

Submission:

Low Carbon Liquid Fuels-A Future Made in Australia: Unlocking Australia's low carbon liquid fuel opportunity

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Introduction

The Australian Maritime College (AMC) is the national institute for maritime training, education, research and consultancy. As a specialist institute of the University of Tasmania, AMC offers courses in the following study areas of critical importance to maritime sectors:

- Maritime Engineering and Hydrodynamics
- Maritime Business and International Logistics
- Ocean Seafaring
- Coastal Seafaring.

Courses are offered across all levels, including vocational certificates, diplomas, undergraduate and postgraduate degree programs, and higher degrees by research.

AMC is one of the seven founding members of the International Association of Maritime Universities (IAMU), which now has 70 members across five continents. We have established strong branding as a world leader in maritime research, education and training and our alumni work in more than 60 countries around the world.

AMC is a centre of excellence for maritime and marine research. We have a unique position as Australia's national maritime centre with the most advanced maritime research facilities in the southern hemisphere. This creates an exceptional environment for facilitating research in diverse areas such as maritime renewable energy, sustainable ports, shipping and supply chains, naval architecture, offshore engineering, human centred design, and underwater robotics.

AMC has actively involved in research projects in relation to decarbonisation including maritime alternative fuels, ports and hydrogen supply chain, hydrogen powering vessels, Australian offshore wind supply chains, and port decarbonisation.

The low carbon liquid fuels (LCLF) are considered as one of the alternative fuel sources for net zero transformation and have been identified by the Australian Government as one of the initiatives in the Future Made in Australia agenda. LCLFs can be applied to different sectors, for example aviation and maritime.

As the national maritime institute, AMC welcomes the opportunity to provide feedback on the consultation paper, including consideration of domestic maritime sector as a potential demand for LCLFs market, emissions and sustainability criteria for fuels to receive support under a production incentive program, and the design of demand side mechanisms.

Domestic maritime sector should be included as a potential demand for LCLFs

The consultation paper primarily focuses on the aviation applications of low carbon liquid fuels (LCLF), including renewable diesel and Sustainable Aviation Fuel (SAF). However, it does not address the maritime industry's application of LCLF. The maritime sector is a hard-to-abate sector with significant energy consumption, and emissions. Hence, there is a potential for the use of LCLFs in Australia's domestic maritime sector.

- "Hard-to-Abate" Sector: Like aviation, the maritime industry is also a "hard-to-abate" sector. To meet Australia's 2050 net-zero target, it is crucial to highlight the maritime industry's energy transition, including the use of LCLFs.
- Significant Emissions: According to the "Australian Infrastructure and Transport Statistics Yearbook 2023 [1]," in the 2022-23 fiscal year, greenhouse gas emissions from the Australian domestic maritime sector were 2.269 million tonnes of CO₂ equivalent. This is about one-third of the emissions from the domestic aviation sector, which were 9.431 million tonnes of CO₂ equivalent. The emissions from the domestic maritime sector cannot be ignored.
- Energy Consumption: In the 2022-23 fiscal year, the domestic maritime sector consumed 30.8 petajoules of energy, compared to 134.5 petajoules consumed by the domestic aviation sector[1]. This indicates that the maritime sector could also be a significant consumer of LCLFs.

Emissions and sustainability criteria for fuels to receive support under a production incentive program

Emissions reduction threshold

We support including an emission reduction threshold as part of the eligibility criteria for fuels to receive support. To evaluate the emission reduction potential, it is crucial to clearly define whether it is based on a lifecycle "well-to-wake (WtW)" emission reduction indicator or a "well-to-tank (WtT)" indicator.

If we consider "well-to-tank (WtT)," some renewable diesel fuels can achieve negative emissions. For example, according to Zhou, *et al.* [2], Used cooking oil (UCO) based Fatty Acid Methyl Ester (FAME) has a WtT emission of -55 g CO₂-eq/MJ, while tallow FAME has a WtT emission of -52 g CO₂-eq/MJ. However, these WtT emission reductions will be offset by the "Tank-to-Wake (TtW)" emissions, which are around 65.1 g CO₂-eq/MJ, whether it is FAME or conventional diesel [3]. For comparison, the WtT emissions of conventional diesel are approximately 16 g CO₂-eq/MJ [3].

Considering this, the WtT emission reduction threshold for LCLFs should be significant. In our view, to achieve meaningful emission reductions from a lifecycle "well-to-wake (WtW)"

perspective, the WtT emission reduction threshold should be at least a 200 percent relative to conventional fuels.

In addition to including emission reduction threshold as part of the eligibility criteria for LCLF production incentive, carbon intensity of LCLFs can be another criterion to be considered by the Government.

Increase threshold over time

We believe that the emission reduction threshold should increase over time to align with the national decarbonisation trajectory, emissions on track to reach 42% below 2005 levels by 2030. For example, the emission reduction threshold could be set at:

- At least 100% by 2030
- At least 150% by 2040
- At least 200% or more by 2050.

Including incentives to encourage emissions reduction in addition to a minimum eligibility threshold

Incentives should be included to encourage emissions reductions beyond just meeting a minimum eligibility threshold. These incentives should target both fuel producers and consumers to foster a broader adoption of LCLF.

The relative cost of LCLF is significantly higher compared to conventional fuels, which can be a barrier to widespread use. By providing incentives, we can make LCLFs more economically attractive and accessible. Incentives could include tax credits, subsidies, or rebates for producers who develop and supply LCLFs, and for consumers who choose to use these cleaner fuels. This dual approach will help accelerate the transition to sustainable energy sources, support the growth of the LCLF market, and contribute to achieving national emissions reduction targets.

Sustainability criteria under consideration as part of the criteria

We suggest that the following additional or alternative criteria should be included to ensure a comprehensive and effective sustainability framework:

- **Land Use and Biodiversity:** It is essential to consider land use and biodiversity to protect natural ecosystems. This includes avoiding deforestation and the conversion of high-carbon stock lands, which are critical for maintaining biodiversity and sequestering carbon.
- **Energy Efficiency:** An important additional criterion is the evaluation of overall energy efficiency in the fuel production process, from cultivation to end use. This ensures that the production and utilisation of fuels are optimised for minimal energy consumption and maximum efficiency.

- **Comprehensive Lifecycle Assessment (LCA):** A thorough LCA should be conducted, encompassing all stages from production to disposal. This provides a holistic view of environmental impacts, ensuring that all aspects of the fuel's lifecycle are considered, and identifying areas where improvements can be made to reduce the overall environmental footprint.

By incorporating these criteria, we can ensure that the sustainability framework for LCLFs is robust and addresses the critical aspects of environmental protection, resource efficiency, and comprehensive impact assessment.

Other views on emissions and sustainability criteria

We believe that technological innovation should be included as a criterion to promote continuous improvement and the adoption of advanced technologies that enhance sustainability. This would encourage the development and integration of innovative solutions throughout the fuel production and utilisation processes. Specific areas to consider include:

- **Advanced Feedstock Processing:** Utilising non-food biomass, agricultural residues, and waste products as feedstocks can improve sustainability by reducing competition with food crops and minimising waste.
- **Enhanced Conversion Technologies:** Developing more efficient conversion technologies, such as improved catalysis, advanced biochemical processes, and thermochemical methods, can increase the efficiency of fuel production and reduce environmental impacts.
- **AI and Digital Technologies:** Implementing AI and other digital technologies can optimise various stages of the production process, from feedstock cultivation to fuel distribution, leading to higher efficiency and lower emissions.

By incorporating technological innovation as a criterion, we can ensure that the industry continues to evolve and adopt cutting-edge technologies that drive sustainability and efficiency improvements across the entire lifecycle of LCLF.

Community benefits associated with LCLF production in Australia

The production of LCLF in Australia offers numerous benefits to local communities:

- **Economic Benefits:**
 - **Additional Revenue for Farmers:** Farmers can benefit from new revenue streams by growing biofuel feedstocks or supplying agricultural residues and waste products for biofuel production.
 - **Job Creation:** The establishment and operation of biofuel production facilities can create jobs across various sectors, including agriculture, manufacturing, research, and logistics. This job creation is particularly beneficial in rural and regional areas, supporting local economies and reducing unemployment.
- **Environmental Benefits:**

- Effective Waste Management: Utilising agricultural, forestry, and municipal waste for biofuel production helps manage waste more effectively, reducing landfill usage and associated environmental impacts.
- Enhanced Energy Security: LCLFs contribute to a more diversified and resilient energy mix, reducing dependence on imported fuels and enhancing national energy security.
- Technological and Research Benefits:
 - Innovation and R&D: Investment in LCLF production drives technological innovation and research and development (R&D), which can lead to the creation of new technologies and processes. These advancements can benefit other industries and promote a culture of innovation within the community.

By supporting LCLF production, Australia can foster economic growth, environmental sustainability, and technological advancement, providing widespread benefits to communities across the nation.

Views on the design of demand-side mechanisms

Regulations

Regarding the maritime sector, the government could consider setting regulations that outline a phased approach to emissions reduction.

EU has set the FuelEU Maritime Regulation [4]. The targets will ensure that the greenhouse gas intensity of fuels used in the sector will gradually decrease over time, starting with a 2% decrease by 2025 and reaching up to an 80% reduction by 2050. Those targets will become more ambitious over time to stimulate and reflect the necessary developments in technology and the uptake in production of renewable and low-carbon fuels. The targets cover not only CO₂ but also methane and nitrous oxide emissions over the full lifecycle of the fuels used onboard, on a Well-to-Wake (WtW) basis. The Regulation also introduces additional zero-emission requirements for ships at berth, mandating the use of on-shore power supply (OPS) or alternative zero-emission technologies in ports, by passenger ships and containerships, with a view to mitigating air pollution emissions in ports, which are often close to densely populated areas.

The EU's approach serves as a valuable reference for Australia, providing a structured framework to progressively reduce emissions in the maritime sector while promoting technological innovation and sustainability. As the Shipping industry is a global enterprise consistency with other national and international approaches will assist industry transition, reduce costs and support national manufacturing to meet industry demand.

Demand-signals that would best drive confidence and certainty for a domestic LCLF production industry

A clear and structured emission reduction timeline would provide a robust signal to drive confidence and certainty for the domestic production of low carbon liquid fuels (LCLF). Such a timeline could include:

- **Emission Reduction Targets:** Establishing specific and measurable targets for reducing greenhouse gas emissions associated with fuel production and consumption. These targets should be ambitious yet achievable, with milestones set over defined periods.
- **Regulatory Framework:** Implementing a regulatory framework that supports the gradual adoption of LCLF, incorporating standards and incentives to encourage the production, distribution, and use of these fuels.
- **Investment Incentives:** Providing financial incentives and support mechanisms for companies investing in LCLF production infrastructure and technologies.
- **Long-Term Commitment:** Demonstrating a long-term commitment to sustainability and energy transition policies, ensuring stability and predictability for businesses planning long-term investments in LCLF production.
- **Market Assurance:** Guaranteeing market demand through mechanisms such as mandates, standards, or trading schemes that create a market for LCLF and ensure a level playing field for producers.

By implementing these demand signals, the government can foster a robust domestic LCLF production and application industry.

Impact of the application of a mandate on business/operations

As a university, the application of a mandate would significantly influence our research and innovation efforts aimed at accelerating the decarbonisation of the maritime sector.

- **Research Focus:** We would prioritise research initiatives that align with the requirements and goals set by the mandate. This includes advancing technologies for LCLF, emissions reduction strategies, fuel supply chains, and sustainable maritime practises.
- **Collaborative Opportunities:** The mandate would likely foster collaborations with industry stakeholders, government agencies, and international partners to address the challenges and opportunities associated with meeting regulatory requirements.
- **Educational Programs:** We would enhance our educational programs to include curriculum components related to maritime decarbonisation, ensuring our students are prepared with the knowledge and skills needed for a sustainable future.
- **Technological Innovation:** The mandate would spur innovation within our institution, encouraging the development of new technologies and solutions that contribute to reducing emissions and improving environmental performance in the maritime sector.

- **Policy and Advocacy:** We would engage in policy discussions and advocacy efforts to support the effective implementation of the mandate, contributing our expertise to shaping regulations and initiatives that promote sustainable maritime practises.

Overall, the application of a mandate would serve as a catalyst for our university to expand its role in advancing sustainability in the maritime sector.

Sectors to apply for demand-side interventions

As discussed in the introduction section, the domestic maritime sector should be considered. Others such as heavy-duty transport vehicles, and export could be considered if scaling up production of LCLFs.

Design of a mandate, low carbon fuel standard, target or other demand option that creates requirements for a certain proportion of fuel use be drawn from Australian produced LCLF

By incorporating requirements for a certain proportion of fuel use from Australian produced LCLF, the government can leverage these benefits to advance energy security, economic prosperity, environmental sustainability, technological innovation, and policy stability.

The impact of introducing demand side measures on the feasibility of domestic production of LCLFs, and the appropriate design of any production support

The introduction of demand-side measures would significantly impact the feasibility of domestic production of LCLFs and influence the design of production support measures:

- **Feasibility of Domestic Production:**
 - **Market Stability:** Demand-side measures, such as mandates or standards, create a stable and predictable market for LCLFs. This stability reduces investment risks and encourages producers to invest in domestic production infrastructure.
 - **Economic Viability:** Increased demand incentivises scale-up and efficiency improvements in LCLF production, potentially driving down costs over time. This makes domestic production more economically viable and competitive against traditional fuels.
 - **Technological Advancement:** Demand signals spur innovation in LCLF production technologies, leading to advancements that improve efficiency, reduce emissions, and enhance product quality.
- **Impact on Production Support Design:**
 - **Targeted Incentives:** Production support measures should be designed to complement demand-side measures by targeting specific barriers to domestic LCLF production. This could include financial incentives for initial capital investment, research and development grants for technology innovation, and subsidies to offset higher production costs.

- Regulatory Alignment: Support measures should align with regulatory frameworks like emissions reduction targets or fuel standards to ensure coherence and effectiveness. This alignment provides clarity and encourages long-term investment in sustainable fuel production.
- Flexibility and Adaptability: The design of production support should be flexible to accommodate evolving market conditions and technological advancements. It should allow for adjustments based on feedback from industry stakeholders and changing environmental policies.

Summary

AMC supports the intent of the LCLF Made in Australia draft Paper and suggests including the maritime sector from demand side to develop LCLFs. Clear and targeted supply and consumption mechanisms aligned with major international trends and policies would enhance industry take up, reduce potential costs and support local enterprise to give Australia the best opportunity to meet its emission targets. Furthermore, it would create an opportunity for Australian product to support the global maritime sector while also enhancing our national fuel security.

References

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