



Gladstone LNG Facility Safety Case Summary



Santos GLNG

Glossary

Santos Management System

The Santos Management System is a comprehensive and integrated management system that has been adopted by GLNG OPL. The Santos Management System sets out the requirements for how Santos and GLNG OPL does business, including managing risks related to Major Incidents at the facility.

GLNG OPL

Gladstone LNG Operations Pty Ltd, the operator of the GLNG Facility. GLNG OPL is a joint venture between Santos Ltd, PETRONAS, TOTAL and Korea Gas Corporation

Hazard

A hazard is anything in the workplace that has the potential to harm people.

LNG

Liquefied Natural Gas

Major Incident

An uncontrolled event, including an emission, loss of containment, fire, explosion or release of energy that involves a Schedule 15 chemical and poses a serious and immediate risk to the health and safety of people.

MHF

Major Hazard Facility. MHFs are facilities that store large quantities of Schedule 15 chemicals.

Risk

A product of the likelihood of a potential Major Incident and the severity of associated consequences both on-site and off-site.

Workplace Health and Safety Queensland

The government regulator responsible for licensing MHFs in Queensland.

Schedule 15 Chemical

A hazardous chemical named or described in Schedule 15 of the WHS Regulation.

SFAIRP

So Far As Is Reasonably Practicable; a measure of risk after implementation of control measures that eliminate or minimise risks so far as is reasonably practicable.

WHS Regulation

The Queensland Work Health and Safety Regulation (2011).

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Safety Message

At GLNG OPL we are committed to conducting our business at the GLNG Facility in a manner that prevents injury or illness to workers and the public who may be affected by our work activities.

We encourage good practice in health and safety management, and apply the Santos Management System to provide a structured framework for management of the business, including for effective environmental, health and safety practices at the GLNG Facility.

At the GLNG Facility we seek to continuously improve our health and safety practices through hazard identification and analysis, feedback and discussion with workers, auditing, and drills.

GLNG OPL reports and investigates all incidents related to injury to people, damage to plant, equipment or the environment, and near-misses, and uses learnings from incidents or near-misses to improve our health, safety and environmental practices.

At the GLNG Facility, we empower our workers to stop the job if they think something is unsafe.

Introduction

This document provides workers and the local community with information regarding health and safety and the potential for Major Incidents at the GLNG Facility. This document is referred to as the Safety Case Summary.

What is a Major Hazard Facility?

Major Hazard Facilities (MHFs) are defined by the Queensland Work Health and Safety (WHS) Regulation and are industrial sites that store, handle or process large quantities of hazardous chemicals identified in Schedule 15 of the WHS Regulation.

They are typically facilities such as oil refineries, gas and chemical plants, and large fuel and chemical storage sites.

All MHFs are required to have a licence to operate issued by Workplace Health and Safety Queensland.

What is a Safety Case?

In order to obtain a licence to operate, a MHF must demonstrate that they are operating in a safe manner. This includes requirements for proper facility design, training, maintenance and emergency response planning. This is done by preparing a Safety Case, to demonstrate that the operator of the facility has analysed and assessed health and safety risks, and eliminated or minimised those risks so far as is reasonably practicable.

The Safety Case is prepared with involvement from, and in consultation with, workers and their health and safety representatives.



The Safety Case provides assurance that the GLNG Facility has appropriate processes, equipment and safety management systems, and people with the appropriate knowledge and skill to operate the GLNG Facility safely and meet all requirements of the WHS Act and Regulation.

The control measures in place that are identified in the Safety Case will enable the GLNG Facility to continue operating at high standards of health and safety performance.

The Safety Case includes the following components:

1. Facility Description
2. Safety Assessment – What the potential Major Incidents, risks and control measures are
3. Safety Management System summary
4. Emergency Response – Action to be taken in the event of a Major Incident.

Off-site risks to nearby neighbours that could be impacted by a potential Major Incident are also examined in the Safety Assessment.

Copies of this Safety Case Summary will be distributed to local libraries in the Gladstone region and is available on the Santos website.

Overview

What is a Major Incident?

A Major Incident is an uncontrolled event, including an emission, loss of containment, fire, explosion or release of energy that involves a Schedule 15 chemical and poses a serious and immediate risk to the health and safety of people.

What is a Schedule 15 chemical?

Schedule 15 of the WHS Regulations defines what hazardous chemicals must be considered in the scope of the Safety Case. The main Schedule 15 chemicals at the GLNG Facility are listed on page 8 of this document.

How is this relevant to me?

The Safety Case Summary is a document that explains how risks of Major Incidents are managed at the GLNG Facility and the potential impact of the facility on workers and the local community. It provides information on how workers and the local community will be notified in the unlikely event of a Major Incident, and the emergency response actions that will be taken.

What do I do in the event of an emergency?

The GLNG Facility is well prepared to handle emergency incidents, and a comprehensive Emergency Response Plan has been developed. Further information is set out on page 15 of this document.

For the local community, in the unlikely event of a Major Incident on the site a siren will be activated. This is to alert on-site workers of an emergency and may also be audible beyond the site boundary. By sounding the siren GLNG OPL are acting in the interests of the health and safety of on-site workers.

When the area is deemed completely safe, an “all clear” siren (continuous tone) will sound.

Information regarding any major incidents will be communicated via normal channels, including through the Gladstone Regional Community Consultative Committee and via the community stakeholder notification process.

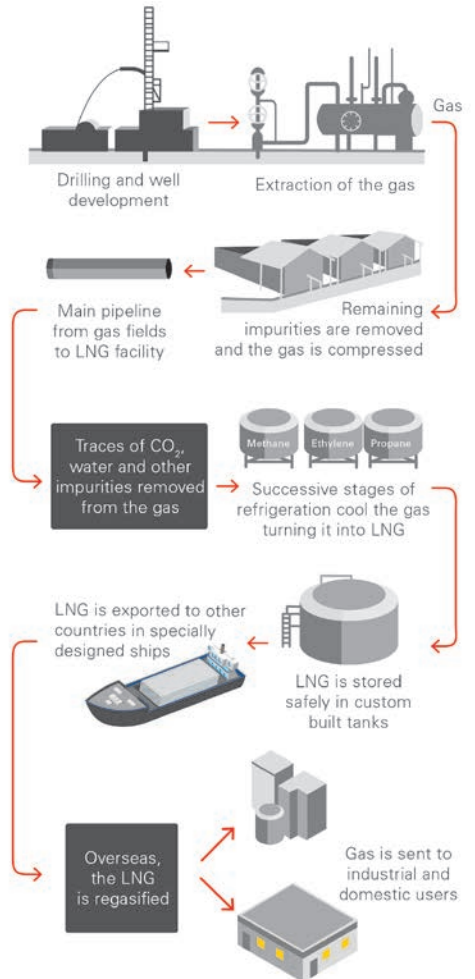
Background

The GLNG Facility, operated by GLNG OPL, encompasses natural gas processing, liquefaction, storage and shipping facilities located on Curtis Island, adjacent to Gladstone in Queensland. The facility and the entire gas supply chain from well to customer is illustrated in Figures 1 and 2.

Fig. 1 – Aerial photograph of the GLNG Facility



Fig. 2 – GLNG Facility process flow schematic



The GLNG Facility was commissioned in 2015 to process natural gas from the Surat and Bowen Basins in Queensland and the Cooper and Eromanga Basins in the north-east of South Australia and south-west Queensland.

The GLNG Facility receives natural gas via a 420km long Gas Transmission Pipeline.

Within the plant there are a number of process pressure vessels, tanks and extensive pipework.

The liquefied natural gas is stored in two 140,000m³ tanks before being shipped to overseas customers in south-east Asia.

The GLNG Facility has a dedicated product loading facility to load LNG carriers. An LNG carrier is loaded every 3-5 days.

Gladstone harbour is administered by Gladstone Ports Corporation.

The GLNG Facility also contains up to 1,300 tonnes of propane and 600 tonnes of ethylene for use in the process as refrigerants.

Personnel

The GLNG Facility has a workforce of approximately 120 workers, including operations, maintenance, engineering, security, laboratory and administration workers. The majority of the workforce are residents of the Gladstone region.

Locality and Community

The GLNG Facility is located approximately 6km to the north of the Gladstone CBD.

Figure 3 – Locality map



Detailed assessments conducted during the design and construction of the facility shows that possible Major Incidents are not expected to cause any immediate impact beyond the GLNG Facility boundary.

Hazardous Chemicals

The GLNG Facility handles and stores a number of hazardous chemicals that are classified as Schedule 15 chemicals under the WHS Regulation. These may be present as liquids, vapour (gas) or a combination of both. Safe management of these substances is vital for workers, the local community, and the environment.

Process and utility equipment that contain or use hazardous chemicals have been designed for the chemical properties, temperatures and pressures involved in that process.

The following Schedule 15 chemicals are stored and processed at the GLNG Facility:

Liquefied Natural Gas (LNG)

LNG is a colourless, odourless, non-toxic, flammable liquid at a temperature of approximately -161°C .

The produced LNG is stored in two tanks that have been designed for the very low cryogenic temperature and operate slightly above atmospheric pressure.

Propane and Ethylene

Propane and Ethylene are both colourless, non-toxic and flammable. Propane is odourless; ethylene has a slightly sweet odour.

Propane and ethylene are used as refrigerants in the LNG production process. Propane and ethylene are both liquid at the storage temperatures and pressures used at the GLNG Facility.

Natural Gas

Natural gas is a colourless, odourless, flammable gas processed at the GLNG Facility to produce LNG. Natural gas is also used on-site as refrigerant and fuel.





Environment, Health and Safety Policy

GLNG OPL's Environment, Health and Safety Policy provides a commitment by GLNG OPL to conduct our business in a manner that prevents injury or illness to workers and the public who may be affected by our work activities.

The Policy is set out below.

Environment, Health and Safety



Policy

Our Commitment

GLNG is committed to being a safe gas and LNG operator and preventing harm to people and the environment.

Our Actions

We will:

1. Integrate environment, health and safety management requirements into the way we work and ensure that we comply with all relevant environmental, health and safety laws.
2. Include environmental, health and safety considerations in business planning, decision making and asset management processes.
3. Identify, effectively control, monitor and ensure awareness of risks that have the potential for serious harm to people and the environment.
4. Lead a strong and consistent environment, health and safety culture across all aspects of the business.
5. Work proactively and collaboratively with our stakeholders and the communities in which we operate.
6. Set, measure, review and monitor objectives and targets to demonstrate proactive processes are in place to continuously reduce the risk of harm to people and the environment.
7. Report to the GLNG OPL Board on our environmental, health and safety performance.

This policy will be reviewed at appropriate intervals and revised when necessary to keep it current.



Rod Duke
CEO GLNG Operations Pty Ltd

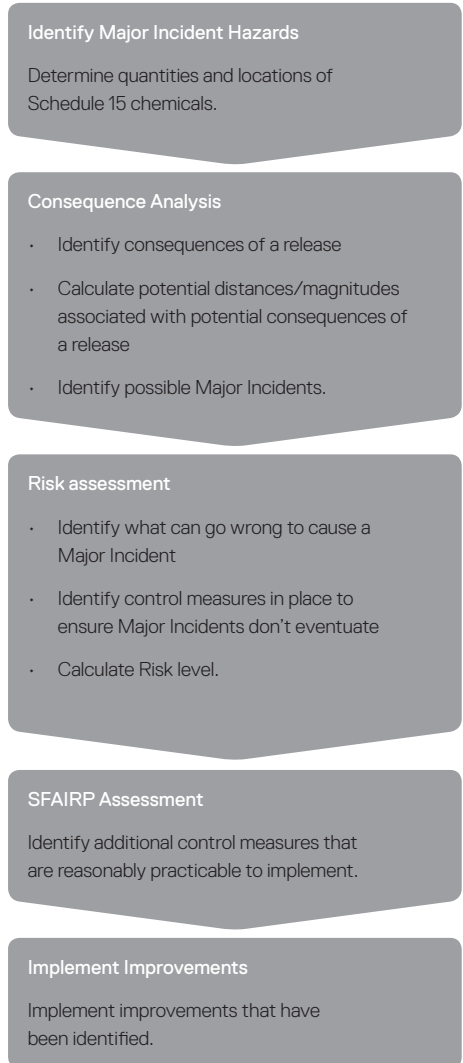
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Safety Assessment

A Safety Assessment must be undertaken in order to assess risks to health and safety associated with Major Incidents at the GLNG Facility. The Safety Assessment requires a structured process to identify hazards, assess risks, and identify the controls required to reduce the risks.

The Safety Assessment process is ongoing, with formal reviews undertaken at least 5-yearly, and will continue throughout the operations phase of the GLNG Facility. The Safety Assessment is also updated whenever significant changes to the GLNG Facility are made. The Safety Assessment has followed the methodology illustrated in Figure 3.

Figure 3 – Risk assessment methodology



Potential Major Incidents Identified

The mechanism for a Major Incident to be realised is the unplanned and uncontrolled loss of containment of a Schedule 15 chemical. Ignition following release of any of the listed Schedule 15 chemicals could result in fires, or in some cases, explosions. The Safety Case has identified the potential for the following types of Major Incidents:

- + **Pool fires:** a fire occurring on top of a pool of flammable liquid; pool fires may burn out quickly, or for larger storages may burn for many hours. The primary concerns with pool fires are radiant heat and smoke.
- + **Flash fires:** a fire resulting from the ignition of a cloud of flammable vapour (gas). Flash fires burn out in seconds and the primary concern is for people who are within the area of the flammable vapour cloud.
- + **Jet fires:** a fire which occurs when liquid or gas is released under pressure and ignites; jet fires are concentrated in a narrow arc, and the primary concerns are the effects of radiation on nearby people and structures.
- + **Vapour Cloud Explosions:** an explosion which may result from the ignition of certain hydrocarbon vapour clouds where there is also a high concentration of equipment; the primary concern is a blast pressure wave that may injure people and damage buildings and structures.

- + **Boiling Liquid Expanding Vapour Explosions (BLEVE):** a rare form of explosion where a fire causes the failure of a pressurised vessel, leading to rapid release of a large volume of hydrocarbon, and subsequent explosion and fireball; the primary concerns are radiant heat, projectiles and a blast pressure wave that may injure people and damage buildings and structures.

Control Measures

The Safety Assessment documents the control measures in place that will adequately control the risks that could lead to Major Incidents.

The types of control measures identified include: equipment design specifications; equipment inspections, pressure relief systems; process control systems; and operating and work permit procedures.

While the majority of control measures focus on preventing potential releases of Schedule 15 chemicals, there are also control measures in place to reduce the impact and severity of any incidents. They include emergency shutdown and isolation systems, ignition prevention, portable and fixed firefighting systems, and emergency response and evacuation procedures.

Safety Management System

The safety management system, comprised of the GLNG Environment, Health and Safety Policy and elements of the broader Santos Management System is the primary system for managing Major Incident risks at the GLNG Facility. The safety management system has been designed to ensure a consistent approach for all workers at the GLNG Facility.

It incorporates industry best practice and includes a suite of management standards and procedures.

The Santos Management System addresses the following:

- + Risk Management
- + Data and Information
- + Compliance
- + Strategy and Planning
- + External Affairs
- + Commercial
- + Joint Venture
- + Asset Life Cycle
- + Financial Management
- + Incident and Crisis
- + Operations Excellence
- + Supply Chain
- + People
- + Assurance

Competency and Training

A competency based training system is in place for operations personnel to ensure they conduct their activities:

- + Safely
- + In an environmentally responsible manner
- + Without damaging plant and equipment

The system defines the knowledge, skill and competency required for each job and includes statutory training, common enterprise requirements and specific technical job competencies. The training system is supported by additional technical training programs to enhance the technical expertise of on-site personnel.

Maintenance

GLNG OPL has implemented a range of maintenance systems and procedures to ensure that equipment is maintained in a safe and reliable condition, and to ensure that asset risks are proactively identified, consistently prioritised and effectively managed.

Highest priority for maintenance is given to the control measures in place to manage risks to safety, the environment and plant.

Emergency Response Plan

The GLNG Facility is well prepared to handle emergency incidents. A comprehensive Emergency Response Plan has been developed in consultation with the Queensland Police Service and the Queensland Fire and Emergency Services.

The design of the GLNG Facility enables rapid isolation and depressuring of sections of the plant in the event of a Major Incident, to reduce the risks from possible ignition of hydrocarbons. In most cases, the excess hydrocarbons will be safely burned using the flare system.

Firewater is reticulated around the GLNG Facility and is connected to fixed firefighting equipment such as deluge systems, foam systems, hydrants and monitors.

All on-site Emergency Response personnel receive training in fire-fighting and emergency response.

Alarms

An emergency alarm is installed at the GLNG Facility, and is vital in ensuring on-site personnel respond quickly and safely to an incident.

The primary purpose of the emergency alarm is to notify personnel on-site of an emergency and to evacuate to safe muster points. However, the alarm is loud and may be heard for some distance outside the facility.

There are four different signals given from the emergency alarm:

Fire Alarm

The fire alarm has a varying low to high “whoop” tone.

Gas Alarm

The gas alarm has a rapid sounding howl.

Muster/Evacuation Alarm

The evacuation alarm is activated from the GLNG Facility Control Room and has a high to low “wail” tone. It is the signal for all on-site personnel without specific emergency duties to proceed to the nearest safe muster point.

All Clear

The all clear alarm has a continuous tone.

All emergency alarms are tested weekly.

Community Response

In the unlikely event of a Major Incident, no impacts are expected for the community. The community should follow the directions of emergency services as with all emergencies.

Santos welcomes your feedback on the GLNG Facility Safety Case Summary.

Please direct your feedback to:

Kylie Williams

Senior Community Relations Adviser

Downstream Operations

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More information regarding the requirements
for Major Hazard Facilities is available from the
Workplace Health and Safety Queensland
website www.worksafe.qld.gov.au