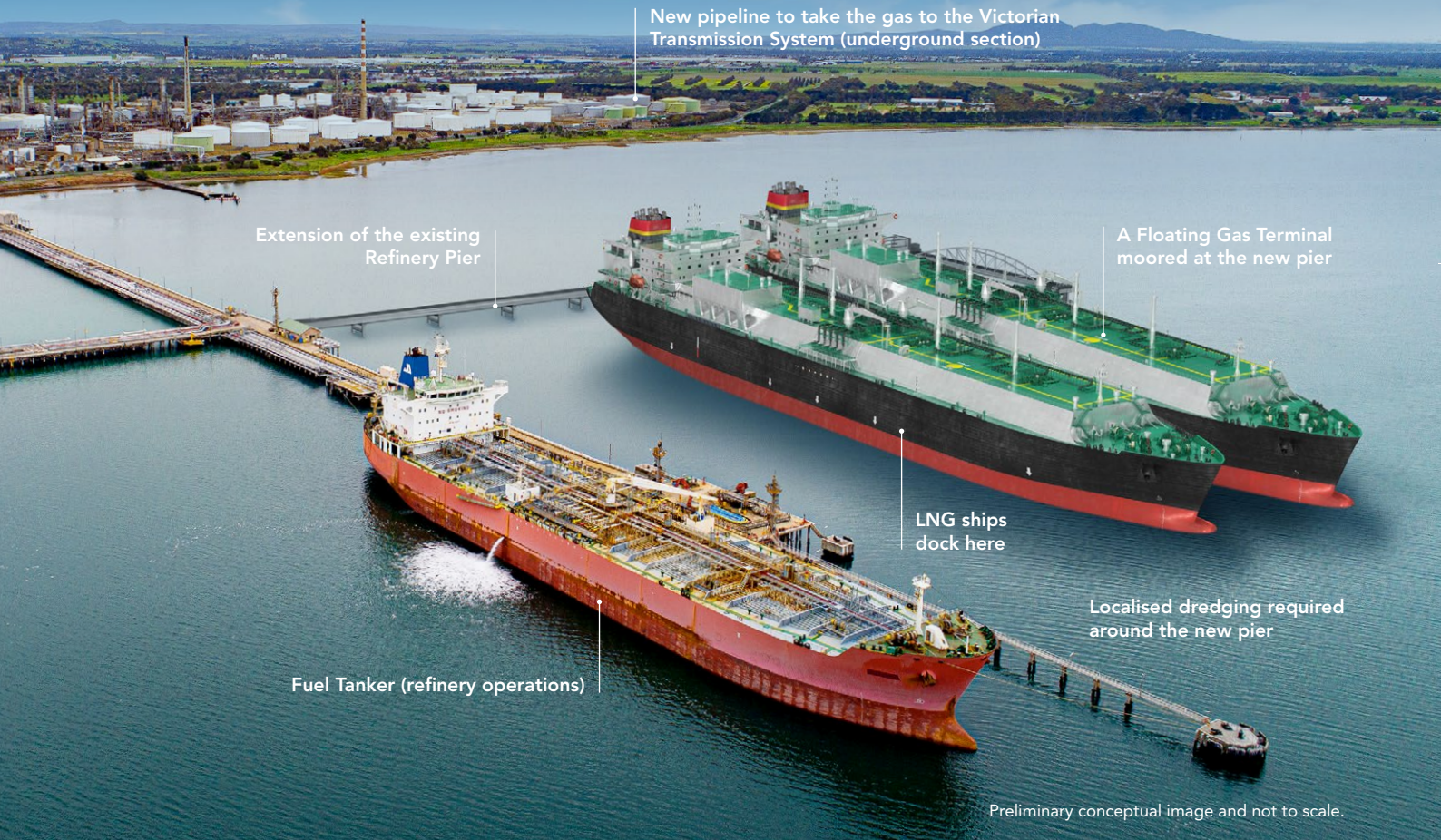




Fact Sheet

LNG Safety

Viva Energy Gas Terminal



Situated in Victoria's second largest port and at the Port of Geelong, the Geelong Refinery is uniquely placed to play a role in supporting the transition of Victoria's energy mix.

Viva Energy owns and operates the strategically located Geelong Refinery in Victoria, which provides around 700 skilled jobs and makes a significant contribution to Australia's fuel security and to the local Geelong community.

We are an experienced operator of Major Hazard Facilities including the Geelong Refinery, Newport Terminal and Lara LPG facility in Victoria. In addition, we own and operate licensed pipelines in Victoria, safely and efficiently delivering fuel to where it is needed.

Viva Energy's number one priority is safe operations and we have a long track record of responsible operations at the Geelong Refinery.

Energy Hub

Viva Energy has announced its vision to transform its Geelong Refinery into an Energy Hub to support the evolving energy needs of south-east Australia. As part of this vision, we are assessing a number of future energy development projects that could be co-located with the Geelong Refinery, diversifying and strengthening operations over time. These projects include a Gas Terminal, a solar energy farm, the potential for hydrogen and alternative fuels production and the development of strategic storage to help support Australia's fuel supply security.



Gas Terminal



Solar Energy Farm



Strategic Supply & Storage



Hydrogen & New Energies

Proposed Gas Terminal

At the centre of the Energy Hub would be the development of a new Gas Terminal to address the projected (AEMO GSOO 2020) gas supply shortages and underpin growing renewable generation. A Gas Terminal could help us to bring gas from where it is produced to where it is needed.

Development of a Gas Terminal would require an extension of the existing Refinery Pier, the mooring of a Floating Regasification and Storage Unit (FSRU) at the new berth, and construction of a new ~6.5km pipeline to take the gas from the facility to the existing gas transmission system.

FSRUs are approximately 290m–300m in length – which is slightly larger than the crude oil tankers that currently visit the Geelong Refinery.

A Gas Terminal also has ancillary infrastructure such as piping and marine loading arms, which are mounted to the jetty.

Detailed environmental and risk assessments would need to be conducted in line with the relevant approvals process and any Final Investment Decision (FID). Community engagement and consultation would be an important part of these processes.

Liquefied Natural Gas (LNG)

In its liquid form, LNG is odourless, colourless and is not flammable. LNG quickly vaporises when exposed to air and will quickly evaporate if released to water, dissipating into the atmosphere, leaving no residue.

LNG is mostly comprised of methane which has been cooled at very low temperatures (rather than pressurising it) enabling its safe and efficient transportation. The volume occupied by LNG as a liquid is about 600 times smaller compared with its volume occupied as a gas.

When LNG reaches its destination at the receiving terminal such as a FSRU, it is re-heated using seawater and converted back to gas and sent through pipelines for delivery to end users.

Gas already plays an important role in the energy market supporting industrial and domestic applications (such as household heating and cooking) and as flexible 'firming' capacity in the electricity market, to reliably meet demand at short notice during peak usage periods (summer and winter) and to provide firming capacity to support the growing amount of renewable energy generation.

LNG Properties



LNG is not carried under pressure and as a liquid cannot be ignited.



Natural gas is lighter than air and quickly dissipates into the atmosphere.



In the unlikely event of an uncontrolled release, LNG will revert to a gas as it warms up in the open air.



Natural gas and LNG are non-toxic.

Gas Terminal Operations

LNG has been safely produced and transported across the world since the 1960s. LNG receiving terminals currently operate worldwide in over 35 countries¹ and it has been demonstrated that these facilities are a safe and efficient means of supplying gas into local economies.

In developing a Gas Terminal, Viva Energy, as an experienced operator of major hazard facilities and industrial sites, would undertake all relevant assessments and approvals processes in conjunction with regulators including extending our existing strong safety culture to these operations.

As part of the approvals process for the project, a comprehensive hazard and risk analysis would be undertaken covering the FSRU operation as well as the visiting LNG carriers and jetty facilities, including landside offloading facilities, which would transfer natural gas to the pipeline located on shore.

The design, construction, installation and operation of the infrastructure required for a Gas Terminal would be carried out in accordance with all statutory requirements, including any licences required prior to operating.

In addition to various safety features, a comprehensive safety management system would be implemented in accordance with relevant regulations, standards and guidelines.

A detailed safety case would also be developed in accordance with the *Occupational Health and Safety Regulations 2017*, which would require separate approval from WorkSafe Victoria. For the

purposes of constructing the pipeline, a Safety Management Plan (SMP) would also be developed in accordance with the *Pipelines Regulations 2017*, which would require approval from Energy Safe Victoria (ESV). The detailed safety case and pipeline SMP would be informed by the detailed design of the project and would provide further detailed assessment of safety risks, emergency planning and management.

LNG Shipping Industry



There are over 600 LNG vessels operating worldwide.



The global LNG shipping industry has an excellent safety record since it began in the 1960s.



More than 100,000 voyages have been completed without a major incident or loss of cargo².

1. 2020 World LNG Report, International Gas Union.

2. The LNG industry, GIIGNL Annual Report 2020.

FSRU and LNG carrier design

Worldwide, there are over 30 FSRUs in operation and there are hundreds of LNG carriers transporting LNG from production facilities to demand centres³.

FSRUs and LNG carriers are built to very strict international design standards, including the International Maritime Organisation's *Code for International Construction and Equipment of Ships Carrying Liquefied Gases in Bulk* (IGC Code), which is regulated in Australia by the Australian Maritime Safety Authority (AMSA).

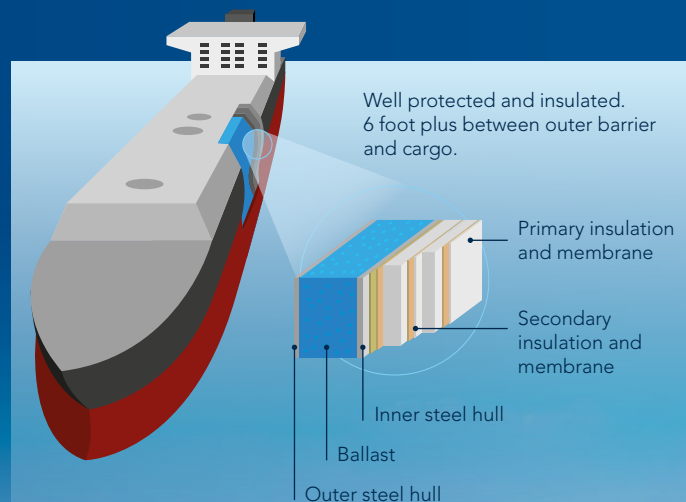
The management of potential hazards associated with the FSRU would require to be outlined in a Safety and Environment Management Plan.

FSRUs and LNG carriers are double-hulled tankers especially designed and constructed to maintain the very low temperature of LNG. These ships contain primary and secondary cargo containment systems that prevent leaks, and feature sophisticated equipment to enhance safe navigation.

Simulations and modelling of LNG vessel movements would also be undertaken in conjunction with the Victorian Regional Channels Authority, Victorian Ports Corporation (Melbourne) and pilotage providers.

The LNG is stored in a special containment system within the inner hull of the vessel. The design of this system enables the LNG to stay cold without the need for pressurisation.

3. LNG Information Paper #3 2019 Update LNG Ships, The International Group of Liquefied Natural Gas Importers.



Tanker safety construction requirements for LNG transport at sea.



LNG Carriers



A typical modern LNG ship, is approximately 300m long and 47m wide which is slightly larger than the crude oil ships currently visiting the Geelong Refinery.



LNG ships must comply with all relevant local and international regulatory requirements, including but not limited to those of the IMO, IGC which are regulated by AMSA.



All LNG ships have double hulls.

Did you know?

There are many global examples of LNG receiving terminals close to urban centres in Europe, North America and Asia – safely operating to meet their energy needs.



If you have any questions about the Project, please contact Viva Energy's Project Team

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