ensuring the structural



integrity of critical elements, such as an emergency shut down valve and the control room of the plant. If necessary, the plant can be shut down safely. See also Double mixed refrigerant process, Liquefied natural gas processing trains.

### LIQUEFIED NATURAL GAS PROCESSING TRAINS

Two liquefied natural gas (LNG) parallel processing trains with an annual capacity of 4.8 million tonnes are fitted with a removal unit for carbon dioxide and hydrogen sulfide, a gas dehydration unit with molecular sieves, mercury removal using activated carbon, fractionation for refrigerant and stable condensate production, and a gas liquefaction unit.

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#### LIQUEFIED NATURAL GAS TANKER

A tanker that transports liquefied natural gas (LNG). Three specialised tankers were built to ship Sakhalin LNG to buyers. The Grand Aniva and the Grand Elena were built at Mitsubishi Heavy Industries shipyard in Nagasaki, Japan. The icestrengthened carriers have an LNG capacity of 145,000 m<sup>3</sup> and were built for a Japanese-Russian joint venture of Nippon Yusen Kabushiki Kaisha (NYK Line) and JSC Sovocomflot, the Russian-owned shipping company.

The Grand Mereya was built at the Chiba works shipyard in Japan by a Japanese-Russian consortium of Mitsui OSK Lines, Kawasaki Kisen Kaisha and Primorsk Shipping Corporation (PRISCO). Designed to operate in low temperatures, the specialized carriers ensure year-round operation from Sakhalin where winters are severe.

### LIQUEFIED NATURAL GAS TRANSPORTATION

Sakhalin-2 liquefied natural gas is transported by specialised LNG carriers. Only about 300 specialised LNG tankers are operating worldwide. The tankers are built to the most stringent safety requirements. The LNG temperature is maintained at minus 162 degrees Celsius, thanks to an onboard cooling system and several polyurethane insulation layers.

Three specialized LNG tankers were built to transport Sakhalin LNG to buyers. The tanks on these vessels are spherically shaped and made of aluminium alloy. The tankers are also double hulled to maintain the inside temperature while protecting the outer tank from the low temperature inside. **See also** Liquefied natural gas tanker.

#### LIQUEFIED NATURAL GAS STORAGE TANKS

Liquefied natural gas (LNG) tanks are double walled and measure 37 metres tall and 67 metres wide. The inner tank is made of 9% nickel steel. The external tank is made of pre-stressed reinforced concrete. Heat insulation between the two layers protects the outer tank from the low LNG temperature and maintains the temperature inside the tank.

#### LUNSKOYE-A

The Lunskove-A (Lun-A) platform was installed in the Lunskove gas field. 15 kilometers offshore in the Sea of Okhotsk at a depth of 48 metres. The Lun-A platform is equipped with minimum processing facilities. It is designed for production year round, and produces the majority of gas for the liquefied natural gas (LNG) plant. Gas treatment is carried out at the onshore processing facility (OPF) before the gas is transported to the LNG plant. Power to Lun-A is supplied by OPF through a subsea cable. The platform's substructure is a four-legged concrete gravity base (CGBS) which supports the topsides facilities. The southeastern leg is used as the well bay, the northeastern leg for the pipeline risers, and J tubes and the remaining legs for the pumps and tanks. The integrated topsides facility was built in South Korea. The topsides include drilling and hydrocarbon liguids separation facilities, storage for chemicals and a living guarters module. All the processing



and drilling equipment are located at the opposite end of the platform from the living quarters to maximise safety. The main working areas are enclosed, temperature controlled and ventilated. Equipment located in the open is protected from ice and cold weather.

A special barge was constructed to transport the topsides to Sakhalin. While being loaded onto the barge, jacks elevated the topsides to a height of 25 metres. In June 2006, the Lun-A platform topsides were installed on the base using the floatover method. The barge with the topsides was placed between the legs of the concrete base. The massive structure of the topsides was slowly and smoothly lowered onto the base legs through ballasting, and attached to the friction pendulum

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bearings, creating a new record for this type of installation. Friction pendulum bearings were placed below the platform's topsides to allow the topsides to move during an earthquake while the CGBS remained firmly anchored to the seabed. Lun-A will be used for extended reach drilling of deviated wells to a maximum horizontal deviation up to 6 kilometers, and to a maximum true vertical depth of 2,960 metres. Lun-A's has the capacity to produce more than 50 million m<sup>3</sup> of gas, and associated condensate and oil of around 8,000 m<sup>3</sup> (50,000 barrels) per day. Gas from Lun-A came onstream in January 2009.

#### Statistics:

**See also** Concrete gravity base structures, Extended reach drilling, Float-over, Friction pendulum bearings and Topsides.

#### **LUNSKOYE FIELD**

The Lunskoye gas field is in the Sea of Okhotsk off the northeast coast of Sakhalin Island. The Lunskoye-A platform was installed in the field in June 2008. **See also** Lunskoye-A.

#### LUNSKOYE LANDFALL AREA

A multiphase pieline from the Lunskoye-A platform comes onshore around seven kilometers from the onshore processing facility (OPF). Hydrocarbons are transported from the OPF to the liquefied natural gas (LNG) plant and oil export terminal at Prigorodnoye.







#### MANUAL SEEDING

Manual seeding is a biological reinstatement technique used to sow seeds on the Right of Way (RoW) for the TransSakhalin pipeline. The process begins with ground preparation (i.e. ripping, tilling) to reduce soil compaction and create a roughened surface that acts as a sink for seeds, water, and nutrients. Next, seeds are sown along the RoW by hand or mechanical hand spreader. This is the most common method used on the RoW. For less fertile soils found in the northern part of Sakhalin Island, fertiliser is also spread over the RoW. Organic erosion matting made from coconuts is also used extensively to promote seed germination and growth in the northern areas. **See also** Reinstatement measures.

#### MARINE MAMMAL PROTECTION PLAN

The Marine Mammal Protection Plan was put into effect in 2006 with the primary aim of introducing measures to mitigate any impacts from the



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Sakhalin Energy projects on the Western Gray Whale and other marine mammals. For more information, please visit **www.sakhalinenergy. com** 

#### MASSIVE HYDRAULIC FRACTURING

A technique used in well completion to increase or restore productivity. A viscous fluid carrying proppant or sand is pumped into the formation above the fracture pressure, to split open the rock and create a high productivity channel. The technique is commonly used in Russia.

#### MEMORANDUM OF UNDERSTANDING (MOU)

A Memorandum of Understanding (MoU) is often the first step in a series of agreements leading to developing a complex contract between companies. It is typically not a legally binding document.

#### MISSION

Sakhalin Energy is committed to being a premier energy supplier, recognised for its operational excellence, reliability and safety. We conduct our business in an ethically, socially and environmentally responsible manner.

#### **MITIGATION MEASURES**

Measures designed to mitigate the negative impacts and enhance the positive benefits from the construction and operation of the Sakhalin-2 project. The purpose is to remove, minimise and compensate for adverse effects to as low as reasonably practicable. The measures were developed to address potentially identified adverse impacts. The measures address the following areas: avoidance:

- avoidanoo,
- compensation;
- decreasing probability of occurrence;
- enhancement;
- impact reduction;
- prevention.

#### **MITSUBISHI CORPORATION (MC)**

Mitsubishi Corporation (MC) is Japan's largest general trading company (sogo shosha), with more than 200 bases of operations in approximately 80 countries around the world, including Japan. With seven business groups and more than 500 subsidiaries and affiliates, MC serves customers in virtually every industry. In addition to Sakhalin, MC is involved in LNG projects in Brunei, Alaska, Malaysia Australia, Indonesia and Oman. **See also** Shareholding structure.

#### MITSUI & CO. LTD.

Mitsui is one of Japan's leading trading houses. The company currently participates in liquefied natural gas (LNG) projects in Abu Dhabi, Australia, Oman, Qatar, Indonesia and Equatorial Guinea as well as in the Sakhalin-2 project. In oil and gas exploration and production (E&P), Mitsui has built solid upstream assets in the Middle East, Southeast Asia, Oceania and North America. Mitsui accounts for approximately one quarter of crude oil and oil products traded in Japan. **See also** Shareholding structure.



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#### MOLIKPAQ

The platform installed in the Astokh part of the Piltun-Astokhskoye field in the Sea of Okhotsk in September 1998, 16 kilometers offshore and at a depth of 30 metres. Molikpaq was the main facility of the Vityaz production complex during seasonal oil production. The Molikpaq is a converted ice-class drilling rig. Its name means "Big Wave" in the language of the Inuit people of northern Canada, where the drilling rig was previously based, in the Beaufort Sea. Fitted to the bottom of the Molikpaq is a 15 metres steel spacer so the platform could be installed in the deeper waters off Sakhalin Island. The Molikpaq contains a caisson structure, its centre filled with sand ballast to ensure effective anchoring of the platform on the seabed.

The main working areas are enclosed, temperature controlled and ventilated. Outside equipment has winter protection. Living quarters were designed for 134 permanent and 30 seasonal employees. Extended reach drilling of deviated wells to a maximum horizontal deviation up to 6 kilometers and a maximum well depth of up to 6,650 metres were used on the Molikpaq. The daily production capacity of the Molikpaq is 90,000 barrels (14.3 thousand m<sup>3</sup>) of oil and 2.1 million m<sup>3</sup> of associated gas. Previously operating only during the summer months, year-round production from Molikpaq started in November 2008.

#### Statistics:

Base	.111 x 111 x 111 metres
Weight	37,523 tonnes
Derrick height	101 metres

Deck	73 x 73 metres
Helideck height	49 metres
Drill slots	32 drill slots
Operating wells:	

13 oil producing, one well for gas injection, four wells for water injection and one well for drilling waste injection. **See also** Caisson and Extended reach drilling.

#### **MONO-ETHYLENE GLYCOL**

Used to inhibit the formation of natural gas clathrate hydrates in offshore pipelines. Ethylene glycol can be recovered from natural gas and reused as an inhibitor, after a purification treatment that removes water and inorganic salts. Ethylene glycol is combustible but not flammable. **See also** Onshore processing facility.



#### **MULTIPHASE LINE**

Carries gas, condensate and glycol water from Lunskoye-A (Lun-A) to the onshore processing facility (OPF).

#### **MULTIPLIER EFFECT**

Investments into development of a large scale project that generate more business for industries and services outside the sector of that project.

Sakhalin Energy's work on the Sakhalin-2 project boosted development of many local, regional and national enterprises, giving them potential access to non-Russian markets, and generating more employment, higher salaries, increased retail trade, better social programmes and larger tax payments. The Project has contributed to a wide-ranging revitalisation of the economy on Sakhalin Island, generally referred to as a "multiplier effect".

According to the Council for Research of Productive Forces part of the Ministry of Economic Development of the Russian Federation, every dollar invested into the construction of the Sakhalin-2 project has generated another 0.60 dollar in other sectors of the economy. mn

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#### NON-DESTRUCTIVE TESTING OF PIPELINE WELDS

As a part of safety procedures, X-rays fully inspected all welds on the TransSakhalin oil and gas pipelines. To ensure complete integrity in the event of an earthquake, the welds on sections of the pipeline that cross seismic faults were inspected by Automatic Ultrasound.

#### **NON-FINANCIAL REPORTING**

Part of a management system to internally monitor the processes used to carry out a company's commitments in social performance management and how these processes are fulfilled and improved. Non-financial reporting is also a tool used to deliver information to all stakeholders, including the release of comprehensive data on social, economic, and environmental subjects. Sakhalin Energy has conducted non-financial reporting since 2002. In 2009, the company decided to implement the Guidelines of the Global Reporting Initiative (GRI), a set of international standards on sustainable development reporting emphasizing best company practices on social, economic, and environmental issues.







#### **OFFSHORE PIPELINES**

The offshore pipeline system that includes the oil and gas transportation pipelines from the Molikpaq platform (PA-A), Piltun-Astokhskoye-B platform (PA-B) and Lunskoye-A platform (Lun-A) to shore, a mono-ethylene-glycol (MEG) delivery line from the onshore processing facility (OPF) to the Lun-A and an oil-loading pipeline at the oil export terminal (OET) at Prigorodnoye. All the offshore

pipelines apart from the MEG delivery pipeline have asphalt enamel coatings and concrete weight coatings. The MEG delivery pipeline has a threelayer polyethylene coating.

The 300 kilometers offshore system comprises these pipelines:

- two 14" pipelines from PA-A to shore;
- two 14" pipelines from PA-B to shore;
- two 30" pipelines from Lun-A to shore at the OPF;
- one 4.5" pipeline from shore to the Lun-A platform;
- one 30" pipeline for tankers from the OET to the tanker loading unit (TLU) in Aniva Bay.



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#### **OIL EXPORT TERMINAL**

The oil export terminal (OET) is located at Prigorodnoye, next to the liquefied natural gas (LNG) plant. An export pipeline and a tanker loading unit (TLU) are incorporated into the OET where oil is stored prior to loading on a tanker. Oil from the Piltun-Astokhskoye oilfield is supplied to the OET via the TransSakhalin oil pipeline, and mixed with condensate produced from the Lunskoye-A (Lun-A) platform at the onshore processing facility (OPF). Then the oil is placed in storage tanks at the OET. Situated on the eastern side of the LNG plant, the OET shares utility systems and its common plant control systems, based in the LNG control centre.

#### **OIL SPILL RESPONSE**

Sakhalin Energy has an excellent record in oil spill prevention over 10 production seasons, since oil production started at the Vityaz Production complex in 1999. As of early 2009, only 2.5 barrels or 396 litres of oil have been spilled from a total of 97.3 million barrels which is about one litre for every 39 million litres produced. The company has a comprehensive oil spill preparedness plan and has organised effective oil spill response plans (OSR), and is developing an OSR for use in each of the Company's facilities onshore, offshore, and for the Prigorodnoye complex. Regular field training exercises are held and substantial funds have already been invested in more than 1400 items of equipment to respond to an oil spill, which are in place and ready to be deployed in an emergency.

The Irbis is an oil spill response (OSR) vessel that is on standby twenty four hours a day at the Molikpaq (PA-A) platform. It has three marine OSR systems on board including marine booms, skimmers and sorbents. See also Boom, Dispersant, Sorbents.





#### **OIL STORAGE TANKS**

The oil export terminal (OET) at Prigorodnoye complex houses two oil storage tanks. The tanks have geodesic curvature-type domes with floating internal roofs and a total net operating capacity of 1.2 million barrels (190,000 m<sup>3</sup>), equal to six days throughput for the onshore pipeline. Oil leak detection systems are installed in the tank pads to prevent soil contamination.

#### **OIL TRANSPORTATION**

Crude oil from the Sakhalin-2 project is transported to customers by oil tankers "Governor Farhutdinov", "Sakhalin Island" and "Zaliv Aniva". These ice-reinforced vessels were custom built to operate in low temperatures and for the climate of the Sakhalin shelf, especially from January to March. In compliance with Sakhalin Energy's policy on ecological responsibility, all Company tankers are double hulled. A bow-loading system is used to load the oil, allowing for year-round export.

The "Governor Farhutdinor" and "Sakhalin Island" tankers each have a loading capacity of 108 000 tonnes, while "Zaliv Aniva" has a capacity of 130 000 tonnes.

All oil carriers are chartered by Sakhalin Energy. Oil transportation under the Sakhalin-2 project is also performed on customers' vessels. **See also** Aframax.

#### **ONLINE BIDDING**

An internet-based quotation tool applied only under certain market circumstances as an integrated part of a tender or quotation process. It allows potential suppliers to place quotations in a dynamic bidding environment where every supplier or other bidder can react to quotes from competitors. Sakhalin Energy pioneered OLB on Sakhalin Island in October 2006 when it awarded a contract for transportation between Moscow and Yuzhno-Sakhalinsk following an OLB process.

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# **PERMIT TO WORK**

#### PHASE 1

Phase 1 of the Sakhalin-2 project started in 1996 and was focused on oil development in the Piltun-Astokhskove field. The Molikpag (PA-A) platform



tem for transport to the liquefied natural gas (LNG) plant and the oil export terminal (OET). Oil and gas produced from the Piltun-Astokhskoye platforms arrives at the OPF and is then transported by pipeline to the LNG plant and the OET at Prigorodnoye complex. The OPF also supplies power to the Lun-A platform. Mono-ethylene is piped to the Lun-A from the OPF and used in the platform process to inhibit hydrates. The glycol returns to the OPF via the multiphase pipeline to be regene-

#### **ONSHORE PIPELINES**

The onshore pipeline system stretches for more than 780 kilometers from the Chaivo landfall on the northeastern coast of Sakhalin to the onshore processing facility (OPF), and continues to the liquefied natural gas (LNG) plant and the oil export terminal (OET) in the southern part of the island.

The entire onshore pipeline consists of these pipelines:

- two 20" oil and gas pipelines from the Chaivo landfall to OPF - 160.5 kilometers:
- two 30" multiphase pipelines from shore to OPF - 6.8 kilometers:



- one 48" gas pipeline from OPF to LNG 620 kilometers:
- one 24" oil pipeline from OPF to OET 620 kilometers.

The oil and gas pipelines are laid in a single Right of Way (RoW). 36 metres wide in most sections north of OPF and 43 metres wide south of OPF. The pipes are laid in separate trenches not less than one metre beneath the surface and are coated with three layers of polyethylene to protect against corrosion.

#### **ONSHORE PROCESSING FACILITY**

The onshore processing facility (OPF) covers 62.2 hectares and is located northeast of Sakhalin, seven kilometres from the landfall point of the multiphase pipelines from the Lunskoye-A (Lun-A) platform, and 70 kilometers from the village of Nysh. Transport to the OPF is via an overnight train journey of 14 hours or a plane trip of one to two hours to Mogliki, followed by a twohour car journey. The primary function of the OPF is to process the gas and condensate produced





from the Lunskove gas field before pumping these

hydrocarbons into the TransSakhalin pipeline sys-

rated. This is a continuous loop process. See al-

so Mono-ethylene alvcol.

was installed as part of the Vityaz production complex and for seasonal oil production. Between 1999 and 2008, seasonal oil production yielded more than one million barrels. **See also** Molikpaq, Project history, Vityaz crude oil and Vityaz production complex.

#### PHASE 2

Sakhalin Energy launched Phase 2 of the Sakhalin-2 project in 2003, an integrated oil and gas development, with six sub-projects simultaneously implemented to enable year-round oil and gas production from the Molikpaq (PA-A), Lunskoye-A (Lun-A), and Piltun-Astokhskove-B (PA-B) platforms. Phase 2 also involved the construction of a liquefied natural gas (LNG) plant and oil export terminal (OET) at Prigorodnoye complex in the south of Sakhalin, an onshore processing facility (OPF), offshore pipelines and onshore pipelines. Sakhalin Energy received the Distinguished Achievement Award for Phase 2 at the 2009 Offshore Technology Conference, in recognition of its unique and significant achievements in developing offshore technology. See also Lunskove-A. Piltun-Astokhskove-B (PA-B). Onshore processing facility, Liquefied natural gas plant, Oil export terminal, Offshore pipelines, Onshore pipelines and TransSakhalin pipelines.

#### **PIG TRAP STATIONS**

The Sakhalin-2 project has five pig trap locations, at Chaivo, the onshore processing facility (OPF), at Gastello, the liquefied natural gas (LNG) plant,



and at the oil export terminal (OET) in Prigorodnoye comlex. See also Pipeline inspection gauge (PIG).

PILTUN-ASTOKHSKOYE-A (PA-A) See Molikpaq.

#### PILTUN-ASTOKHSKOYE-B (PA-B)

The Piltun-Astokhskoye – B (PA-B) platform was installed in July 2007 in the Piltun area of the Piltun-Astokhskoye oil field, 12 kilometers offshore and at a depth of 32 metres. Designed for yearround production, the PA-B is a drilling, processing and production platform that extracts oil and associated gas from the Piltun reservoir. The platform's substructure is a four-legged concrete gravity base which supports the topside facilities. The southeastern leg will be used as the well bay, the north-eastern leg for the pipeline risers, J tubes and the remaining legs for pumps and tanks. The integrated topside facility was manufactured for the PA-B in South Korea. The topsides include drilling and hydrocarbon liquids separation facilities, storage for chemicals and a living guarters module. The main working areas are enclosed.



temperature controlled and ventilated. Equipment located in the open has ice protection. PA-B's production capacity is around 70,000 barrels (11.1

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**PILTUN-ASTOKHSKOYE FIELD** The Piltun-Astokhskoye oil field is in the Sea of Okhotsk off the northeast coast of Sakhalin Island. It is divided into two areas for development. The Piltun-Astokshskoye-A platform (PA-A or Molikpag) is installed on the Astokhskoye feature, and the Piltun-Astokhskove-B (PA-B) platform is installed on the Piltun feature. See also Hydrocar-

bon resource volumes. Molikpag and Piltun-As-

thousand m<sup>3</sup>) of oil and 92 MMscf (2.9 million m<sup>3</sup>)

Accommodation .....100 permanent

Topsides ......flare stack height:

98.6 metres

of associated gas per day.

Substructure ......

Statistics:

...height: 53 metres B (PAB). weight: 90.000 tonnes dimensions:

and 40 temporary staff

94 x 91.5 x 11.5 metres

weight: 28,000 tonnes

well slots: 45 well slots

#### **PIPELINE INSPECTION** GAUGE (PIG)

PILTUN FEATURE OF

**PILTUN-ASTOKHSKOYE FIELD** 

The Piltun-Astokhskove-B (PA-B) platform is built

in this area, in the Sea of Okhotsk off the north-

east coast of Sakhalin Island. See also Hydrocar-

bon resource volumes and Piltun-Astokhskove-

A pipeline tool that runs through lengths of installed pipeline for commissioning and maintenance. PIGs serve a wide range of functions, from a simple foam cleaning PIG to intelligent PIG for performing detailed inspections.





#### PIPELINE MAINTENANCE DEPOTS

Stations that support and maintain the pipeline system. The depots are also used to store machinery and equipment for onshore oil spill response. Four PMDs are located alongside the onshore pipelines in Nogliki, Yasnoye, Gastello and Sovetskove.

#### PIPELINES

See TransSakhalin pipelines, Offshore pipelines and Onshore pipelines.

#### PLAN OF DEVELOPMENT (POD)

A general document required by the Production Sharing Agreement (PSA) outlining the technical.

financial, environmental and other aspects of developing Sakhalin-2. The PoD is subject to the approval of the Supervisory Board of Sakhalin-2. The PoD of Phase 1 was approved in 1997, for Phase 2 in 2001 and an update for Phase 2 was approved in 2003. See also Production Sharing Aareement.

### PRESSURE MAINTENANCE **PROJECT (PMP)**

After completing Phase 1 development drilling for Astokh, and initial production under a depletion drive with gas reinjection, water injection was chosen to maximise reservoir recovery through voidage replacement under a Pressure Maintenance Project (PMP).

A second phase of drilling (Phase 1a) of water injector wells was started, and a water treatment, injection module and power generation module were installed on the Molikpag (PA-A) platform.

The PMP project was completed in 2005 when a fourth water injector well was drilled with a water injection capacity of 115.000 barrels a day.

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tokhskove-B (PAB).

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#### **PRESSURE TESTING**

A process in which a piece of equipment e.g. a pipe, is tested to its design or working pressure, to ensure its integrity.

#### PRIGORODNOYE PRODUCTION COMPLEX

The Prigorodnoye production complex is located on the southern shores of Sakhalin Island, on the coast of Aniva Bay. The complex comprises the liquefied natural gas (LNG) plant and an oil export terminal (OET). **See also** Liquefied natural gas plant and Oil export terminal.

#### **PRIGORODNOYE SEAPORT**

Prigorodnoye Seaport was named in September 2007 and was formally established and opened to foreign vessels in May 2008. The Port Prigorodnoye Closed Joint-Stock Company is a joint venture on a parity basis between Sakhalin Energy





and OAO Sovcomflot via its respective subsidiary. It was incorporated on 31 July 2008 to assist the operations of Sakhalin Energy in the Prigorodnoye seaport.

#### PRODUCTION SEASON – PHASE 1

The production season of Phase 1 of the Sakhalin-2 project ran from 1999 to 2008. The oil was produced through the Vityaz production complex during the summer months. **See** Molikpaq and Vityaz production complex.

#### PRODUCTION SHARING AGREEMENT

Sakhalin Energy signed a Production Sharing Agreement (PSA) in 1994 with the Russian Fede-

ration, represented by the government of the Russian Federation and the Sakhalin Oblast Government. A PSA is a commercial contract between an investor and the state, allowing the investor to make large scale. long-term and high-risk investments. According to a PSA, the state grants an investor the exclusive right to develop a subsoil field and an investor undertakes to develop the fields by its own means and at its own risk. The purpose of the Sakhalin-2 PSA was to define the terms and conditions for the exploration, development, production, processing and transportation of hydrocarbons by replacing existing tax and license regimes with a contract-based arrangement that exists for the life of the project. According to the conditions of the PSA, the Russian Federation retains the sovereign right of ownership to the oil

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and gas fields and Sakhalin Energy invests the funds required for the exploration and development of the fields. This contract allows for complete transparency of the project economics of Sakhalin-2.

The state, the Russian Federation, approves the estimates of expenditure and has the right to audit the investor's expenses. In addition, the parties bear mutual responsibility for compliance with the established rules of the PSA.

The Sakhalin-2 PSA states a specific tax regime for project development. Most taxes and customs duties are substituted by production sharing. This effectively means that instead of a value-added tax, a mineral resources tax, or other taxes, Sakhalin Energy will pay 10% to 70% depending on the internal rate of return of remaining production and a 32% profit tax on the company's share, even though the Russian Federation has lowered the profit tax to 24%. These amounts constitute the "take" of the Russian Federation from the Sakhalin-2 project. After cost recovery, the minimum amount to be paid to the Russian Federation will be about 45% of the total revenues of the Sakhalin-2 project.



#### PRODUCTION SYSTEM CAPACITY

- PA-A (Molikpaq) 90,000 barrels (14.3 thousand m<sup>3</sup>) of oil per day;
- 70.5 MMscf (2.1 million m<sup>3</sup>) of gas per day;
- no gas produced from the Molikpaq during Phase 1;
- PA-B 70,000 barrels (11.1 thousand m<sup>3</sup>) of oil per day;
- 92 MMscf (2.7 million m<sup>3</sup>) of gas per day;
- Lun-A 1,800 MMscf (52.5 million m<sup>3</sup>) of gas per day;
- 60,000 barrels (9.5 thousand m<sup>3</sup>) of oil/condensate per day;

 LNG plant 9.6 million tonnes of liquefied natural gas per year.

#### **PROJECT FINANCE**

Often used in the global oil and gas industry for developing major infrastructure assets. The debt repayment is made from the cash flow generated by the financial asset. Sakhalin-2 Phase 1 project financing in 1998 was the first joint venture in hydrocarbons project finance in the Russian Federation.

The Japan Bank for International Cooperation (JBIC), which was the Export-Import Bank of Japan at the time, was one of the project lenders. The largest project finance deal in Russia was signed in June 2008 when Sakhalin Energy secured a \$5.3 billion loan from JBIC and an international consortium of banks.

In October 2009, Sakhalin Energy got an additional \$1.4 billion, bringing the total project financing for Phase 2 up to \$6.7 billion. A consortium of international commercial banks provided additional debt, and Nippon Export and Investment Insurance (NEXI), an Export Credit Agency owned by the Japanese government provided the insurance. **See also** Japan Bank for International Cooperation.

## PROJECT HISTORY

A consortium of companies comprising McDermott, Marathon and Mitsui (the MMM wins tender to carry out a feasibility study to develop Offshore oil and gas fields.

The MMM consortium, in co-operation with Sakhalinmorneftegas (SMNG), carries out a feasibility study for the Sakhalin offshore development project that included a programme to appraise and develop all discovered and prospective oil and gas bearing fields and structures.



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Shell and Mitsubishi join the Consortium, now referred to as MMMSM.

#### 1993

The Russian State Expert Council approves the Project's feasibility study (TEO). The Council recommended design effort should continue and a PSA be drafted for the fields.

#### 1994

Sakhalin Energy Investment Company Ltd. (Sakhalin Energy) formed and assumes ownership of banks.

22 June, the Russian Federation and Sakhalin Energy sign a Production Sharing Agreement (PSA), "Agreement on the Development of Piltun-Astokhskoye and Lunskoye Oil and Gas Fields on the Basis of Production Sharing".

#### 1996

Project Commencement Date 22 May. Sakhalin Energy proposes phased development of the Piltun-Astokhskoye field, starting with the Astokhskoye feature (Phase 1) and conducts concurrent programme of appraisal and facilities design.

#### 1997

Supervisory Board approves the Plan of Development (PoD) for Phase 1.

McDermott sells its shares in the project to the other shareholders. Sakhalin Energy declares the Date of Development under Phase 1.



#### 1998

Sakhalin Energy secures Project Finance for Phase 1.

Piltun-Astokhskoye-A (Molikpaq) platform installed in the Sea of Okhotsk.

#### 1999

Start of oil production from the Molikpaq (PA-A) platform under Sakhalin-2, Phase 1.

#### 2000

Contracts awarded for designing offshore and onshore facilities for the complete development of the Piltun-Astokhskoye and Lunskoye fields. Sakhalin Energy moves into corporate head-

quarters in Yuzhno-Sakhalinsk in May.

Shell becomes Sakhalin Energy's majority shareholder, in December, following an asset exchange agreement with Marathon. The shareholding of Sakhalin Energy became Royal Dutch Shell (55%), Mitsui (25%) and Mitsubishi (20%).

#### 2001

Supervisory Board approves Sakhalin Energy's Integrated Plan of Development (PoD) for the

Piltun-Astokhskoye and Lunskoye licence areas (Phase 2, PdD) on 14 June.

**2002** Sakhalin Energy submits Phase 2 TEOC.

#### 2003

Sakhalin Energy declares Date of Development under Phase 2.



First long-term agreements for LNG supply concluded with Japanese energy Companies in May.

Ground-breaking ceremony at the construction site of the first liquefied natural gas (LNG) plant in Russia takes place in June.

#### 2004

Construction starts on the TransSakhalin pipeline in January.

Sakhalin Energy concludes long-term agreement for LNG supply to North America's west coast.

#### 2005

Sakhalin Energy concludes long-term agreement for LNG supply to South Korea.

Concrete gravity base structures, the first used in Russia, are successfully installed in the Lunskoye field in June and the Piltun-Astokhskoye field in August.

#### 2006

Installation of Lunskoye-A (Lun-A), the first ice class, gas platform in Russia takes place in June.

Future capacity of the LNG plant's trains 1 and 2 is committed for 20-plus years for deliveries to Japan, South Korea and North America.

#### 2007

Gazprom, Russia's largest company, becomes Sakhalin Energy's majority shareholder.

The Piltun-Astokhskoye-B (PA-B) platform is installed in July.

First LNG imported to Sakhalin to accelerate start-up of LNG plant commissioning.

#### 2008

Sakhalin Energy secures Russia's largest project finance deal of \$5.3 billion from the Japanese Bank for International Cooperation and an international consortium of banks in June.

First oil from the Molikpaq platform enters the TransSakhalin pipeline in November.

First oil from Piltun-Astokhskoye-B (PA-B) enters the pipeline system in December.

The single anchor leg mooring (SALM) and the floating storage and offloading unit (FSO) Okha are demobilised from the Vityaz production complex in December.

#### 2009

First gas is produced from the Lunskoye-A (Lun-A) platform in January.

Start-up of Russia's liquefied natural gas (LNG) plant takes place in February.



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First Sakhalin-2 LNG cargo is exported in March.

Sakhalin Energy has secured an additional \$1.4 billion in project financing, bringing the total Phase 2 project financing up to \$6.7 billion.

#### PUBLIC CONSULTATION AND DISCLOSURE PLAN

Sakhalin Energy considers regular and meaningful engagement with the public and key stakeholders, and public disclosure of relevant project information, important for the successful development of the Sakhalin-2 project.

The Company's strategy for public consultation and information disclosure has evolved over more than 10 years of engagement with the communities of Sakhalin Island and other interested parties. Feedback from this process has helped Sakhalin Energy develop a meaningful approach to ensure interested stakeholders are adequately informed of project activities, and has provided the Company with an effective way to hear their concerns. Additionally this feedback has been a useful tool for Sakhalin Energy's compliance with the legal requirements of the Russian Federation for public consultation and International Finance Corporation (IFC) Guidance Note F on the preparation of a Public Consultation and Disclosure Plan (PCDP).

The PCDP describes Sakhalin Energy's plans and programmes for public consultation and disclosure of information on the project. Given the massive scale of the project, Sakhalin Energy is committed to regularly engaging the public and other stakeholders locally where the project is under development as well as nationally and internationally. **See also** Stakeholders, International Finance Corporation.





#### QUALITY ASSURANCE

A formal methodology used by Sakhalin Energy to assess the quality of products or services. Quality assurance includes a formal review of care, problem identification, corrective actions to remedy deficiencies, and evaluation of actions taken. The method considers that necessary precautions have been taken so the entire production of a product or service is within specifications and conditions of operation apply to all users. Typically, indicators monitor the production process to ensure it is mastered.

#### **QUALITY CONTROL**

Quality control is a management system, used by Sakhalin Energy, to ensure that items, systems, construction etc are fit for purpose, built as per design or constructed as per code etc. It includes the regulation of the quality of raw materials, assemblies, products and components as well as services related to production and management, production and inspection processes.



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#### REAL-TIME OPERATIONS CENTRE

A centre set up in Sakhalin Energy's administrative offices in Yuzhno-Sakhalinsk that uses drilling and geological expertise to monitor wells. Drilling control centres are linked by high-speed satellite or fibre optic cable to the main operations centre, where a dedicated multi-disciplinary team of well engineers, geologists, reservoir



engineers, production technologists and operations engineers study data transmitted from wells. The team has round-the-clock access to data, 3D seismic visualisation, reservoir models and connections to global expert support.

#### **RECOVERABLE RESERVES**

The estimated amount of hydrocarbons in a field that can be produced using currently available technology.

#### **REINSTATEMENT MEASURES**

Used to permanently stabilise and re-vegetate an area affected by pipeline construction, reinstatement is an important component of Sakhalin Energy's commitment to the environment and to maintaining the integrity of the pipelines during operation. Reinstatement is undertaken in several steps, first to restore drainage patterns and profile the landscape, or technical reinstatement. Next erosion control measures are put in place. The final phase is biological reinstatement, mostly by seeding, of the Right of Way (RoW), to promote the rapid return of vegetative cover, providing long-term protection against erosion.



Erosion control involves mostly controlling damage and stabilising the ground. It may include temporary reinstatement until construction is finished and permanent reinstatement to return the land to a stable condition, no longer vulnerable to natural erosion. Methods to control erosion include installing slope breakers, silt fences, and drainage channels, and seeding to promote revegetation. Erosion controls help prevent sediment entering waterways and potentially silting up spawning areas.

A gabion is a double-twisted, wire mesh basket of variable size, uniformly partitioned into internal cells, interconnected with other similar units, and filled with stone, used to stabilise a trench. The Sakhalin-2 project used gabion walls to stabilise slopes while upgrading roads and bridges. Gabion walls are visible on the road to Prigorodnoye from Korsakov and on the Tikhaya River to the north of Vzmoye, Dolisnk District.

Riprap, usually made from hard rock such as granite, protects areas from erosion and stabilises river banks to avoid silting. It was widely used next to rivers crossed by the TransSakhalin pipelines.

A slope breaker is a special trench constructed across a slope for drainage. The breaker catches water, diverts it away from disturbed areas and slows the flow rate to prevent erosion. During construction of the TransSakhalin pipelines, st

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slope breakers were used as an erosion control measure on steep slopes on Sakhalin during construction of the TransSakhalin pipelines. **See also** River crossings.

#### **REMEDIAL ACTION PLAN**

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A plan written in August 2007 for rivers, erosion control and reinstatement, and wetlands, in response to several incidents of environmental noncompliance during construction of the onshore pipelines for Phase 2 of the Sakhalin-2 project. The full report is available in the library sec-

tion of Sakhalin Energy's website at www.

**sakhalinenergy.com. See also** Reinstatement measures and TransSakhalin pipelines.

#### **RESERVES IN PLACE**

The total amount of estimated hydrocarbons in a field, usually considerably higher than recoverable reserves. Reserves are estimated with figures taken from exploratory drilling or by seismic modelling. The oil and gas industry is continuously developing and trialling new methods to maximise recovery or the extraction of hydrocarbons. **See also** Recoverable reserves and Seismic modelling.



#### RESERVOIR

A crucial component of a complete petroleum system, a reservoir is a subsurface volume of porous and permeable rock in which oil, gas or both have accumulated. Sedimentary rocks are the most common reservoir rocks because they have more porosity than most igneous and metamorphic rocks, and form at the same temperatures needed to preserve hydrocarbons.

#### **RESETTLEMENT ACTION PLAN**

The policy framework and procedures followed to address land acquisition and resettlement, required for construction and operation of the Sakhalin-2 Phase 2 project. The RAP is implemented according to World Bank guidelines. The plan ensures land users affected by the land required for the liquefied natural gas (LNG) site or the pipeline Right of Way (RoW) are resettled to new properties, compensated or both. A targeted compensation programme is being implemented for the dacha owners and users near the LNG site, whose properties are not close enough to require resettlement under Russian law. **See also** World Bank guidelines.



#### **RIGHT OF WAY (ROW)**

The cleared area where oil and gas pipelines and associated valves are installed, which is subsequently technically and biologically reinstated. The RoW is continuously maintained to prevent erosion and ensure safety of the pipelines. **See also** TransSakhalin pipelines.

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#### **RIVER CROSSINGS**

The TransSakhalin pipeline system crosses over 1,000 watercourses of different sizes, characteristics and importance along the pipeline route. About 170 crossings were made on rivers considered ecologically sensitive and of commercial fishing value. The pipeline system crosses the rivers only in winter, when salmon are absent and water flow is lowest, reducing any potential ecological impacts. **See also** TransSakhalin pipelines.

#### **RIVER RESTORATION PROJECT**

A pilot project started by Sakhalin Energy in 2007 to help restore and sustain ecological functioning of rivers on Sakhalin Island after the rivers



had been damaged by fire and soil erosion. The project is based on sustainable development principles aimed at improving the environment, and building up the local economy by involving local communities. Environmental engineers from Sakhalin Energy supervise the project with advice from the USA Forest Service, the Wild Salmon Center and the Sakhalin Salmon Initiative. For the first river to benefit from this initiative, the Diimdan river in Nogliki district, the local Nogliki community participated in project implementation. The vegetation cover on the Diimdan's basin was severely disturbed by major forest fires in 1989 and 1998. Soil erosion had steadily filled the river with a lot of sediment, which affected salmon spawning areas. The pilot project is reducing the accumulation of fine sediment from sources next to watercourses and creating new in-channel habitats.

#### **ROYAL DUTCH SHELL PLC**

One of the leading players in the global energy market, Shell is active in 130 countries and produces 3.5 million barrels a day of oil equivalent. The company has successfully implemented five



similar projects to Sakhalin-2 in Australia, Brunei, Oman, Malaysia and Nigeria, where it has commissioned and constructed eight liquefied natural gas (LNG) processing trains. Shell holds the largest equity share of LNG capacity among international oil companies. It also holds a leading position in LNG shipping and in the marketing and trading of natural gas and power in Europe, the USA and the Asia Pacific. **See also** Shareholding structure.

#### ROYALTIES

Sakhalin Energy pays a 6% royalty to the government of the Russian Federation on all oil and gas produced during the lifetime of the project.

#### **RUSSIAN CONTENT**

Human and industrial resources in Russia that are deployed for a project. Under the Production Sharing Agreement (PSA) Sakhalin Energy signed with the Russian Federation, Russian content is defined

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in man hours and the volume and quantity of materials. Sakhalin Energy is committed to using 70% Russian content over the life of the project, which includes labour, equipment, materials and contract services. **See also** Production Sharing Agreement.

#### **RUSSIAN PARTY**

Sakhalin Energy and the Russian Federation collectively referred to as the Russian Party (RP) signed the Production Sharing Agreement. The Russian Party to the PSA is made up of representatives from the Federal and Sakhalin Government. **See also** Production Sharing Agreement.



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#### SAFETY EXCLUSION ZONES

Zones established in the event of an oil spill. The zones are about one kilometre away from the source of a significant or ongoing spill of crude oil or condensate, and air and sea travel from them may be restricted. Exclusion zones may vary in size after a safety assessment is carried out. **See also** Oil spill response.

#### **SAKHALIN CLIMATE**

The climate of Sakhalin Island is a study in extremes. Aniva Bay, where Sakhalin Energy's liquefied natural gas (LNG) plant is located, is largely ice free during winter. In other parts of Sakhalin, temperatures can drop to as low as  $-30^{\circ}$ C in Yuzhno-Sakhalinsk in the south and to  $-54^{\circ}$ C at Nogliki in the north. Sakhalin's lakes and large swaths of the surrounding sea ice over in winter. Snow is heavy: snowfall of up to three metres is common from November to March, which can cause major transportation problems on the island and travelling to and from. Winter days can also be clear and dry with blue skies and sunshine, making Sakhalin an excellent area for winter sports. Winter can last from October to May in



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the north of Sakhalin Island. In the spring, melting snow can also cause problems and mud is very common. In summer, temperatures can reach 34°C. Autumn is the best time of year on Sakhalin when temperatures are moderate and rainfall is scant from August to September.

#### SAKHALIN ENERGY INVESTMENT COMPANY LTD.

The operating company for the Sakhalin-2 Production Sharing Agreement (PSA) formed in 1994 to develop the Piltun-Astokhskoye and the Lunskoye oil and gas fields in the Sea of Okhotsk, offshore Sakhalin Island in the Russian Far East. **See also** Project history, Sakhalin-2 and Shareholding structure.

#### SAKHALIN ENERGY PRIORITIES

The Company's strategy is to act in line with its vision and mission. To that end, our major priorities for the coming years are in the following areas:

- safety world-class safety performance, ensuring no harm to people, the environment, or assets;
- reliability consistent, high quality performance;
- production operational excellence, meeting targets, a lean, flexible and efficient operating culture;
- delivery meeting or exceeding customer expectations for oil and LNG delivery;
- costs promoting control, accountability and awareness of costs;
- growth increasing existing plant capacity, including by re-rating, de-bottlenecking.

#### SAKHALIN INDIGENOUS MINORITIES DEVELOPMENT PLAN See Social Investment.



#### SAKHALIN ISLAND

An Island is in the Russian Far East, a nine hour flight from Moscow and a two hour flight from Tokyo. The population of Sakhalin Island is nearly 520,000 and its capital is Yuzhno-Sakhalinsk. Its main industries are oil and gas production and fishing. **See also** Indigenous People and Yuzhno-Sakhalinsk.

SAKHALIN ROAD SAFETY PARTNERSHIP See Social Investment.

## SAKHALIN SALMON INITIATIVE

See Social Investment.

#### SAKHALIN-2

One of the world's largest integrated oil and gas projects being developed in phases to enable yearround production of oil and gas in the Russian Far East. From three offshore platforms, the oil and gas are transported by the TransSakhalin pipelines via an onshore processing facility (OPF) in the northeast of Sakhalin Island to the liquefied natural gas (LNG) plant and the oil export terminal (OET) in the south of the island. Sakhalin-2 also includes projects to improve the island's infrastructure and the well-being of the community through charitable events and sustainable development programs.

#### SAKHALIN-2 RECORDS

- first PSA agreement signed in Russia;
- first operating PSA in Russia;
- first offshore oil and gas operation in Russia;



- first simultaneous implementation of several large interconnected green field sub-projects in Russia;
- phase 1 project financing first funding of its kind in Russia's oil and gas industry;
- largest project finance deal in Russia (2008);
- first offshore platform installed in Russia (Molikpaq);
- zero to minimal gas flaring, the first system of its kind in Russia (Molikpaq);
- first construction of water injection and power generation modules in Russia: Amur shipyards in Komsomolsk for the Molikpaq (PA-A) platform;
- first use of directional hydraulic fracturing, of formation for well completion in Russia (Molikpaq platform);
- first use of indirect fracture of formation for well completion in Russia (the Molikpaq platform);
- first commercially produced oil from an offshore platform in Russia (Molikpaq) on the continental shelf;
- first concrete gravity base structure in Russia, built for the Lunskoye-A platform (Lun-A);



- first ice class stationary gas production platform installed in Russia – Lunskoye-A platform (Lun-A);
- float-over of the Lunskoye-A, 21,800 tonnes topsides in 2006 a world and Russian record in 2006;
- installation of friction pendulum bearings on Lunskoye-A is first use of these bearings in the oil and gas industry anywhere in the world;
- float-over of 28,000 tonnes Piltun-Astokhskoye-B (PA-B) topsides in 2007 broke the float-over record;

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■ first liquefied natural gas (LNG) plant – the first of the kind built in Russia:

- first import of LNG to Russia:
- first export of LNG from Russia:
- first LNG carrier to enter Russian territorial waters - Granosa in 2007:
- first real-time operations centre in Russia:



- first time LNG measurement methodology was used in Russia:
- first use ISSOW electronic permit to work svstem used in Russia:
- first time an oil and gas company set up a business and scientific cooperative group, the Western Grav Whales Advisory Panel:
- first road safety partnership between public administration and business in Russia (Sakhalin Road Safety Partnership);
- the first offshore 4D seismic survey in Russia.

#### SALES AND PURCHASE AGREEMENT

The final sales and purchase contract which contains all the detailed provisions that govern the long-term delivery of liquefied natural gas (LNG). See also Heads of Agreement.

#### SANITARY PROTECTION ZONE (SPZ)

A sanitary protection zone (SPZ) is a special area established around a hazardous facility required by Russian Federation regulations. Land use is restricted within the SPZ meaning no crops, no

permanent living guarters, and no resorts. A onekilometre SPZ has been set up around the liquefied natural gas (LNG) plant and oil export terminal (OET) at Prigorodnove.

#### SEISMIC MODELING

Software that accurately represents the complex geology and geophysical phenomena underwater or underground. When interpreted, seismic modelling gives an approximation of the extent to which oil, gas and water are present and a three dimensional (3D) picture of an oil or gas reservoir. Afterwards, exploration and drilling rigs take samples from the reservoir before launching any project to recover or extract hydrocarbons.

#### SEISMIC MONITORING SYSTEM

A system installed on the TransSakhalin pipelines and other project facilities that records detailed data of any seismic event along the pipeline in real time and in digital format. The information is then forwarded to the control centre at the onshore processing facility (OPF) and used in making decisions on operations. Any section of the pipeline or part of the processing plants near an



earthquake can be shut down and isolated immediately. See also Block valve stations, SCADA and TransSakhalin pipelines.

#### SEISMIC SURVEYS

A 3D survey carried out in the Lunskove gas field in 2003 to provide additional geological information for developing the field and identifying marine mammals in the area. The survey found Western Gray whales, Minke whales, Orcas, Harbour seals and Dalls porpoises. In July 2010 in consultation with the Western Gray Whales Advisory Panel (WGWAP) Sakhalin Energy successfully completed the first offshore 4D seismic survey in Russia. **See also** Western Gray Whales Advisory Panel.

#### **SENYA**

**See** Social Investment – What to do in emergency situations programme

#### SHAREHOLDING STRUCTURE

Sakhalin Energy's shareholding is broken out as follows: OAO Gazprom 50% plus one share, Royal Dutch Shell 27% minus one share, Mitsui & Co. 12.5%, Mitsubishi Corporation 10%.

#### SINGLE ANCHOR LEG MOORING

Part of the Vityaz production complex, the SALM was raised in summer from the sea bottom into an upright position to receive crude oil from the Molikpaq platform that continued to flow to the floating storage offloading tanker (FSO) via a



loading hose. The SALM served as a connection buoy for the FSO via two 950 tonne MBL mooring hawsers and was demobilised in 2008. The Vityaz production complex produced oil in Phase 1 while oil is now produced at Molikpaq which is connected to the new pipeline system and then exported from the oil export terminal in Prigorodnoye complex. **See also** FSO Okha and Vityaz production complex.

SMALL GRANTS — BIG-DEEDS See Social Investment.

#### SMART WELLS

Technology that uses multi-zone water injection to effectively manage flooding on a platform. Pressure, temperature and other parameters on the platform are monitored remotely by experts in Yuzhno-Sakhalinsk to effectively control of water injection rates in different reservoirs, so they are in alignment with a continuously updated dynamic reservoir model. **See also** Real-time operations centre.

#### SOCIAL IMPACT ASSESSMENT

A report prepared by independent socialists and economists from Sakhalin and international SIA experts, including input from more than 5000 Sakhalin residents in 52 communities, carried out from September 2001 to November 2002. The report was published in 2003 and an addendum came out in 2005.

Sakhalin Energy follows the policies, procedures and commitments in the SIA on the Sakhalin community. The full report is available in the library section of Sakhalin Energy's website at www.sakhalinenergy.com

#### SOCIAL INVESTMENT

Well-aware of its responsibility for prosperity and sustainable development of the local community Sakhalin Energy has been investing in the community through a programme of sponsorships and donations since the beginning of the Sakhalin-2 project. The programmes, rooting from the sustainable development principles, encompass health, charity, education, biodiversity protection, business and infrastructure development issues. They range from opening internet centres in Sakhalin libraries to training district medical teams and finding families for orphaned children. In 2007–2009 the company supported social projects of more than 350 million roubles and was recognised by the Sakhalin Oblast Government in March 2008 as its Benefactor of the Year 2007 – High Social Efficiency for the second year in a row. Sakhalin Energy social investment programmes



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are declared the best practices of the kind both at regional and federal levels.

#### **Educational grants**

A programme running since 2003 that gives grants to graduates from Sakhalin schools to attend Russia's best universities.



**Employee charitable support programme** An internal charitable donation programme. The programme was set up to support employees of Sakhalin Energy who contribute to society. The company matches funds raised by employees who are nominated from fundraising events or other activites, to underwrite specific social projects. "Hurry up for good deeds" is the motto of the programme.

#### Sakhalin Indigenous Minorities Development Plan

Launched in 2006 as a cooperative effort of Sakhalin Energy, the Sakhalin Oblast Government and the Sakhalin Indigenous People's Council, the main objective of the SIMDP is to support the social and economic development of the indigenous minorities of Sakhalin Island, through protecting health, promoting education, preserving traditional lifestyles, and supporting traditional economic development. The International Finance Corporation, a member of the World Bank Group, singled out the SIMDP in 2007 as a model of international best practice. In 2008 the Plan received a Letter of Honours from Russia's largest



Indigenous People's (IP) organisation, Riapon. The plan was also included as one of 16 Russian projects in the 2006–2007 edition of Best Corporate Social Projects 2006–2007. The Russian Federation Council's Committee for the North and Indigenous People gave Sakhalin Energy its highest evaluation in 2008 for its cooperation with the indigenous population, through the SIMDP. **See also** Indigenous People.

Sakhalin Road Safety Partnership (SRSP) With Sakhalin Energy's initiative and active participation, the SRSP started in 2005, the first Russian partnership between public administration and business to help improve road safety. The SRSP is responsible for the successful "Seat Belt



Campaign" as well as the pre-hospital care and the "Safe Routes to School" projects. The seat belt campaign won a safety award in 2007 from the London-based Energy Institute, which holds an annual awards ceremony to recognise excellence and innovation in the energy industry.

#### Sakhalin Salmon Initiative (SSI)

Sakhalin Salmon Initiative was established in 2004 within the Wild Salmon Centre (USA). Since 2005 Sakhalin Energy has been financing SSI concept note and strategy development. Sakhalin Salmon Initiative is a large scale enterprise that supports wild salmon conservation and sustainable salmon reproduction as well as the preservation of salmon river ecosystems. Other goals of the SSI include



building institutional capacity for conservation and promoting sustainable economic development on Sakhalin Island. The Sakhalin-based SSI centre manages the initiative and it is overseen by a SSI Coordinate Committee that includes representatives from the Sakhalin Oblast Government, regional and federal agencies, academic institutions, business enterprises, commercial fishermen, indigenous communities and local and international NGOs. In 2008 Sakhalin Energy and the USbased Wild Salmon Center (WSC) jointly funded a four-year (2008–2011), \$8.8 million programme to conserve wild salmon, that is managed by the SSI (Sakhalin Energy donate 4.4 million dollars).

2009 Sakhalin Salmon Initiative won in nomination "Best programme demonstrating corporate philanthropy policy and social investment principles" announced within the Corporate Donor of Russia — the national awards for best practices in corporate social investments.

#### Small grants-big deeds

A charitable programme aimed at supporting local initiatives in the Sakhalin Oblast area, which started in 2003. Small grants are awarded on a competitive basis to initiative groups, NGOs and other organisations working at the community level in the Sakhalin Oblast to fund social, cultural, and educational initiatives that produce results for community groups. A total of 47 projects have been implemented through the programme so far.

#### Sports development programme

One of the priorities in the company social investments are sports development projects. Sakhalin Energy supported the construction of sports facilities and children's playgrounds, and contributed into material and technical foundation enhancement across Sakhalin Region. Moreover Sakhalin Energy assisted in organisation of sports events for kids and juniors, and performed a partner in Sakhalin Oblast project – Sports against juvenile delinquency. In 2005–2008 Sakhalin Energy allotted some 1.15 million dollars on Sakhalin Region sports development projects.

In 2006, with financial help from Sakhalin Energy, a new mini football pitch with artificial grass in Makarov and a hockey ground in Tymovsk were built. A sports ground in Aniva was



also reconstructed through this programme. Sakhalin Energy has organised visits of the "Soviet Hockey Legends" to Sakhalin Island since 2006.

#### Sustainable Development Chair

Sakhalin University established a Sustainable Development Chair in 2006, focusing on three areas for spreading the principles of sustainable development on Sakhalin Island. Based on a specific curriculum, the Chair selects local projects that amplify research, provide teaching support, and educate and inform the general public.

## What to do in emergency situations programme

Sakhalin Energy, in partnership with the Ministry of Emergency Situations (EMERCOM), set up this programme in 2006. A cartoon character, Senya, advises children on television on what to do in an emergency or dangerous situation.

Under the project 12 Sakhalin schools, performing safety classes were packed with necessary equipment, and educational campaigns on safety rules are regularly arranged. The series of safety cartoons, with Senya in the lead, is the

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major instrument of the programme: being the means of social impact the cartoons teach children to respond to various emergency situations.

The project is in demand in other regions of Russia. Senya cartoons on safety are posted on the Emercom web site. They are also released on DVDs, broadcast to children in cinemas, on TV, on street screens, and in schools and kindergardens in Khabarovsk, Blagoveschensk, Kamchatka, Magadan, Yakutia and other regions. Emercom's Medical Evacuation Centre recommended showing the cartoons in kindergardens and schools. The project won the Corporate Donor of Russia contest for "Best Programme for improving the social climate in the community – caring about family values".

#### SOCIAL PERFORMANCE POLICY AND COMMITMENTS

Sakhalin Energy has systematic tools and processes to assess, manage and monitor the social impacts of its business operations. A management framework sets targets, measures and improves the impacts of Sakhalin Energy's business operations and to meet lender requirements. A wide range of stakeholders are consulted for feedback on identifying, managing and monitoring social issues.

Sakhalin Energy aims to have an exemplary social performance, to earn the confidence of customers, shareholders and society at large, to be a good neighbour, and to contribute to sustainable development.

Sakhalin Energy is committed to these objectives:
pursuing the goal of no harm to people, including those people who live near operations;

 contributing to the wider, long-term, economic, environmental and social benefit of the regions where it operates working to mitigate any negative social impacts of its business operations;

- reporting publicly on performance;
- playing a leading role in promoting best practice in industry;
- promoting a culture in which all staff share these commitments.

#### SORBENTS

A special material that absorbs hydrocarbons. **See also** Oil spill response.

#### SPORTS AGAINST JUVENILE DELINQUENCY See Social Investment.



#### STAKEHOLDERS

Individuals or organisations which can influence the performance of Sakhalin Energy's business, including customers, suppliers, contractors, industry bodies, local and national governments, non-governmental organisations and employees.

#### STATE ENVIRONMENTAL EXPERT REVIEW (SEER)

A review carried out by about 70 Russian scientists on the Sakhalin-2 project, Phase 2 in 2003. The review established that the company's planned activities for the integrated development of its hydrocarbon fields in the Sea of Okhotsk complied Russian environmental law. SEER made 90 recommendations in its report.

#### **STELLER'S SEA EAGLES**

Found only in Russia, Japan, and the Aleutian Islands, they are among the world's largest eagles. Steller's Sea Eagles are listed in the Sakhalin and Russia Red Data Books and included in the International Union for the Conservation of Nature (IUCN) Red List. A Steller's Sea Eagle has a wingspan of two metres. Male birds weigh around six

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kilogrammes and females nine kilogrammes. Since 2003, Russian ornithologists, contracted by Sakhalin Energy, have conducted extensive studies of the eagles in northeast Sakhalin. Based on their research, special programmes were developed to mitigate impacts on this rare species, including limiting motor vehicle speed, suspending work during nesting periods and re-routing onshore pipelines.



#### SUPERVISORY BOARD

Sakhalin-2's highest executive entity, the Supervisory Board reviews issues connected with the approval of development plans, development budgets, annual work programmes and budgets, principal financial documents and liquefied natural gas (LNG) sales agreements. The Supervisory Board is made up of six representatives from Sakhalin Energy and its shareholders and six representatives of the Russian party to the Production Sharing Agreement (PSA), including two representatives of the Sakhalin Oblast Government and four representatives of the Federal government.

## SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA)

A software package for controlling remote facilities and for logging data, showing alarms and displaying information installed along the TransSakhalin pipeline. From locations along the route, signals are routed back to the control centre by fibre optic cable for real time, continuous monitoring. Control room operators use the data to monitor operating parameters and to make decisions, assuring the safe operation of the pipeline.



#### SUPPORTING FLEET

Three, ice-class supply vessels used for Sakhalin Energy's three offshore platforms, the Pacific Endeavour, the Pacific Endurance, and the Pacific Enterprise. The ships were built at the Norwegian shipyard of Aker Langsten in 2006, as part of a joint venture between JSC Primorsk Shipping Corporation (PRISCO) and Swire Pacific Offshore. All ships are fitted with an anti-freeze system, advanced computer constrol systems and are operated by a crew of Russian nationals.

The Svitzer Aniva, the Svitzer Busse, the Svitzer Korsakov, and the Svitzer Sakhalin, four iceclass tugs based in Prigorodnoye complex are chartered by Sakhalin Energy on a long term basis to service the liquefied natural gas plant and the oil export terminal (OET). The tugs perform ship berthing, buoy maintenance, ice channel breaking and ice management, and were designed to break up to 85 cm of level ice travelling at a minimum of three knots and to manage harbour ice. When operating in tandem, two tugs can break a channel wide enough for tankers calling at the terminal to pass through.

#### SUSTAINABLE DEVELOPMENT

A broad concept defined as a development which meets the needs of the present without compromising the ability of future generations to do the same. Sustainable development is a priority for Sakhalin Energy and for Sakhalin Island, to pursue economic growth and social advancement



in ways that can be sustained in the long term by conserving resources and protecting the environment.

#### SUSTAINABLE DEVELOPMENT CHAIR See Social Investment.

#### TAIMEN

A rare, protected species of salmon included in the World Conservation Union's (IUCN) Red List as critically endangered and rapidly declining. More than half of the world's Sakhalin Taimen population is thought to live on Sakhalin Island. Taimen are vulnerable to poaching and information on them is scant. In 2007, Sakhalin Energy launched a survey to identify the river systems



inhabited by taimen along the company's pipelines. The study provided support for many stakeholders, including Japanese scientists and experts from the Wild Salmon Center. It assessed eight river catchments in the autumn and spring. The study's results established a baseline for future scientific research, identified the main juvenile habitats, and estimated the population size and reproductive success of the taimen.

#### **TANKER LOADING UNIT**

The tanker loading unit (TLU) acts as a single point mooring, and is located 4.5 kilometers offshore in Aniva Bay at a depth of 30 metres.

An offshore pipeline supplies oil to the TLU from oil storage tanks. During operations, three pumps are used, with an additional pump on standby. Each pump used for loading crude oil has a maximum hourly capacity of 2650 m<sup>3</sup>. On the TLU, a tower fitted with a mooring yoke connects to the oil loading arm with hawsers. The TLU services oil tankers with a capacity of 40,000 m<sup>3</sup> to 150,000 m<sup>3</sup> and should load around 100 oil tankers per year. Loading operations last 14 to 24 hours, depending on tanker capacity. Sandwell



Engineering won the Lieutenant Governor's award of excellence in 2007 for its TLU design at the Engineering Excellence Gala, hosted by the Consulting Engineers of British Columbia, Canada.

#### TECHNICAL AND ECONOMIC SUBSTANTIATION FOR CONSTRUCTION (TEOC)

A report summarising key technical and environmental information on the Sakhalin-2 Phase 2 project which has additional summaries on cost and project economics. Technical, environmental and economical solutions are also included for the implementation of the project necessary to fulfill requirements of the Russian Federation. Russian authorities approved the TEOC in 2003.

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Further detail is available in subsequent volumes. The TEOC report can be accessed in Sakhalin in district libraries and the Regional Research Library.

#### **TECHNICAL INTEGRITY**

Ensuring the safety of physical assets, such as a platform throughout its life cycle to help eliminate failures that could harm people or damage the environment. During the life of an asset, the project team ensures technical integrity during the design stage and the operating team safequards it during the operational phase.

### **TECHNICAL** REINSTATEMENT

Creating a stable land form along the TransSakhalin pipelines Right of Way (RoW) once all construction activities have been completed. The main focus of technical reinstatement is to restore the RoW to its original condition wherever practicable. However in order to ensure pipeline integrity. this is not always possible.

Technical reinstatement includes the following techniques:



levelling soil after backfilling the trench over the width of the RoWprofiling soil to return the site to its pre-existing land form and drainage pattern when feasible:

- removing all construction wastes and refuse. including large rocks and wood debris:
- removing running track where required:
- installalling erosion control measures, such as riprap, slope breakers, and erosion matting):
- stabilising watercourses.

Once technical reinstatement is complete, biological reinstatement is performed. See Biological reinstatement, Right of Way (RoW) and TransSakhalin pipelines.

#### TOPSIDES

Integrated decks that provide living and working accommodation and an area for driling and production equipment on a platform. The topsides for the Lunskoye-A (Lun-A) and Piltun-Astokhskoye-B (PA-B) were built at the Samsung Heavy Industries construction vard on Geoie Island in South Korea. See also Concrete gravity base structure. Float-over, Lunskove-A and Piltun-Astokhskove-B.



#### TRAINING CENTRES

The training centre for Sakhalin Energy at the Yuzhno-Sakhalinsk Fuel and Energy College conducts basic trainee and apprenticeship programs to meet the Russian Federation's mandatory requirement for certification. The Sakhalin Island Technical Training Centre trains staff, contractors, and other oil and gas operators. It also holds courses on fire fighting and helicopter, underwater, and escape training (HUET).

#### TRANSSAKHALIN PIPELINES

The name given to Sakhalin Energy's onshore pipelines system. It includes the following infrastructure:

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- onshore gas and oil pipelines;
- fiber optic cable network;
- two booster stations to maintain pressure in the pipeline;
- five pig (pipeline inspection gauges) launchers and receiver stations for cleaning and diagnostics;
- 104 block valves on the oil pipeline, 47 block valves on the gas pipeline, four block valves on the multiphase line between the onshore processing facility (OPF) and the Lunskaya-A (Lun-A) platform Associated facilities installed along the pipeline route, including five pipeline maintenance depots (PMDs).

Hydrocarbons are transported through the Trans-Sakhalin pipeline system, from the Piltun-Astokhskoye and Lunskoye fields in the north of Sakhalin to the OPF in the Nogliki district, and then to the liquefied natural gas (LNG) plant and the oil export terminal (OET) in the south of Sakhalin at Aniva Bay. See also Block valves, Block valve station, Pig, Pipeline maintenance depots and Right of Way.

## TREATMENT PLAN FOR OBJECTS OF CULTURAL HERITAGE

Procedures to follow in the treatment of cultural objects potentially affected by construction of the Sakhalin-2 project in fulfillment of the commitments made by Sakhalin Energy to safeguarding these items. Resources or objects of cultural heritage include archaeological sites, historic objects, religious objects, and locations, including sites of cultural importance to Indigenous Peoples (IP), and paleontological objects and places with unique characteristics to their natural environment. The list of objects includes sites identified before and during construction. Items of cultural heritage value for Indigenous Peoples include objects or locations they consider of spiritual, sacred, or natural value.



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#### UNITED NATIONS GLOBAL COMPACT

The United Nations Global Compact is a strategic policy initiative and practical platform for businesses that are committed to aligning their operations and strategies with 10 universally accepted principles in the areas of human rights, labour relations, environmental protection, and anticorruption. Sakhalin Energy joined the Global Compact in 2009. Membership is voluntary and contributes to sustainable development and the general liability of a corporation. By joining the Global Compact, a company acknowledges that business based on these general principles helps foster a more sustainable, fair and inclusive global economy and thriving companies.



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### VENDOR DEVELOPMENT PROGRAMME

A training programme to develop Russian vendors and contractors aimed at boosting the competitiveness of Russian enterprises and sharing insights with them on the unique expertise used on the Sakhalin-2 project. In the programme, several training courses introduce Russian contractors to many aspects of direct cooperation with Sakhalin Energy and other major operating companies.

#### VESTI

A Sakhalin Energy publication of news and analysis about the Sakhalin-2 project. Vesti was included in "Best Corporate Publications in Russia 2006–2007". The publication is available in Russian at **www.sakhalinenergy.ru** 

#### VISION

To be the premier energy source for the Asia-Pacific region.

#### **VITYAZ CRUDE OIL**

A new brand of crude oil that Sakhalin Energy introduced to the market. Vityaz is a light, sweet oil with similar qualities to light Oman crude oil. **See also** Vityaz production complex.

#### **VITYAZ PRODUCTION COMPLEX**

The Vityaz production complex was the Phase 1 solution for seasonal oil production and export. It was situated in the Astokh part of the Piltun-Astokhskoye field. It comprised the Molikpaq (PA-A) production platform, a single anchor leg mooring (SALM), an underwater pipeline and the Okha floating storage and offloading (FSO) unit. Phase 1 oil was produced from the complex from 1999 until 2008 when year-round production began under Phase 2. The Molikpaq platform now produces oil and exports it via the pipeline system to the oil export terminal (OET) in Aniva Bay. The SALM and FSO Okha were decommissioned at the end of 2008. **See also** Molikpaq, Vityaz crude oil and FSO Okha.





#### WESTERN GRAY WHALES

One of the largest mammals on earth, the Western Gray Whale is critically endangered. International estimates show around 130 individual whales remain, including 25 to 35 reproductive females. Western Gray whales spend the summer feeding in the waters surrounding Sakhalin Island, before moving south to warmer climates in winter. Sakhalin Energy is committed to minimising any risks to the Western Gray Whale. The company rerouted the subsea pipeline to bypass feeding areas and in 2007 put into effect stringent noise level criteria during installation of topsides on the Piltun-Astokhskoye-B (PA-B) platform to avoid any disturbance to the whales. **See also** Western Gray Whales Advisory Panel.



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#### WESTERN GRAY WHALE ADVISORY PANEL

Sakhalin Energy requested a panel be established to advise the company on the evolution of the Western Gray Whale population around Sakhalin Island. WGWAP was set up in 2006 under the auspices of the International Union for Conservation of Nature (IUCN, also known as the World Conservation Union). The panel comprises 11 leading marine scientists who continue to provide independent review processes and risk management advice to the company. Sakhalin Energy is the first oil and gas company to set up a cooperative initiative involving business and the scientific and environmental communities. **See also** Western Gray Whales.

#### WET-CUT CROSSING

A technique used to install a pipeline under a watercourse. A trench is due through a watercourse while the water continues to flow. As soon as the trench is finished, a pre-welded, hvdro-tested pipe section is lowered into the freshly cut trench. which is then backfilled with clean material. In most cases, pipeline trenches are cut with an excavator or, because of the limited reach of an excavator, with a dragline for larger watercourses. The Sakhalin-2 project used the wet-cut technique when crossing the majority of watercourses and only in winter for rivers in fragile environments when water flow is reduced or sometimes. non-existent, minimising any sediment-related impacts. See also Auger bore method, Dry-cut crossing. Right of Way and TransSakhalin pipelines.

#### WHAT TO DO IN EMERGENCY SITUATIONS PROGRAMME See Social Investment.

#### **WORKING GROUP (WG)**

A group of experts established in 2000 by a decision of the Supervisory Board for the Sakhalin-2

project. The group is made up of representatives of the Russian Federal Government, the Sakhalin Oblast Government and Sakhalin Energy.

Its objective is to prepare and coordinate documents and decisions at a working level for further consideration and decision by the Supervisory Board.

#### WORLD BANK GUIDELINES

In addition to fulfilling the regulatory requirements of the Production Sharing Agreement and the Russian Federation, Sakhalin Oblast Government Energy also conducts its Project activities according to several other guidelines.

These include the World Bank/IFC and Ex-Im Bank qualitative and quantitative policies and guidelines to ensure that business activities are conducted in a sound social, environmental, financial and economically balanced way; and all or part of European Union directives on health and safety as specified in the Relevant Standard Requirements column in Annex A of the Health, Safety, Environmental and Social Action Plan (HSESAP).





X-RAY OF PIPES See Non-destructive testing of pipeline welds.







#### YUZHNO-SAKHALINSK

The administrative centre of the Sakhalin Oblast Government where the offices of Sakhalin Energy are based. Previously known as Vladimirovka until 1905, when it was renamed Toyohara while southern Sakhalin was under the control of Japan until 1945. Today Yuzhno-Sakhalinsk has a population of about 181,000.



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## **ZERO DRILLING DISCHARGE**

The Molikpaq (PA-A), Lunskoye-A (Lun-A), and Piltun-Astokhskoye-B (PA-B) platforms operate with zero drilling discharge to the environment, meaning no drill cuttings, or driling muds are discharged overboard. All process fluids, effluents and water that are produced are injected into cuttings re-injection wells. **See also** Cuttings re-injection.

## ZERO FLARING

The Molikpaq is Russia's first operating platform to apply a policy of zero flaring of associated gas, starting in 2005. In the past, standard oil field procedure was to burn or flare the gas. Before installation of the subsea pipelines, all associated gas was re-injected into the reservoir by gas compressors. Today all the gas is exported to Prigorodnoye complex to produce liquefied natural gas (LNG).





## **ZIMA HIGHLANDS**

The Zima Highlands housing complex is situated on 40 hectares of land just south of Yuzhno-Sakhalinsk where almost 500 Sakhalin Energy staff reside. It is divided into five areas, Zima 1, 2, 3 and 4 with homes in the adjacent Strawberry Hills complex. The main facility has a recreation centre complete with gym, weight room and badminton courts.