GEELONG GAS TERMINAL PROJECT

Safety, hazard and risk assessment

Planning for Safe Operations

Viva Energy is committed to the safety of the local community, and we will not proceed with the gas terminal unless we are confident that it will be safe.

In fact, we will not get a licence from Worksafe Victoria to operate the proposed gas terminal unless we can demonstrate it will be safe.

The local community can be reassured to know that comprehensive science-based safety hazard and risk assessments are being undertaken to mitigate and minimise any risk from the gas terminal operation. Results to date – along with the excellent safety record of the global LNG industry – give us confidence that the terminal will be operated safely, without putting the safety of neighbours, our workforce or the broader community at risk.

Safety studies including further risk assessment of viable scenarios are ongoing as the gas project continues to develop.

Safeguards and mitigations will be in place to reduce the risk of an incident occurring, either accidental or intentional, at the FSRU and for LNG ships in transit (see Shipping Safety Fact Sheet).

There are strict regulations governing an operation like this, including shipping, and we are working with State and Federal regulators to make sure all appropriate safeguards are in place, and that we meet all regulatory and licencing requirements, including for WorkSafe, ESV and Ports Victoria.

Safety studies and assessments

Studies and risk assessments are being undertaken at every stage of Project development, and are an important input to the ongoing design process, allowing modifications to be made as we seek to identify opportunities to mitigate risk.

Preliminary findings of modelling and risk assessments carried out to date are reported in the EES Safety and Risk Study Summary.

The studies to date give us confidence that the terminal can be operated safely, and presents indicates very low incremental risk to the community.

How is risk calculated?

There are two parts to the calculation of risk: the likelihood of an event/incident occurring and potential consequences.

Risk assessment is a widely-used scientific and mathematical process to help assess and manage process safety. There are accepted industry and Government/Regulator processes and standards, which are widely used for industry, insurance and other applications. Standard tools and processes, including computer models and specialised software are used to help quantify and mitigate risk.

What is a Quantitative Risk Assessment (QRA)?

Quantitative risk assessment (QRA) is a tool often used for Major Hazard Facilities like a refinery, allowing us to assess the cumulative effects of different events. It is used to estimate the likelihoods of, and consequences from, hazardous events. Results are expressed quantitatively (as a number) as risk to people and/or property.

QRA modelling is performed by experienced and qualified Safety & Risk Engineering professionals. The risk modelling software we used is a widely used industry standard package, extensively validated against experimental data. The software is one of the industry standard tools for analysis of flammable, fire, explosion and toxic hazards.

Risk Assessment of the FSRU

The Project team has completed quantitative risk assessments on the FSRU operation, analysing a potential incident on board or at Refinery Pier. The QRA looks at the worst case scenario, and even in that unlikely scenario, shows that the risk of fatalities – even a very small risk – is localised to the area around the floating terminal. Land-based activities are at negligible risk of being impacted, and there are no measurable impacts to residential areas (note that the closest houses are more than 1.3 km away).

International studies and modelling

As part of the broad safety and hazard assessment for the Project, safety experts examined a number of reports which make up a body of international research and experience in LNG operations and safety.

The Sandia Report

The US Sandia National Laboratories Report is one such assessment, a credible and well-researched piece of work that is much-quoted in relation to LNG safety. It was initially completed in 2004, updated in 2008; and followed by a report to US Congress in May 2012.

The Sandia Report examines a low probability, high–consequence catastrophic event which results from a major spill to water with a subsequent pool fire and potential vapour cloud, resulting in a large potential impact zone with potential implications for public safety.

The theoretical scenario is based on a successful adversarial threat (i.e. terrorism). The probability of this scenario occurring in the specific operation proposed is assessed as extremely unlikely.

The Sandia scenario assumes a large breach in an LNG ship caused by a deliberate attack, which punctures more than one cargo tank, with a 5m2 or larger hole, resulting in LNG on the water burning in a pool fire

- This scenario will not occur with a minor or even mid-size spill. The conditions required are very specific, and based on a major volume of LNG released to water in

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one big release (e.g. not a slow leak, which would allow the LNG to evaporate as it is exposed to air)

- The Sandia report itself acknowledges that a spill of the size required cannot occur through an accidental incident such as grounding or collision.
- The double hull design of LNG carriers is one key reason why it would be very difficult to achieve a large (5m2) hole in an LNG carrier. The cargo is well protected in an inner containment system, plus two outer steel hulls two metres apart. All of these would need to be pierced before any fuel could escape.

Security considerations

Australia is overall a low risk environment and a safe place to do business. Notwithstanding, Viva Energy takes the security of our facilities very seriously. We are ever-vigilant and periodically conduct comprehensive security risk assessments to ensure that the security measures in place remain adequate and appropriate to the external environment, our business and operational footprint.

When considering the chances of a successful planned attack (terrorism) on the proposed floating gas terminal or LNG ships in Corio Bay, it is important to remember some key facts:

- Across more than 50 significant ports in Australia, we have never experienced a major targeted terrorist attack;
- The availability and accessibility of armaments and explosives is highly regulated and very limited here;
- Multiple layers of mitigation and safeguards are in place, including Security measures as documented in the Marine Security Plan and regulated by the Federal Government;
- Viva Energy has ongoing active engagement with Federal Security agencies, who constantly monitor Australia's security and threat level;
- In relation to Maritime security, the official baseline threat level has not changed since its inception.

Frequently Asked Questions

Addressing claims of public safety risk: Are residents across Geelong at risk as claimed by some project opponents?

No. Analysis based on the Sandia report and modelling of actual local conditions shows that even in a major intentional adversarial attack (such as a terrorist event) leading to a major LNG incident, claims of public safety risk to Geelong residents in a 3km radius are not credible.

An accidental grounding or low-speed collision would not result in a tank breach or spill, and therefore would have no impacts on residents (supported by the Sandia report modelling).

The claims are based on extremely unlikely scenarios, and the dire consequences predicted are not credible. They are based around modelling in US Sandia report – however its findings have been inaccurately interpreted and selectively applied, and don't take actual local conditions into account. For example –

- The "hazard zones" shown are based on a successful adversarial attack on an LNG ship in Corio Bay (e.g. a major act of terrorism)–in itself a highly unlikely event.
- The possibility that a vapour cloud would form and move a significant distance into the community is not credible, nor are the extreme consequences put forward.
  - If a cold vapour cloud formed following a major spill, it would very likely ignite during the initial attack, or soon after (this is supported by Sandia modelling).
  - Local topography would prevent the migration of a vapour cloud inland.
- A "large shock wave" isn't credible - a blast wave/ overpressure can only happen if there is confinement, which doesn't exist in the local setting (for example, there are no high cliffs present).

Are North Shore residents at risk from an incident involving a passing LNG ship?

The LNG shipping transit lane passes within 250 metres of North Shore residents, at the closest point. Up to 45 LNG ships each year are expected to pass by, around one every 7-10 days. This is a small percentage of the total shipping traffic already passing through the shipping lane on a daily basis – carrying a range of cargoes including hydrocarbons. Around 1000 ships are expected to visit Geelong Port each year.

The chances of a major incident occurring as an LNG ship passes by the North Shore – a 25 minute window once in 7-10 days - are extremely low. But what would happen in the unlikely event that there was such an incident?

ACCIDENTAL SPILL:

According to the Sandia report, an accidental grounding or low-speed collision with the LNG ship would not result in a breach or spill, and therefore have no impacts on residents - even at the closest point to the North Shore.

Viva Energy conducted its own quantitative risk assessment (QRA) modelling covering an accidental unplanned release (parameters based on TNO guidelines), that shows that LNG ships in transit would not present an unacceptable risk to public safety.

A high-speed ship collision is not considered to be a plausible event given mitigations and safeguards that will be in place – including speed limits, tugboat escorts and other Port restrictions covering all vessels using Corio Bay.

Modelling shows no risk to residential areas of any credible accident occurring at sea.

DELIBERATE CARGO BREACH:

A catastrophic event involving a major spill from an LNG ship has an extremely remote likelihood of taking place. It would take a successful major adversarial attack (terrorism) to breach the steel double hulls of the LNG ship, and simultaneously breach three tanks to cause a major spill and fire.

The "worst case scenario" outcome of a major pool fire on the water would entail a series of events to take place, each one of which in itself is unlikely.

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Even in this scenario, an explosion or “large shock wave” would not eventuate - a blast wave / overpressure requires there to be confinement, which would not exist in this situation.

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