



## APPENDIX 1

# Air Emissions and Energy Management Standard Overview

### Purpose

To manage the *Risk*<sup>1</sup> associated with air emissions and energy management, in particular *Greenhouse Gases* and energy use, *Flaring or Venting* of hydrocarbons, release of *Ozone Depleting Substances*, and emissions to air such as *Sulphur Oxides*, *Nitrogen Oxides*, *Volatile Organic Compounds* and others.

### Who is this for?

- *Asset Managers*;
- *Supervisors*;
- *HSE Professionals*;
- *Contract Holders*;
- *Contractors* where Contract Scope includes use of stationary or mobile sources of emissions to air.

### What situations are covered?

This document applies to all *Sakhalin Energy Assets, Facilities*, operations, *Projects* and activities, including activities undertaken by contractors on behalf of the Company. This document does not address air quality standards established for the purpose of protecting the occupational health of staff and contractors in the work place refer [Occupational Health and Hygiene Standard](#)<sup>2</sup>.

### Requirements

**Asset Managers are Accountable for requirements 1 to 12 in their own organisation:**

- 1. Manage Air Emissions and Energy Use in compliance with:**
  - a. Russian Federation law (overview is provided in [Appendix 2 Legal Requirements for Air Emissions and Energy Management](#));
  - b. Lenders and Shareholders as specified in [Appendix 3 International Requirements for Air Emissions and Energy Management](#) and [Appendix 4 Air Emissions Standards Comparison](#).Requirements 2 to 12 shall be established and maintained in accordance with requirement 1.
- 2. Implement roles and responsibilities** as defined in [Roles and Responsibilities for Industrial Environmental Control](#).
- 3. Design and Modify facilities** in accordance with Requirement 1 of this document, the [Managing Risk Standard](#), and the [Asset Integrity and Process Safety Standard](#).
- 4. Manage Greenhouse Gas and Energy use.**
  - a. Significant (>25,000 tons CO<sub>2</sub> equivalent per year) greenhouse gas (GHG) emissions from all facilities and offshore support activities should be quantified annually as aggregate emissions in accordance with internationally recognized methodologies and reporting procedures [IFC EHS guidelines];
  - b. Report values as CO<sub>2</sub> equivalent (CO<sub>2</sub>e) emissions as described the [HSE Monitoring and Reporting Standard](#);
  - c. Establish and maintain a five-year [Greenhouse Gas and energy management plan](#);
    - c1. A plan covering all existing Assets shall be updated annually and includes:
      - Sakhalin Energy Greenhouse Gas and Energy Management Objectives;
      - annual inventory of Greenhouse Gas emissions based on the *Parameters* defined in the [HSE Monitoring and Reporting Standard](#);
      - a list of improvement options detailing operational and capital projects;
      - an economic assessment of improvement options using the CO<sub>2</sub> Project Screening Values;
      - targets and performance monitoring in support of the Greenhouse Gas and energy management objective;

<sup>1</sup> Italicized terms in this document are included in the [Sakhalin Energy HSE Glossary](#).

<sup>2</sup> Underlined items in this document refer to Sakhalin Energy Controlled Documents.



- a forecast for Major Installations with a 10-year look ahead or for Upstream through End of Field Life using the *Parameters* defined in the [HSE Monitoring and Reporting Standard](#);
  - include in the forecast Greenhouse Gas reduction and energy management opportunities that have been approved for implementation.
- c2. A plan for any new Major Installations and modifications of Major Installations within the scope of the Opportunity Realization Manual that will result in a significant change (>25,000 tons CO<sub>2</sub> equivalent per year) in Greenhouse Gas emissions beginning at the “Identify” process phase of the Opportunity Realization Manual that includes the following:
- an economic assessment of the options and commercial opportunities using the *CO<sub>2</sub> Project Screening Values*;
  - Greenhouse Gas emissions and/or energy performance target(s) in support of the Greenhouse Gas and energy management objectives;
  - a Greenhouse Gas emissions forecast for the project using the specification Greenhouse Gas Forecasting;
  - update the plan at each Opportunity Realization Manual process phase.

## 5. Manage Flaring and Venting.

This requirement 5 applies where Continuous Flaring or Venting from a Source would result in emission of 1000 metric tonnes per year, or more, of carbon dioxide equivalent.

It does not apply to:

- fugitive emissions and tank breathing losses (refer to requirement 8 Volatile Organic Compounds);
  - Emissions from process units such as heaters, boilers, cogeneration units, tail gas treating units, incinerators, waste heat recovery units, glycol treatment and produced water treatment systems;
  - flare pilot light gas, flare sweep gas and vent purge gas;
  - flaring or venting required for safe start-up and shut-down;
  - *Emergency releases*;
  - well flow tests conducted as part of exploration or appraisal to gather field data;
  - early oil production phase of a new field with a maximum of 2 years; and
  - oil production at End of Field Life.
- a. Establish, implement and maintain Sakhalin Energy Flaring Commitment;
- b. Design requirements:
- design new or modify existing Installations to prevent Continuous Flaring or Venting of hydrocarbons as a means of disposal [EIA V5-Ch.3];
    - where this cannot be met, reduce Continuous Flaring and Venting to As Low As Reasonably Practicable (ALARP), and document the ALARP determination and control plan. Include in the ALARP determination an assessment showing the net increase or decrease in Greenhouse Gases and the alternatives to flaring or venting that were rejected for safety, technical or environmental reasons.
  - do not use vents unless it can be demonstrated that the lifecycle greenhouse gas emissions from the vent are lower than those from a flare system;
  - use of a reliable pilot ignition system and efficient flare tips and optimize the size and number of burning nozzles [IFC EHS guidelines];
  - install of high integrity instrument pressure protection systems, where appropriate, to reduce over pressure events and avoid or reduce flaring situations [IFC EHS guidelines];
  - minimizing flaring from purges and pilots, without compromising safety, through measures including installation of purge gas reduction devices, flare gas recovery units, inert purge gas, soft seat valve technology where appropriate, and installation of conservation pilots [IFC EHS guidelines];
  - locating flare at a safe distance from local communities and accommodation units [IFC EHS guidelines];
  - minimizing liquid carry over and entrainment in the gas flare stream with a suitable liquid separation system [IFC EHS guidelines].



- c. Operate the facility consistent with the design and Management of Change Procedure to control Continuous Flaring or Venting;
- evaluate operational deviations from design that cause Continuous Flaring or Venting and reduce them to ALARP in line with Managing Risk;
  - implementation of source gas reduction measures to the extent possible [IFC EHS guidelines];
  - minimizing flame lift off and/or flame lick [IFC EHS guidelines];
  - operating flare to control odor and visible smoke emissions (no visible black smoke) [IFC EHS guidelines];
  - implement burner maintenance and replacement programs to ensure continuous maximum flare efficiency [IFC EHS guidelines];
  - metering flare gas [IFC EHS guidelines];
  - to minimize flaring events as a result of equipment breakdowns and plant upset, plant reliability should be high (> 95%) and provision should be made for equipment sparing and plant turn down protocols [IFC EHS guidelines];
  - for maximizing flare combustion, efficiency should be controlled and optimized flare fuel/air/steam flow rates to ensure the correct ratio of assist stream to flare stream [IFC EHS guidelines];
  - flaring shall only be conducted during commissioning, process upsets or non-routine maintenance activities. There shall be a constant small pilot and purge gas flare at all facilities. [EIA V5-Ch.3];
  - if flaring is the only option available for disposal of test fluids during well clean-up or well flow tests, the following should be applied:
    - flow only the minimum volume of hydrocarbons required for the test;
    - reduce well test durations to the extent practical;
    - select an efficient test flare burner head equipped with an appropriate combustion enhancement system to minimize incomplete combustion, black smoke, and hydrocarbon fallout to the sea;
    - record volumes of hydrocarbons flared [IFC EHS guidelines];
    - divert produced fluids to a tank until a sufficiently high hydrocarbon level is reached for efficient combustion;
    - initiate flaring during daylight hours;
    - operator lookout;
    - cease flaring if oil sheen appears on sea surface;
    - light the sea surface by floodlight [EIA V 2 ch. 3.4.3].
  - there shall be no venting and / or flaring from production well tests except in exceptional circumstances and during the designed warm up period during cold start of Lunskeye gas wells. (Astokh test separator gas header routed for compression). [EIA Addendum Chapter 10];
  - a preference shall be demonstrated to flaring gas rather than venting during operational testing, and maintenance activities shall be assessed on a case-by-case basis to assure the safest evacuation method is utilised. Log of non-routine emissions shall be recorded [EIA V 4 ch. 3.14.3];
  - flaring and well testing during periods of fog or temperature inversions should be avoided to reduce impacts on local air quality [EIA V 2 ch. 3.11.3].

**6. Implement the following requirements for combustion sources:**

- a. All vessels, engines, exhaust systems, and power generation facilities shall be regularly maintained and operated under manufacturers standards to ensure efficient combustion and operational efficiency. Generators shall have suitable exhaust stacks to aid effective dispersion of pollutants [EIA V5 ch. 3.3.2; V2 ch. 3.11.3];
- b. Certified fuel and lubricants. Low sulphur fuel (<0.05% S) shall be used if commercially available without significant excess fuel cost [EIA V1 ch. 2.5, V5 ch.3.3.2, V2 ch.3.11.2];
- c. Meet the emission limits specified in applicable Permits, and limits specified in Appendix 4;
- d. Assess the effect of future emissions from a new or modified Major Installation on ambient air quality in the Airshed. If future emissions will cause the ambient air quality to exceed the standards specified



in Appendix 2 or in Appendix 3, mitigation measures should be provided and document how emissions will be controlled [Framework];

- e. Low NO<sub>x</sub> burners and low NO<sub>x</sub> high efficiency turbines should be used for permanent power facilities and furnaces [EIA V1 ch. 2.5; V2 ch. 3.11.3, V5 ch. 3.3.4];
- f. Preferentially select gas-fired or, where natural gas is not continuously available, dual-fuel turbines for power generation [EIA V1 ch. 2.5], minimize use of diesel as a fuel for electricity generation [V 5 ch. 3.3.4].

#### 7. Implement the following requirements to manage dust:

- a. Dust collectors shall be placed on pressurized tanks' ventilation systems and other storage vessels that contain dry bulk materials (cement, barite and other mud components) [EIA V2: 3.11.3]. Dust catchers shall be in operation at bulk plants and during fluffing / blowover of stored materials. Schedule shall be kept at asset to maintain dust collectors through emptying and visual inspection for efficiency;
- b. Any construction concrete batching plant shall be enclosed with air emissions filtered, and a dust monitoring program shall be implemented [V3 ch. 3.11.2]. Protocol of daily inspections shall be implemented to visually monitor plume and the need for dust suppression/control activities [EIA V4-3.14.2; V5-3];
- c. Dust prevention measures should be taken to reduce dust emissions from the vehicles, if required [V5 ch. 3.7.1], such as minimizing vehicle movements and using water for dust suppression [V4 ch 2.3.7].
- d. Implement dust suppression during particularly dusty operations or in close vicinity to residential areas [V4 ch. 3.14.1].

#### 8. Manage emissions of Volatile Organic Compounds (VOC).

- a. Methods for controlling and reducing fugitive emissions should be considered and implemented in the design, operation, and maintenance of facilities. The selection of appropriate valves, flanges, fittings, seals, and packings should be based on their capacity to reduce gas leaks and fugitive emissions [IFC EHS LNG facilities];
- b. To minimise emissions of hydrocarbons from sources such as pumps, seals, valves, the project should use closed draining, install dry seals on compressors and where applicable double seals for hydrocarbon pumps [V5 ch. 2.10.1];
- c. Install pressure relief valves to protect equipment [V2 ch. 3.11.3];
- d. Use high quality seals and leakage monitoring devices in assembly designs [V2 ch 2.2.5] and implement Preventative Maintenance Regimes (PMR) to reduce leaks from pumps [V2 ch. 3.11.3];
- e. Where vapour recovery is not proposed for new projects, the decision shall be approved by the HSE Management Committee;
- f. Boil Off Gas (BOG) should be collected using an appropriate vapor recovery system (e.g. compressor systems). For LNG plants (excluding LNG carrier loading operations) the vapor should be returned to the process for liquefaction or used on-site as a fuel; on board LNG carriers BOG should be re-liquefied and returned to the storage tanks or used as a fuel [IFC EHS LNG facilities];
- g. For Assets with total VOC emissions greater than 100 tons per year (excluding VOC emissions that are produced by combustion or covered by requirement 5a – 5c(Continuous Flaring and Venting), and excluding process streams where the VOC content is less than 10% by weight) implement requirements below [Framework]:
  - Establish and maintain controls to reduce VOC emissions to ALARP;
  - For Major Installations, establish and maintain a risk-based Leak Detection and Repair programme to control fugitive emissions by monitoring to detect leaks and implementing repairs.

#### 9. Manage Ozone Depleting Substances.

Requirement 9 does not apply to Domestic-sized Appliances or drinking water coolers containing Ozone Depleting Substances in sealed systems [Framework].

- a. Identify Ozone Depleting Substances and maintain an inventory until they are eliminated;
- b. Eliminate Halons and Hard CFCs in all operations by end-of-year 2010 and eliminate HCFCs by end-of-year 2020 in accordance with the Montreal Protocol;
- c. Do the following until the substances in requirement 9b are eliminated:



- remove Ozone Depleting Substances from *Non-sealed Systems*;
  - provide controls to prevent loss of Ozone Depleting Substances;
  - provide controls for recovery and destruction of Ozone Depleting Substances. Do not transfer Ozone Depleting Substances to third parties for re-use. Where permitted under RF law, in-company transfers and transfer to Halon banks are permitted;
- d. Put controls in place so that new installations are not fitted with HCFCs from beginning of year 2010 onwards.

**The Supervisor is *Responsible* for the requirements below.**

- e. Make people aware of any equipment that contains Ozone Depleting Substances and the controls required before they perform work that could release these substances;
- f. Apply the [Permit to Work](#) procedure to control work on, or disposal of, equipment that contains Ozone Depleting Substance in line with the requirements above.

**Contract Holders are Responsible for requirement 10.**

10. Where contracted activities include use of stationary or mobile sources of emissions to air, provide terms in relevant Contracts to require Contractors and subcontractors to:
- a. Obtain required permits for their operations, and conduct operations under their control in compliance with applicable regulatory and permit requirements;
  - b. Include Air Emissions and Energy Management in the [Contract HSES Management Plan](#), including controls in compliance with the relevant requirements of this standard (including international standards where applicable), and an inventory of Air Emissions and Energy use, emission limits, and targets;
  - c. Monitor and report air emissions and compliance data in line with applicable permits and international standards;
  - d. Report any non-compliance with this Standard to the Contract Holder; and
  - e. Where relevant, provide terms in contracts for the purchase, service or disposal of equipment or refrigerant that contains Ozone Depleting Substances, which comply with requirement 9.
11. **Implement inspection and audit** in accordance with [Air Emissions and Energy Use Assurance](#) specification.
12. **Monitor, report and retain records of Air Emissions and Energy use** in accordance with the [HSE Monitoring and Reporting Standard](#).