Low Carbon Methanol in Melbourne: Feasibility study

Port of Melbourne

A Memorandum of Understanding was signed in March 2023 between Port of Melbourne, Maersk, ANL (part of the CMA CGM Group), Svitzer, Stolthaven Terminals, HAMR Energy and ABEL Energy to explore the establishment of a low carbon methanol bunkering hub at the Port of Melbourne. The first phase of the feasibility study has been completed, finding that the port has the necessary infrastructure to receive and store low carbon methanol, with supplier production projects in the pipeline to meet potential demand. Moving forward, collaboration across industry and government will be crucial to address challenges and progress toward a reduced GHG emission fuel supply chain.

About Low Carbon Methanol

Low carbon methanol (LCM)[1] is a renewable, lower Greenhouse Gas (GHG) emissions alternative to traditional marine fuel, when produced using a sustainable biogenic source of carbon like waste biomass (bio-methanol) or atmospheric carbon dioxide, and hydrogen produced from renewable electricity from wind and solar (e-methanol).

LCM addresses the maritime industry's need to reduce both GHG and pollutant emissions, and to comply with increasingly stringent climate regulations.

Compared to conventional fuels, LCM can reduce lifecycle GHG emissions potentially by 60% to 90% or more in the best cases in the combustion phase, reduce nitrogen oxide (NOx) emissions by 60% to 80%, and eliminate sulphur oxide (SOx) and particulate matter emissions[2].

Methanol (CH_3OH) is already used as a chemical building block in thousands of everyday products, including plastics, paints, pharmaceuticals, cosmetics, and fuels. Liquid methanol is made from synthesis gas, a mix of hydrogen, carbon dioxide and carbon monoxide. These components can be sourced from a wide range of feedstocks using different technological approaches. To date, most methanol is produced from natural gas, resulting in GHG emissions during production and combustion when used as a fuel.

The advent of LCM from renewable energy sources makes it a promising alternative to fossil fuels in reducing the GHG footprint of hard-to-abate industries such as maritime transport. Methanol has long been transported as marine cargo, and it is already used as fuel by chemical carriers and new container ships. Therefore, the marine technology that enables the use of methanol as fuel is available and proven in an operational environment.

Low Carbon Methanol properties

Liquid at room temperature	Lower energy density	Sulphur/PM free	Biodegradable	Flammability	GHG emissions reduction
Unlike ammonia, hydrogen, ethane, LPG, and methane (natural gas), LCM does not need to be pressurised, compressed, or stored cryogenically.	LCM has a lower energy density than traditional Heavy Fuel Oil (HFO) – about 15.8 MJ/L, as compared to 38 MJ/L – more volume will have to be stored onboard for the same amount of stored energy.	LCM can have no sulphur oxides (SOx) and particulate matter (PM) emissions on combustion.	LCM can naturally dissolve in water and biodegrade quickly.	LCM has low flashpoint at 12°C.	LCM fuel can have significantly lower well-to-wake GHG emissions when produced from renewable sources.

Regulatory driver for maritime decarbonisation

International Maritime Organisation (IMO) targets to cut global maritime sector GHG emissions from 2008 levels:

20% by 2030 | **70% by 2040** | **Net-zero by or around 2050**

These goals are driving the industry toward cleaner alternatives to conventional fossil fuels. The IMO Net-Zero Framework, recently approved at the Marine Environment Protection Committee's 83rd session (MEPC 83) in April 2025, will set mandatory marine fuel standard and global GHG emissions pricing mechanism for shipping industry from 2027.

Low Carbon Methanol: A marine fuel with lower GHG emissions

LCM, when produced from renewable sources like biomass and renewable electricity, can offer a lower GHG emissions alternative to traditional marine fuels. In the best of cases, this fuel can reduce GHG emissions by up to 95%, positioning it as a key solution for meeting stringent industry decarbonisation targets.

Rising industry adoption of Low Carbon Methanol

LCM is gaining traction among major shipping companies, and the shipping industry has ordered almost 170 container vessels capable of sailing on methanol.

Maersk already operates nine methanol dual-fuel vessels with many more to come, while CMA CGM Group currently has 32 container vessels being built/on-order. Some conventional fuel vessels may also be retrofitted to methanol/dual fuel.

The industry has also seen successful pilot projects like the Maersk's vessel Laura Maersk's methanol bunkering in 2023. This shift signals a strong market opportunity for LCM bunkering at Port of Melbourne to support shipping routes in the region.

1 There is no current international consensus on the definition of 'low carbon methanol', although some national and corporate-led standards are emerging (BNEF, 2014). LCM is generally considered methanol that is derived from renewable feedstock including sustainable biomass, biogenic or recycle carbon dioxide and hydrogen. LCM's carbon content (gCO2eq/MJ) needs to target compliance with IMO marine fuel standard or EU Renewable Energy Directive (RED II) reduction threshold regulations (at least 70% lower emissions than fossil fuels) and to be certified by recognised international certification schemes such as ISCC or equivalent.

2 Methanol Institute - https://www.methanol.org/renewable/

PHASE 1 feasibility study findings and next steps

Port of Melbourne

The outcomes of the first phase of the feasibility study confirmed some of the technical and operational needs to develop a low carbon methanol supply chain at the Port of Melbourne. The next phases of the feasibility study will advance technical and commercial assessments, prioritising collaboration to develop operational, commercial and safety guidelines for low carbon methanol.

Supply and demand

Potential supply and demand for LCM depends on a wide range of factors but is emerging at a scale that could support a LCM supply chain in Melbourne.

Robust supply potential

LCM producers are strategically located near the Port of Melbourne, with ABEL energy in Bell Bay, Tasmania, and HAMR Energy in Portland, Victoria. Production projects are at various stages with the first supply (around 500,000 tonnes) anticipated to be available in 2029. These projects have the potential to support a supply chain that can transport LCM as fuel to Port of Melbourne for bunkering of commercial vessels.

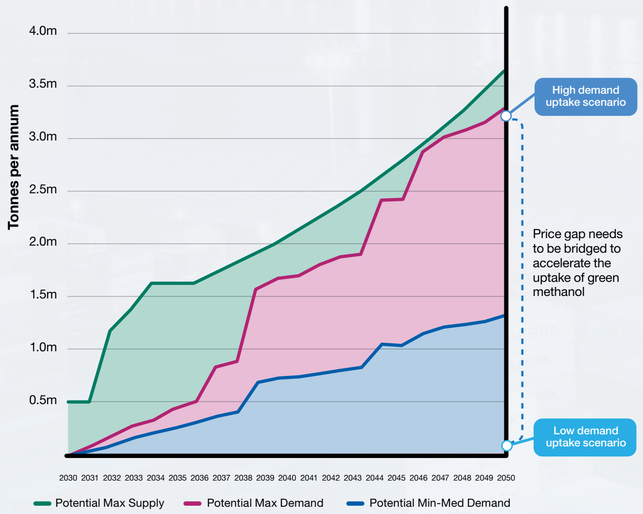
A key success factor for LCM at Port of Melbourne will be the ability to produce LCM at a global competitive market price as well as capability of storage and efficient bunkering procedures.

Growing demand

The demand for LCM as a marine fuel is anticipated to grow. To enable a low carbon fuel supply chain between Australia and the world, vessel deployment plans will depend heavily on the availability of fuel and bunkering capabilities. These are crucial to achieving the IMO 2050 emission reduction ambition.

Scenarios for long term LCM vessel deployment and bunkering demand in Melbourne are varied and highly dependent on establishing a reliable, efficient and competitive LCM supply chain.

Port of Melbourne LCM potential supply and demand usage forecast*



*Supply & demand scenarios are highly dependent on variables such as LCM's commercial competitiveness against other alternatives, technical and operational feasibility, policy and regulations.

Source: Potential cumulative Supply and Demand forecast derived from combined research of future project pipeline and vessel order books data from various sources (IRENA, POM Future Fleet Forecast, Alphaliner, DNV). Note: Project pipeline as of November 2024. Demand from shipping sector assumes all ordered methanol dual-fueled vessels call Melbourne use LCM.

Further investigation is required to refine demand models in various scenarios.

Transport and infrastructure

Transporting LCM from production sites to storage infrastructure is similar to well-established fuel and chemical supply chains.

Transport

The global methanol industry currently uses chemical carriers with capacities of up to 50,000 tonnes to ship methanol from production sites to customers. For example, at Port Taranaki in New Zealand, Canadian company Methanex ships over one million tonnes per year of methanol produced locally from natural gas to customers in Asia. ABEL Energy has its own deep-water terminal at Bell Bay for maritime dispatch of methanol, and HAMR Energy has both port, road and rail transport options under consideration for the Port of Melbourne.

Port of Melbourne infrastructure readiness

The feasibility study determined that Port of Melbourne has existing appropriate infrastructure and pipelines to receive and store LCM with potential to expand further to meet growing fuel demand.

Future storage expansion

To support projected demand through 2050 and beyond, there will be a need to understand whether, and, if so when, additional storage infrastructure may be necessary and whether any expansion of current liquids precincts at the port may be necessary. If so, Port of Melbourne may be able to identify additional sites to support future storage of LCM and other renewable fuels to support decarbonisation of the port freight supply chain and seek to negotiate commercial tenancies with operators wishing to provide this service.

Bunkering process

Operational requirements to supply LCM to vessels at the Port of Melbourne would require new approaches compared to current bunkering processes.

Current bunkering at Port of Melbourne

Bunkering services are currently limited to a single vessel, the barge ICS Allegiance operated by Viva, which supplies traditional marine fuel primarily to Bass Strait ferries, CSL cement ships, and trans-Tasman trade vessels. Bunkering generally occurs at anchor and occasionally at berth, but never concurrently with cargo operations.

LCM bunkering

LCM bunkering remains a new practice, trialled in only a few ports worldwide. A range of bunkering methods were explored through the feasibility study.

Due to the lower energy density than HFO and the time needed for bunkering LCM volumes, simultaneous cargo operations and ship-to-ship bunkering at berth (SIMOPS) are essential for shipping lines to accept bunkering.

This would allow refueling without interrupting cargo handling and aligning with shipping lines' efficiency goals and scheduling requirements.

Alternative methods, like truck-to-ship, are impractical due to excessive refueling times, while terminal pipe-to-ship is not feasible due to infrastructure constraints.

PHASE 1 feasibility study findings and next steps

During the next phases MOU participants will evaluate viable commercial operating models and build a business case for low carbon methanol producers and storage and cartage providers, setting the stage for a potential pilot demonstration project. Collaboration with industry and government will be essential to address challenges and leverage local renewable fuel production opportunities to support decarbonisation of the maritime supply chain.

Commercial viability and next steps

A key challenge for all alternative fuel pathways is the capital investment required to establish the necessary infrastructure, and the operating cost for lower GHG emissions fuels which can be significantly more expensive than traditional HFO.

Commercial model and market competitiveness

Establishing a competitive commercial model will require insights into projected costs, pricing strategies, and service standards that can position Melbourne as a preferred bunkering hub. Collaboration with industry stakeholders will be key to setting attractive and sustainable pricing that meets market demands. The next phase will assess the strategic and financial viability of various operational approaches to establish a foundation for long-term success.

Operating model and SIMOPS

Drawing on global efforts and international trials such as the Singapore MPA new Methanol Bunkering Standards (released in March 2025), this next step will require broader collaboration with regulatory authorities and stevedores to further explore SIMOPS bunkering. Commercial and operational analysis of the limitations of at-anchorage bunkering will also be necessary.

Comprehensive risk assessment

A thorough risk assessment will encompass financial, operational, resourcing & training, regulatory, and environmental considerations, identifying potential challenges and mitigation strategies to ensure safe and sustainable operations.

Collaboration with authorities and government

The next phase of work will clarify areas of potential engagement and collaboration with operational authorities, government and industry to explore the operational, regulatory and commercial considerations to enable a viable and competitive LCM supply chain in Melbourne.

International collaboration

Continued collaboration with industry stakeholders will be essential to address challenges, facilitate knowledge sharing, and promote best practices in LCM bunkering. Further opportunities will also be explored for international collaboration and the potential establishment of shipping corridors, supporting joint supply chain logistics, safety training, and bunkering standards for low and zero-emission fuels.

About the participants

Port of Melbourne

"As Australia's largest container port and the trade gateway of Southeastern Australia, Port of Melbourne is well-positioned to work with port users, alternative fuel producers and service providers, and the government to progress the decarbonisation of the maritime industry."

Port of Melbourne CEO
Saul Cannon

ANL

"Alternative energies are key to the reduction of carbon emissions throughout the supply chain. Low carbon methanol presents another excellent opportunity for the shipping industry to decarbonise and we are supportive of the robust exploration of a bunkering hub such as this."

ANL Managing Director
Shane Walden

Maersk

"Maersk is striving to achieve net-zero house gas emissions by 2040, and we proudly operate nine dual-fuel vessels capable of running on methanol. The main challenge for the industry is to make lower emissions fuels a viable and competitive choice. As an island nation heavily reliant on ocean transport, Australia has the potential to lead the transition away from fossil fuels. Partnering with the Port of Melbourne to explore establishing a methanol bunkering hub could help drive this change."

HAMR Energy

"HAMR Energy is developing a world-class lower emissions methanol facility in Portland, Victoria to accelerate shipping industry decarbonisation which will rely entirely on natural and renewable resources available in Australia."

HAMR Energy Director
and Company Secretary
David Stribley

ABEL Energy

"ABEL Energy's first Australian hydrogen and methanol project will be built at the port of Bell Bay, using Tasmania's renewable hydro and wind-based power supply, and sustainable forestry residues."

ABEL Energy CEO
Simon Talbot

Stolthaven

"Stolthaven Terminals is pleased to support this project – as well as many others worldwide – that enable the transition to er energy alternatives. The scope of activities involved under this MoU will evolve as the collaboration progresses and the parties develop a clearer understanding of how our respective expertise can be combined on this potential project."

Stolthaven Terminals
General Manager
Ben Serong

Svitzer

"Svitzer recently signed a contract to build the world's first battery electric methanol hybrid tug. It is only by partnering with other port stakeholders that we can develop the infrastructure to support these innovative technologies, and Svitzer welcomes this MOU as an important step in the drive for er solutions in Australia."

Svitzer Australia Chief
Operating Officer
David Phillips