

# Transport and Infrastructure Net Zero Consultation Roadmap

## Take the survey

Department of Climate Change, Energy, Environment and Water

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1 Confirm that you have read and understand this privacy notice.

Yes

2 Please indicate how and if you want your submission published.

Public

3 Published name

Bioenergy Australia

4 Confirm that you have read and understand this declaration.

Yes

5 First name

Georgi

6 Last name

York

7 Email

[REDACTED]

8 Phone



9 Who are you answering on behalf of?

Organisation

10 Organisation name

Bioenergy Australia

11 What best describes you or your organisation?

Not for profit

12 What sector do you represent?

Maritime

Rail

Heavy road vehicles (trucks, buses etc.)

Public transport

Climate change/net zero

Energy

13 What state or territory do you live in?

New South Wales

14 Postcode

2113

15 What area best describes where you live?

City

16 1. Do you support the proposed guiding principles?

Not answered

17 1.1 Please add details to your response.

Not answered

- 18** 2. Do you support the use of the avoid-shift-improve framework as a tool to identify opportunities for abatement?  
Not answered
- 19** 2.1 Please add details to your response.  
Not answered
- 20** 3. Do you agree the development of a national policy framework for active and public transport will support emissions reduction?  
Not answered
- 21** 3.1 Please add details to your response.  
Not answered
- 22** 4. What should be included in a national policy framework for active and public transport and how should it be developed?  
Not answered
- 23** 5. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure the movement of people contributes to transport emissions reduction?  
Not answered
- 24** 6.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure that the movement of goods contributes to transport emissions reduction?  
Not answered
- 25** 6.2. How would these actions address the identified challenges and opportunities for emissions reduction in the movement of goods?  
Not answered

- 26 7. Do you agree with the proposed net zero pathway for light road vehicles?  
Not answered
- 27 7.1 Please add details to your response.  
Not answered
- 28 8. The Australian Government is currently developing an Australian New Vehicle Efficiency Standard and has already begun to implement actions in the National Electric Vehicle Strategy.8.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce light vehicle emissions?  
Not answered
- 29 8.2 How would these actions address the identified challenges and opportunities to reduce light vehicle emissions?  
Not answered
- 30 9. Do you agree with the proposed net zero pathway for heavy road vehicles?  
Not answered
- 31 9.1 Please add details to your response  
Not answered
- 32 10. The proposed pathway for heavy road vehicles relies on a mix of battery electric, hydrogen fuel-cell and low carbon liquid fuels.Rank from 1 to 3, the order in which these should be prioritised for emissions reduction.  
Not answered
- 33 10.1 Please add details to your response. Why did you rank them in that

order?

Not answered

**34** 11. What role should low carbon liquid fuels play in the heavy vehicle decarbonisation?

Not answered

**35** 12. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce heavy vehicle emissions?

Not answered

**36** 13. Do you agree with the proposed net zero pathway for rail?

Not answered

**37** 13.1 Please add details to your response.

Not answered

**38** 14. The proposed pathway for rail relies on a mix of battery electric, hydrogen fuel-cell and low carbon liquid fuels. Rank from 1 to 3, the order in which these should be prioritised for emissions reduction.

Not answered

**39** 14.1 Please add details to your response. Why did you rank them in that order?

Not answered

**40** 15. What role should low carbon liquid fuels play in rail decarbonisation?

Not answered

**41** 16. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to

reduce rail emissions?

Not answered

42 16.1 How would these actions address the identified challenges and opportunities to reduce rail emissions?

Not answered

43 17. Do you agree with the proposed net zero pathway for maritime?

Not answered

44 17.1 Please add details to your response.

Not answered

45 18. The Australian Government is engaging in consultation as part of the development of the Maritime Emissions Reduction National Action Plan and those consultations will also inform the final Roadmap and Action Plan. 18.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce maritime emissions?

Not answered

46 18.2 How would these actions address the identified challenges and opportunities to reduce maritime emissions?

Not answered

47 19. Do you agree with the proposed net zero pathway for aviation?

Not answered

48 19.1 Please add details to your response.

Not answered

49 20. The Australian Government has already engaged in consultation on aviation decarbonisation through the development of the Aviation

White Paper and those consultations will also inform final Roadmap and Action Plan.

Not answered

- 50 20.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce aviation emissions?

Not answered

- 51 21. Do you agree with the proposed net zero pathway for transport infrastructure?

Not answered

- 52 21.1 Please add details to your response.

Not answered

- 53 22. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce transport infrastructure emissions and ensure that transport infrastructure is ready for and enables low-emission transport modes?

Not answered

- 54 22.1 How would these actions address the identified challenges and opportunities to reduce transport infrastructure emissions?

Not answered

- 55 23. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure the energy mix is ready to support transport emissions reduction?

Not answered

- 56 24. How should the use of low carbon liquid fuels (LCLFs) be prioritised

across different transport modes over time to achieve maximum abatement?

Not answered

- 57 25. What are the best ways for the Australian Government to work collaboratively with industry, business, governments and communities to implement the proposed pathways?

Not answered

- 58 25.1 What are good domestic or international examples of partnership and collaboration on transport and transport infrastructure emissions reduction that could inform the final Roadmap and Action Plan?

Not answered

- 59 25.2 What opportunities can Government leverage to show leadership in Australia and internationally?

Not answered

- 60 26. What measures and metrics should be used to evaluate the final Transport and Infrastructure Net Zero Roadmap and Action Plan?

Not answered

- 61 26.1 What other data and evidence could governments use and how could this offer further insights on the pace, scale and location of transport emissions reduction pathways?

Not answered

- 62 27. Do you have any feedback on the proposed review process?

Not answered

- 63 28. Do you have any further feedback on the Consultation Roadmap and proposed pathways?

Not answered

- 64 28.1 Is there anything missing? Are the sections appropriately integrated? Is the Roadmap appropriately ambitious?  
Not answered
- 65 29. Is there any further information or documentation that you wish to be considered with your submission?  
Not answered
- 66 Would you like to upload a document?  
Yes
- 67 Have you removed any identifying information from your submission?  
Yes
- 68 Upload a submission  
Bioenergy\_Australia\_Submission\_Transport\_and\_Infrastructure\_Net\_Zero\_Consultation\_Roadmap.21966539\_Redacted.pdf
- 69 Upload a submission  
Not answered
- 70 Upload supporting file  
Not answered
- 71 Upload supporting file  
Not answered

## Bioenergy Australia Submission – Transport and Infrastructure Net Zero Roadmap and Action Plan

Bioenergy Australia (BA) is the national industry association committed to accelerating Australia’s bio economy. Our mission is to foster the bioenergy sector to generate jobs, secure investment, maximise the value of local resources, minimise waste and environmental impact, and develop and promote national bioenergy expertise into international markets.

*This submission from Bioenergy Australia is on behalf of the Renewable Gas Alliance (RGA), Sustainable Aviation Fuel Alliance of Australia and New Zealand (SAFAANZ) and the Cleaner Fuels Alliance (CFA). These alliances were founded to accelerate the development and deployment of Low Carbon Liquid Fuels (LCLFs) including sustainable aviation fuel (SAF), renewable diesel, biodiesel, and ethanol fuels and biomethane in Australia. Individual members of the alliances will be providing more detailed submissions specific to their business and expertise.*

Australia’s Bioenergy Roadmap (ARENA, November 2021) outlines how, by the start of the next decade, Australia’s bioenergy sector could contribute to around \$10 billion in extra GDP per annum and 26,200 new jobs (predominately regional), reduce emissions by about 9 per cent, divert an extra 6 per cent of waste from landfill, and enhance fuel security. Now is the time to capitalise on these opportunities by prioritising LCLFs within the **Transport and Infrastructure Net Zero Roadmap and Action Plan**.

We thank the Department for the opportunity to provide feedback to the **Transport and Infrastructure Net Zero Roadmap and Action Plan**. We welcome the Department’s commitment to developing a decarbonisation plan that will support Australia’s transport sector in its clean energy transformation as we strive to meet our net zero targets. The development of this plan comes at a pivotal time where Australia is ready to support and accelerate key renewable decarbonisation opportunities.

We support the Department’s approach to the development of this plan, which not only provides a clear and comprehensive strategy for reducing transport emissions but also identifies key pathways and technologies that leverage Australia’s unique LCLF position. We commend the Department’s recognition and acknowledgment of the essential role LCLFs will play in decarbonising Australia’s transport sector.

The development and deployment of the following LCLFs are a key opportunity for decarbonising existing transport technologies and infrastructure:

- Sustainable Aviation Fuel (SAF) (aviation)
- Renewable Diesel (heavy haulage, rail, construction, mining, agriculture)
- Biodiesel (heavy transport, marine, construction, agriculture)
- Biomethanol (Marine and heavy transport)

- Ethanol (Road and pathway for aviation)
- Renewable Very Low Sulphur Fuel Oil (VLSFO) (Marine)
- Biogas/biomethane - Gas-to-liquid (GTL) fuel conversion and e-fuels (SAF, renewable diesel)

These LCLFs can act as drop-in or blended fossil fuel replacements without the need for significant upgrading/changes to existing vehicles, engines, infrastructure or equipment. They have much lower carbon intensity as they derive from existing atmospheric carbon rather than from petroleum, meaning they contribute greatly to decarbonisation when used as replacements for traditional fuels. They offer the following transport decarbonisation benefits:

- Renewable diesel offers an excellent, tested and readily available alternative to mineral diesel for heavy trucks, with as much as a 75-95% reduction in life cycle emissions compared with mineral diesel.<sup>1</sup> It can be used as a 100% drop-in replacement for diesel-reliant technologies. Additional benefits include improvements to air quality compared with mineral diesel by reducing pollutants. The technology developed to produce renewable diesel can also be used to produce other renewable products such as SAF, a product that has been recognised as a main lever to reduce emissions in the aviation sector.<sup>2</sup> It is proven technology with an established market, with global transport renewable liquid fuel capacity expanding by 7% in 2022, driven mainly by growth in renewable diesel, thanks to attractive policies in the United States and Europe.<sup>3</sup> Renewable diesel has been used in Australia with over 162,000L of renewable diesel used by Australian construction companies.<sup>4</sup>
- Biodiesel (which differs from renewable diesel<sup>5</sup>) is also a pathway which produces less carbon dioxide emissions than oil-based fuels over the full lifecycle of production and use. Biodiesel can lead to reduced tailpipe emissions, and depending on the feedstock, the replacement of 1 litre of fossil diesel with 1 litre of B100 biodiesel can result in an 86 per cent reduction in carbon dioxide equivalent emissions (or at least 15% for B20).<sup>6</sup> Biodiesel is already being produced in Australia by its three biodiesel facilities, which have a combined capacity to produce at least 100 million litres annually.<sup>7</sup> Biodiesel is already used as a drop-in fuel in the maritime, shipping, mining, and construction sectors as it is fully compatible with these applications. Local biodiesel production can also support Scope 3 emission reductions by processing local feedstock for domestic supply, thereby avoiding emissions associated with exporting and importing.
- SAF can reduce emissions across the lifecycle by 80%, compared to fossil jet fuel, depending on the feedstock.<sup>8</sup> In the Qantas and Airbus, ICF Report 'Developing a SAF Industry to Decarbonise Australian Aviation', the modelled central scenario in 2040 shows that SAF would mitigate 9.4 million tonnes (MT) of CO<sub>2</sub> per year from Australian aviation, and over 50.7 MT

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<sup>1</sup> [Industry Letter, 'Open Letter to The Hon Chris Bowen MP - Minister for Climate Change & Energy' \(2023\).](#)

<sup>2</sup> Department of Infrastructure, Transport, Regional Development and Communications, '[Aviation Green Paper](#)' (2023)

<sup>3</sup> [IEA, 'Tracking Biofuels Supply: Investment'](#)

<sup>4</sup> [Australian Constructors Association, 'ENVIRONMENTAL SUSTAINABILITY'](#)

<sup>5</sup> [US Department of Energy, Biodiesel and Renewable Diesel](#)

<sup>6</sup> [Lifecycles, 'Greenhouse gas and sustainability footprints of current and future biofuels for Queensland' \(2016\)](#)

<sup>7</sup> <https://ethanolproducer.com/articles/report-biofuel-consumption-in-australia-remains-minimal-in-2022-19909>

<sup>8</sup> [IATA, 'Developing Sustainable Aviation Fuel \(SAF\)'](#)

CO<sub>2</sub>e in cumulative emissions.<sup>9</sup> Every SAF facility would also produce renewable diesel and naphtha as co-products, supporting the decarbonisation of long-distance road transport, mining, and chemicals. In the same scenario, these co-products contribute an additional 3.7 MT emissions reduction per year by 2040, bringing the cumulative total emissions reduction to over 70 MT CO<sub>2</sub>e by 2040.<sup>10</sup> SAF is the critical technology for reducing emissions in the aviation sector, with IATA predicting that by 2050, 65% of the industry's decarbonisation efforts will come from SAF.<sup>11</sup>

- Ethanol burns cleanly, lowers emissions, and improves the efficiency of engine combustion by providing additional oxygen (it is known as both an octane enhancer and oxygenate). Over 95 per cent of gasoline sold in the United States is E10.<sup>12</sup> Over the years, Brazil has become the world's second-largest producer of ethanol fuel. One of the key successes of Brazil's ethanol program has been its impact on reducing air pollution and carbon emissions. The use of ethanol as a fuel has led to a 50% reduction in air pollution in major cities like São Paulo.<sup>13</sup> Additionally, the program has avoided more than 1.34 billion tons of CO<sub>2</sub> equivalent emissions, contributing to a cleaner energy profile and improved public health. The production of second-generation ethanol in Brazil also avoids competing with food production and uses waste materials that would otherwise be discarded.<sup>14</sup> The U.S. EPA has designated Brazilian sugarcane ethanol as an advanced biofuel due to its 61% reduction in total life cycle greenhouse gas emissions.<sup>15</sup>
- Biomethanol is chemically identical to fossil fuel based-methanol but result in significantly lower GHG emissions during the entire life cycle.<sup>16</sup> It is compatible with current methanol dual-fuel marine engine technology, offering a clear pathway to decarbonisation without future investment or compatibility issues. Bio-methanol is a safe, proven, cost-competitive marine fuel for the commercial shipping industry that can meet or exceed current and planned emissions regulations.<sup>17</sup>
- Biomethane can meet all technical requirements set by the vehicle manufacturers and natural gas transportation system operators and can be used everywhere in the same way as natural gas itself. Its use can result in significantly lower emissions of pollutants (such as hydrocarbons, carbon monoxide, nitrogen oxides, and particulate matter).<sup>18</sup> Vehicles which can be fuelled using compressed natural gas, and as a result biomethane, include ships, heavy duty vehicles, buses, passenger cars, and agricultural tractors. Approximately 20–30 million

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<sup>9</sup> [Qantas & Airbus, ICF Report, 'Developing a SAF industry to decarbonise Australian aviation' \(November 2023\).](#)

<sup>10</sup> Ibid

<sup>11</sup> IATA, [Net zero 2050: sustainable aviation fuels](#) (2023)

<sup>12</sup> [Ethanol as Australia's Octane Enhancer - Implementation of the Aromatics Pool Reduction in Australia's Fuel Standards \(2021\)](#)

<sup>13</sup> [Beyond megacities: tracking air pollution from urban areas and biomass burning in Brazil | npj Climate and Atmospheric Science \(nature.com\)](#)

<sup>14</sup> <https://hbr.org/podcast/2024/01/can-second-generation-ethanol-production-help-decarbonize-the-world>

<sup>15</sup> [EPA designates sugarcane ethanol as advanced biofuel](#)

<sup>16</sup> <https://www.sciencedirect.com/science/article/abs/pii/S1364032118304945#:~:text=If%20the%20bio%2Dmethanol%20fuel,to%20the%20conventional%20diesel%20fuel.>

<sup>17</sup> [Methanex, 'Methanol as a Marine Fuel'.](#)

<sup>18</sup> <https://www.europeanbiogas.eu/wp-content/uploads/2019/07/Biomethane-in-transport.pdf>

vehicles globally are fuelled by compressed natural gas or biomethane.<sup>19</sup> CO<sub>2</sub> and biomethane can also be converted to support other LCLFs such as synthetic diesel and SAF.<sup>20</sup>

Australia's transport sector requires a solution that can decarbonise its existing technologies without incurring significant costs and time. This is because the sector will continue to rely on liquid fuels in the long term, given the extended operational lifespan of Australian transport assets. Upgrading these transport technologies is often impractical, time-consuming, and expensive, leading to the continued operation of fuel-reliant assets over the long term. Thus, LCLFs are a straightforward solution, being proven technology that is compatible with existing technologies.

In addition to its decarbonisation potential, a domestic LCLF industry will enhance Australian domestic transport fuel security. As noted in the CSIRO Sustainable Aviation Fuel Roadmap, Australia imports over 90 per cent of its liquid fuels through long supply chains exposed to geopolitical and climate change risk.<sup>21</sup> This creates national security challenges, a concern clearly identified in the Defence Strategic Review. The creation of a domestic LCLF industry can ensure that industry development is done in such that prioritises domestic uplift and consumption, increasing the resilience and security of Australia's fuel and energy supply chain. This concern extends beyond defence to Australia's commercial sectors, and the enormous task for the industry to meet its commitment to net zero emissions by 2050. As raised in the 'Developing a SAF Industry to Decarbonise Australian Aviation' Report, Australia has starkly increased reliance on imported jet fuel, growing from 18% imports in 2010 to 78% in 2022, with similar trends for diesel and petroleum. The value of imported jet fuel also increased from A\$m 1,500 in 2010 to A\$m 5,865 in 2022.<sup>22</sup>

Developing a domestic LCLF industry offers a clear and effective solution to drive Australia's clean energy transition and future proof Australia's fuel supply. By domestically producing these fuels, we can secure a reliable, proven, and interoperable energy supply that can effectively decarbonise Australia's liquid fuels sector.

We provide the following responses to the discussion paper questions:

## 1. Do you agree with the proposed guiding principles?

LCLFs meet all five guiding principles outlined in the Roadmap. We also propose the following principles to be considered key principles:

- Timely policy action and near-term solutions should be prioritised to give Australia the best chance of meeting its fast-approaching decarbonisation targets
- Maintain social licence through robust sustainability standards.
- Leverage Australia's unique feedstock potential to create a competitive LCLF market.
- Create a valuable domestic supply chain that benefits the domestic economy including fuel producers, consumers and feedstock providers.

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<sup>19</sup> [IEA Bioenergy: Task 37, Perspectives on biomethane as a transport fuel within a circular economy, energy, and environmental system \(2021\)](#)

<sup>20</sup> [EDL, Biomethane Fact Sheet](#)

<sup>21</sup> [CSIRO Sustainable Aviation Fuel Roadmap \(2023\)](#)

<sup>22</sup> [Qantas & Airbus, ICF Report, 'Developing a SAF industry to decarbonise Australian aviation' \(November 2023\).](#)

## 2. Do you support the use of the avoid-shift-improve framework as a tool to identify opportunities for abatement?

LCLF supports the avoid-shift-improve framework by improving the carbon footprint of existing transport technologies that will remain operational in the long term, without requiring significant investment in upgrades or modifications. LCLF also promotes further emission reductions during the shift to public transport. Public transport has been a pioneer in developing decarbonisation solutions, and LCLFs have historically been among the most cost-effective and GHG-efficient tools for this purpose.<sup>23</sup> The success of adopting LCLFs in the public transport sector has been demonstrated.

For example, Murrays Coaches' 2022 trials showed that B100 biofuel maintained similar power and fuel efficiency while reducing CO2 emissions by 80% or more. This success led to their order of five new Scania biodiesel coaches for Queensland.<sup>24</sup> Biomethane powered buses (and coaches) fuelled by compressed gas are common in several parts of the world, often used for public transport in cities. Many cities have opted to use biomethane to significantly reduce GHG emissions, air pollution and noise levels. In Sweden, biofuels like ethanol, biomethane, and biodiesel have been pivotal in transitioning from a 100% fossil-fuel-dependent to a 94% fossil-free public transport sector.<sup>25</sup> There are also bus models designed to use liquid methane to increase the range up to 1,000 km.<sup>26</sup>

Amtrak's 2023 sustainability report highlighted their replacement of over 2 million gallons of fossil fuel with renewable diesel on California's state-supported passenger trains, achieving a 63% reduction in GHG emissions.<sup>27</sup> Additionally, Bunker One supplied B100 biofuel to Color Line's SuperSpeed 1 and 2 ferries, resulting in an average 85% reduction in CO2 emissions on routes between Denmark and Norway.<sup>28</sup>

The use of LCLFs across the transport sector offers broad material benefits beyond decarbonisation, including improving local air quality and public health<sup>29</sup>, fostering energy security, future proofing our tourism industry, and creating regional jobs and economic development.

## 3. Do you agree the development of a national policy framework for active and public transport will support emissions reduction?

Yes, and we refer to the above response on how LCLFs can further enhance the emission reduction potential when shifting to public transport.

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<sup>23</sup> [International Association of Public Transport \(UITP\) 'The Road to Sustainability Report'](#)

<sup>24</sup> <https://www.scania.com/au/en/home/about-scania/newsroom/news/>.

<sup>25</sup> Swedish Public Transport Association, 2021.

<sup>26</sup> [IEA Bioenergy: Task 37, Perspectives on biomethane as a transport fuel within a circular economy, energy, and environmental system \(2021\)](#)

<sup>27</sup> [Amtrak Releases Fiscal Year 2023 Sustainability Report \(2024\)](#)

<sup>28</sup> [Offshore Energy, 'Color Line's ferry duo switches to biofuel' \(2024\)](#).

<sup>29</sup> [Rhodium Group, 'Sustainable Aviation Fuels: The Key to Decarbonizing Aviation' \(2023\)](#)

**4. What should be included in a national policy framework for active and public transport and how should it be developed?**

In developing a national framework for public transport, we recommend the framework incentivises and supports the use of LCLFs in public transport technologies. This should include consideration on how governments can support public transport providers acquire and use LCLFs.

**5. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure the movement of people contributes to transport emissions reduction?**

It is essential to recognise that due to Australia's geographical remoteness and vast distances between regions, the transport of people, goods and services over long distances will continue to be vital to the Australian economy. Given that many liquid fuel-dependent transport technologies will remain in operation long-term, it is crucial to implement emissions reduction solutions that address existing technologies. Governments, industry, and stakeholders must acknowledge this reality to ensure that emission reduction plans are realistic and accurately reflect Australia's transport sector. In addition to recognising this, the following actions can support

- **Government Action:** Government commitment to supporting both demand and supply-side policies, as well as enabling policies, is vital and will act as a catalyst for investment, development, and the adoption of LCLFs.
- **Industry:** The private sector must actively participate in developing the renewable liquid fuels industry. Industry commitment to production, adoption, and utilisation of renewable liquid fuels is already driving innovation and market acceptance. Continued government support will be essential for sustaining this development.
- **Individuals:** Individuals can play a significant role in promoting public social license and awareness regarding LCLFs. They can contribute by raising awareness, promoting public acceptance, supporting policies that encourage the adoption of LCLFs as well as choosing to purchase LCLFs over fossil fuels.

**6. The Australian Government has already engaged in consultation on the 2023 review of the National Freight and Supply Chain Strategy and those consultations will also inform the final Roadmap and Action Plan.**

**6.1. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure that the movement of goods contributes to transport emissions reduction?**

Refer to the above response.

**6.2. How would these actions address the identified challenges and opportunities for emissions reduction in the movement of goods?**

The adoption of LCLFs presents a practical and immediate solution to address the challenges and opportunities for emissions reduction in Australia's movement of goods sector. Unlike the impracticality and expenses associated with upgrading existing freight technologies, LCLFs offer a

feasible pathway to decarbonise fuel-reliant assets over the long term. This approach is crucial given the expected growth in the freight sector, ensuring that emissions reductions can keep pace with economic demands without compromising logistical efficiency.

Supporting the adoption of LCLFs not only tackles emissions directly but also complements ongoing efforts to address other challenges, such as regulatory restrictions on advanced vehicle standards and safety concerns related to new technologies like electric trucks and rail interoperability.

By providing incentives that de-risk investment for fleet owners, including funding for LCLFs projects, competitive grant-based production incentives (such as contracts for difference or fixed grant amounts) and production tax incentives, Australia can effectively encourage the widespread adoption of LCLFs.

**7. Do you agree with the proposed net zero pathway for light road vehicles?**

Yes.

**8. The Australian Government is currently developing an Australian New Vehicle Efficiency Standard and has already begun to implement actions in the National Electric Vehicle Strategy.**

**8.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and, in the future, to reduce light vehicle emissions?**

We refer to our submission to the [New Vehicle Efficiency Standard—Consultation Impact Analysis](#), which highlights the complementary role a domestic LCLF industry can play in achieving significant emission reductions across the transport sector.

**8.2 How would these actions address the identified challenges and opportunities to reduce light vehicle emissions?**

An Australian LCLF industry not only complements the benefits of the New Vehicle Efficiency Standard, but also serves as a versatile solution, addressing key issues such as: consumer choice (by allowing consumers the flexibility to continue using vehicles that align with their lifestyle and preferences); supporting the ongoing operability of legacy vehicles, including utes and SUVs (as these fuels can operate within existing vehicles without the need for significant upgrading); and product availability (providing consumers with a broader range of vehicle choices while still reducing emissions).

**9. Do you agree with the proposed net zero pathway for heavy road vehicles?**

LCLFs will play a leading role in decarbonising heavy road vehicles. While we agree that with adequate supportive policies in place, LCLFs can be available in the short term, we wish to stress that these fuels will also play a continuing role in the long term.

LCLFs such as renewable diesel and biodiesel can be used as drop-in replacements or blended fuel in existing heavy vehicles without requiring costly and disruptive updates or modifications. This compatibility is particularly important given the notably long lifespans of Australian trucks, which can

span up to 30 years. Thus, a new diesel truck sold today will still be on the road in 2054.<sup>30</sup> This longevity underscores that even in 2030, approximately 98% of trucks will still be relying on diesel fuel.<sup>31</sup> LCLFs offer a pragmatic approach to achieving emissions reductions in the heavy road sector both now and in the long term, as these trucks continue to operate throughout their lifespan. Liquified biomethane is also suitable for heavy duty vehicles as it can achieve a similar range as when fuelled by diesel without needing significantly larger fuel tanks. Liquified biomethane used in heavy duty vehicles is a relatively new phenomenon but there has been a rapid expansion with ongoing development in the Nordic countries, Italy, and the UK.<sup>32</sup>

While we support electrification when feasible, we note that battery electric vehicles (BEVs) may face significant issues with battery production, resource constraints, and limited driving ranges, making them less suitable for long-haul and heavy-duty applications. This limitation will specifically impact rural and regional areas which are reliant on heavy road vehicles for transporting goods, equipment, and supplies over long distances, and which often lack the necessary infrastructure to support BEV adoption. Furthermore, in the short term, establishing the required charging infrastructure for electric vehicles will require significant time and investment, making the immediate adoption of LCLFs a more practical solution for reducing emissions. Even as BEV infrastructure gradually expands in the medium term, this will not be at the pace required to meet our decarbonisation objectives. Therefore, LCLFs provide a highly practical, effective and enduring solution for reducing emissions in the heavy road sector.

#### **10. The proposed pathway for heavy road vehicles relies on a mix of battery electric, hydrogen fuel cell and low carbon liquid fuels. Rank from 1 to 3 the order in which these should be prioritised for emissions reduction.**

We support the development and deployment of LCLFs to decarbonise heavy road vehicles.

#### **11. What role should low carbon liquid fuels play in heavy vehicle decarbonisation?**

LCLFs can play a key role in decarbonising the heavy vehicle sector now and out to 2050. All vehicles can operate on 100% renewable diesel and a blend of biodiesel. No other technology can be rolled out as quickly or economically.

These LCLFs will play the following roles in reducing emissions in the heavy vehicle sector:

- Offers significant decarbonisation opportunities for heavy road vehicles. The Transitioning Australia's Liquid Fuel Sector: The Role of Renewable Fuels report stated that replacing just 2 percent of diesel with biodiesel or renewable diesel, based on current targets, would be the equivalent of taking 29,000 rigid trucks off the road.<sup>33</sup>

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<sup>30</sup> Truck Industry Council, "Trucking to net zero starts with a B5/R5 mandate" Australian Renewable Fuels Week presentation (March 2024).

<sup>31</sup> Truck Industry Council, "Trucking to net zero starts with a B5/R5 mandate" Australian Renewable Fuels Week presentation (March 2024).

<sup>32</sup> [IEA Bioenergy: Task 37, Perspectives on biomethane as a transport fuel within a circular economy, energy, and environmental system \(2021\)](#)

<sup>33</sup> [Transitioning Australia's Liquid Fuel Sector: The Role of Renewable Fuels Report](#)

- Enables immediate emission reductions with renewable diesel being compatible as a drop-in decarbonisation solution for existing transport technologies and infrastructure.
- Provide emissions reduction solutions for heavy trucks without requiring substantial upfront investments or disruptive mode switching.
- Leverages and supports Australia's agricultural and feedstock sectors, providing economic growth and workforce opportunities for regional Australia.
- Poven technology already being deployed internationally and domestically.
- Offers substantial employment and development opportunities for regional Australia. Capitalising on Australia's bioenergy potential could lead to \$10 billion in GDP per annum being added to the economy over the next decade, along with 26,200 new jobs (predominately regional).<sup>34</sup>

LCLFs meet all five guiding principles outlined in the Roadmap.

## 12. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce heavy vehicle emissions?

**Government:** There are several government intervention mechanisms that can be implemented to support emission reductions in heavy vehicles:

- A regulated demand side lever tied to carbon intensity including:
  - Low carbon fuel standard connected with a trading scheme
  - A mandate introduced over time
- Implementation of supply-side support, including:
  - Capital and development grants to expand funding available for LCLF projects.
  - Production tax incentives/production credits
  - Contract for Difference (CfD)
- Introduction of government procurement programs within Defence and Government Departments and Agencies.
- Extension of excise/fuel tax mechanisms to support and enable the growth of renewable diesel in the market.
- Recognising and including biodiesel within policy support mechanisms to ensure we utilise our existing domestic production capabilities.
- Supporting the development and deployment of biomethane in Australia so that it can be utilised in decarbonised natural gas vehicles.
- Development of sustainability standards aligned with existing global systems (yet reflects the Australian context) to preserve the social license and maximise Australian specific feedstock and production characteristics.
- Research support for feedstock supply.
- Provide knowledge-sharing campaigns and resources to raise awareness and help consumers understand the role, compatibility, and sustainability of LCLFs.

We recommend a combination of these intervention mechanisms be developed alongside each other to ensure they complement each other effectively.

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<sup>34</sup> [Australia's Bioenergy Roadmap, ARENA, 2021](#)

**Industry:** Industry must play an active role in developing the LCLFs industry. Industry has already shown its readiness to engage in this transition through various actions and commitments, including:

- Bp has committed to transitioning its former oil refinery site at Kwinana into an energy hub that produces Sustainable Aviation Fuel (SAF) and Hydrogenated Vegetable Oil (HVO), also known as renewable diesel.<sup>35</sup> The Kwinana Energy Hub is scheduled to be operational in mid-2026 and has long term advanced biofuel production targets of, up to, 500 million litres per year.
- Cleanaway launched their HVO100 demonstration, with two vehicles to be powered by Neste's 'Neste MY Renewable Diesel', HVO100, made exclusively from used cooking oil and that reduces greenhouse gas (GHG) emissions by 91 per cent.
- Ampol committed to a renewable diesel trial with Hanson, as their first customer partner. This trial will feature a blend comprising 20 per cent renewable diesel and 80 per cent ultra-low sulphur diesel.
- bp and BHP collaborated on a trial to power haul trucks and other mining equipment at their Yandi iron ore operations in Western Australia using renewable diesel.
- Rio Tinto successfully completed the full transition of its heavy machinery from fossil diesel to renewable diesel at its Boron operation in California. There's potential for this transition to extend to their sites in Australia.<sup>36</sup>
- Biodiesel blended at high levels has been commonplace in the underground mining sector for nearly 20 years due to its ability to reduce diesel particulate matter.<sup>37</sup>
- Murrays Coaches running their vehicles on B100, which delivered very similar power and fuel efficiency as fossil diesel and resulted in an 80% or more reduction of CO2 emissions.
- Bioenergy Australia launched The Renewable Diesel Ford Ranger campaign. Powered by 100% renewable diesel supplied by Refuelling Solutions, a Ford Ranger will tour Australia, visiting schools, events, trade shows, and businesses to highlight the opportunity Renewable Diesel presents in the nation's decarbonisation challenge.

### 12.1 How would these actions address the identified challenges and opportunities to reduce heavy vehicle emissions?

These actions will enable the significant opportunities, referred to in question 11, and address the following key barriers:

- **Creates an LCLF market:** Supply and demand-side support can enable the development of a local LCLF industry, ensuring that these fuels are produced and available domestically. Establishing domestic production will strengthen fuel security, noting that Australia currently imports 90% of its liquid fuels.<sup>38</sup>

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<sup>35</sup> [bp, 'Kwinana Energy Hub'](#)

<sup>36</sup> RioTinto, [Rio Tinto Kennecott to fully transition to renewable diesel](#) (2023)

<sup>37</sup> [Chevron & Renewable Energy Group, 'Biodiesel in Mining: Your Questions Answered'](#)

<sup>38</sup> [CSIRO Sustainable Aviation Fuel Roadmap \(2023\)](#)

- **Production costs:** Supply-side support will reduce the cost premium for these fuels, lessening the impact on consumers and businesses as the production cost curve decreases.
- **Offtaker assurances:** Demand-side interventions create certainty regarding LCLF adoption, leveling the playing field for offtakers and preventing competitive disadvantage for early adopters.
- **Cost Disparity:** Addressing the cost disparity between LCLFs and traditional fossil fuels, which currently results in higher fuel prices for LCLFs purchasers and users. This adjustment can make LCLFs more competitive in the market, encouraging their adoption and reducing emissions in vehicles.
- **Investment certainty:** Clear and consistent policies can provide regulatory certainty and incentives for investment in LCLFs, fostering industry growth and emission reductions.
- **Leveling the Playing Field:** Addressing the uneven playing field compared to fossil fuel alternatives through incentives and market mechanisms. This includes promoting fairness in pricing and support structures to encourage the transition to LCLFs.
- **Promotion of Domestic Industry:** Creating a robust domestic industry that retains economic value within Australia for growers and feedstock producers. This supports local economies and reduces reliance on overseas markets, enhancing sustainability and economic resilience.
- **Market and Investment Certainty:** Addressing market and investment uncertainty, which acts as a barrier to project development. Clear investment signals and targeted support can mitigate risks and attract investment in LCLFs projects.
- **Enable decarbonisation of existing fleets:** Development of a domestic LCLF industry would enable these fuels to be utilised within existing heavy road technologies. This would achieve emission reductions in the short term without the time or cost required to update or modify heavy road vehicles or refuelling solutions.
- **Existing LCLF supply underutilised:** This can support the existing biodiesel production in Australia, which is currently underutilised, presenting an immediate opportunity for increased production.

### 13. Do you agree with the proposed net zero pathway for rail?

We agree that LCLFs, like renewable diesel, are a key solution that will allow the rail industry to use their existing diesel fleet while lowering emissions.

### 14. The proposed pathway for rail relies on a mix of battery electric, hydrogen fuel cell and low carbon liquid fuels. Rank from 1 to 3 the order in which these should be prioritised for emissions reduction.

We support the development and deployment of LCLFs to decarbonise rail.

## 15. What role should low carbon liquid fuels play in rail decarbonisation?

LCLFs can play a key role in decarbonising the rail sector. Given the long lifespan of locomotives and Australia's vast geographic distances, transitioning this sector to electrification will take many years. Therefore, LCLFs represent a critical solution for achieving substantial emission reductions during this transition.

They contribute to rail decarbonisation through the following roles:

- Offers significant decarbonisation opportunities for rail transport. Biodiesel and renewable diesel can be utilised as a long-term solution, complementing electrification and hydrogen alternatives in the long run.
- LCLFs enable immediate reductions in emissions from existing rail technologies and infrastructure. This quick deployment capability helps in achieving short-term emission reduction targets effectively.
- Offers emissions reduction solution without the need for significant upfront investments or disruptive mode switches. LCLFs can be integrated into current rail operations, supporting continuity and efficiency.
- Leverages and supports Australia's agricultural and feedstock sectors, providing economic growth and workforce opportunities for regional Australia.
- Offers substantial employment and development opportunities for regional Australia. Capitalising on Australia's bioenergy potential could lead to \$10 billion in GDP per annum being added to the economy over the next decade, along with 26,200 new jobs (predominately regional).<sup>39</sup>

LCLFs meet all five guiding principles outlined in the Roadmap.

## 16. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce rail emissions?

**Government:** We refer to the government intervention mechanisms recommended in our response to question 12.

**Industry:** Industry must play an active role in developing the LCLFs industry. Industry has already shown its readiness to engage in this transition through various actions and commitments, including:

- Wilmar Sugar and Renewables, Australia and New Zealand's largest manufacturer and marketer of raw and refined sugar products, has swapped conventional diesel for renewable diesel in a landmark trial aimed at reducing greenhouse gas emissions in its locomotive fleet.<sup>40</sup>
- Amtrak has replaced more than a million gallons of fossil fuel with renewable diesel in the past 12 months.<sup>41</sup>

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<sup>39</sup> [Australia's Bioenergy Roadmap, ARENA, 2021](#)

<sup>40</sup> [Wilmar Sugar and Renewables, Media release: Trialling Renewable Diesel \(2023\)](#)

<sup>41</sup> [Biofuels International, 'Amtrak replaces fossil fuels with renewable diesel' \(2024\)](#)

## 16.1 How would these actions address the identified challenges and opportunities to reduce rail emissions?

These actions could address the following key barriers:

- **Creates an LCLF market:** Supply and demand-side support can enable the development of a local LCLF industry, ensuring that these fuels are produced and available domestically.
- **Cost Disparity:** Addressing the cost disparity between LCLFs and traditional fossil fuels, which currently results in higher fuel prices for LCLFs purchasers and users. This adjustment can make LCLFs more competitive in the market, encouraging their adoption and reducing emissions in vehicles.
- **Investment certainty:** Clear and consistent policies can provide regulatory certainty and incentives for investment in LCLFs, fostering industry growth and emission reductions.
- **Leveling the Playing Field:** Addressing the uneven playing field compared to fossil fuel alternatives through incentives and market mechanisms. This includes promoting fairness in pricing and support structures to encourage the transition to LCLFs.
- **Promotion of Domestic Industry:** Creating a robust domestic industry that retains economic value within Australia for growers and feedstock producers. This supports local economies and reduces reliance on overseas markets, enhancing sustainability and economic resilience.
- **Market and Investment Certainty:** Addressing market and investment uncertainty, which acts as a barrier to project development. Clear investment signals and targeted support can mitigate risks and attract investment in LCLFs projects.
- **Enable decarbonisation of existing fleets:** Development of a domestic LCLF industry would enable these fuels to be utilised within existing rail technology. This would achieve emission reductions in the short term without the time or cost required to update or modify existing rail technology or refuelling solutions.

## 17. Do you agree with the proposed net zero pathway for maritime?

LCLFs will play an essential role in decarbonising the maritime sector.

Maritime is a hard-to-abate sector that will largely continue to rely on liquid fuels as hydrogen and electrification are not readily available or economically feasible to fully support this sector in time to achieve our net-zero targets. Therefore, urgent solutions are needed to decarbonise existing fleets and technologies, with LCLFs such as biodiesel, renewable diesel, biomethanol, and biomethane playing a crucial role.

The availability of these fuels in the near term is crucial for Australia to fulfill its commitments under the International Maritime Organization (IMO). The IMO's 2023 Strategy on Reduction of GHG Emissions from Ships commits to increasing the uptake of alternative zero and near-zero GHG fuels by 2030. It also sets indicative checkpoints for international shipping to achieve net-zero GHG emissions by 2030 (at least 20%, striving for 30%) and 2040 (at least 70%, striving for 80%).<sup>42</sup> To meet these

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<sup>42</sup> [IMO's work to cut GHG emissions from ships](#)

fast-approaching obligations, Australia's maritime sector needs a solution to start decarbonising today.

Renewable diesel, biodiesel and bio-methanol are all compatible as drop-in replacement fuels within maritime vessels without the need for expensive, time-consuming, or disruptive upgrades. This means that today's maritime technologies, which will likely continue to be used in the long-term and can begin decarbonising now, rather than waiting for alternative solutions to become available or compatible.

Liquefied biogas also represents an opportunity for the shipping industry to reduce its emissions. A vessel operating with biogas reduces CO<sub>2</sub> emissions by up to 90% compared to a conventional petrol-fuelled vessel.<sup>43</sup> It can also achieve a similar range as when fuelled by diesel without needing significantly larger fuel tanks. Several countries have developed plans to create liquefied biogas infrastructure (ports, fuel stations, vehicles, etc).<sup>44</sup>

To address the Roadmap's concern regarding limited availability of sustainable feedstock, we raise the following points:

- CSIRO Sustainable Aviation Fuel Roadmap highlights that each state and territory have their own feedstock advantages. It estimates that in 2025, Australia will have enough feedstocks, if liberated, to produce 60 per cent of local jet fuel demand using biogenic feedstocks, growing to 90% by 2050.<sup>45</sup>
- Australia's agricultural feedstock potential cannot be overstated, representing an estimated 41 percent, or 1066PJ per annum, of the nation's bioenergy resource potential by 2030.<sup>46</sup>
- The Race for 2030 Report stated that within Australia, our vast amount of agricultural waste stands out as having the greatest potential for renewable fuel expansion, potentially accounting for 86% of the total biomethane potential by 2050. It states that agricultural waste could account for 319 PJ/yr of the overall biomethane potential of 371 PJ/yr in 2050, and landfills, wastewater sludge, livestock manure, and FOGO accounting for the remaining 52 PJ/yr.<sup>47</sup>
- There is significant opportunity to utilise waste-derived feedstocks for LCLF and biomethane production if supportive federal and state policies are implemented. Landfill diversion is a genuine issue in Australia, with over 20 million tonnes of waste going to landfill each year, of which significant volumes that could be utilised for renewable fuel production.<sup>48</sup> This utilisation will expand domestic feedstock availability in population centric waste producing areas and transform Australia from one of the highest per capita waste generators to a leader in renewable fuel production.
- There is also great opportunity to scale up and expand current domestic oil feedstock capabilities, which could include deploying intermediate oilseed crops ('oilseed cover crops') such as Carinata as a winter rotation crop within current summer cropping systems (e.g., cotton cropping) and in marginal areas.

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<sup>43</sup> [Air Liquide, 'Biogas in maritime transport'](#)

<sup>44</sup> Ibid.

<sup>45</sup> [CSIRO Sustainable Aviation Fuel Roadmap \(2023\)](#)

<sup>46</sup> Ibid.

<sup>47</sup> [Race for 2030, 'Anaerobic digestion for electricity, transport and gas, Race for 2030' \(2023\).](#)

<sup>48</sup> [Australia Landfill Statistics: Key Findings and Challenges](#)

- Australia’s significant feedstock availability and capacity is currently supporting overseas LCLFs markets, notably:
  - Approximately, two-thirds of Australia’s canola oilseed exports are to the EU, largely for biodiesel production, thanks to the incentives for bioenergy production and use in the EU.<sup>49</sup>
  - Australia exports 85 per cent of the ~4m tonnes of sugar produced annually from the 30 m tonnes of cane produced, making Australia one of the world’s largest exporters of sugar after Brazil. This sugar could be diverted to make ethanol or SAF, as could the >10m tonnes of dry residual material.<sup>50</sup>
  - Australia is already exporting around 72 per cent of the total value of its agricultural, fisheries and forestry production.<sup>51</sup>
  - There has been over a 30,000 per cent increase in the export of used cooking oil from Australia to the USA from 2020 to 2022.
  - Australia’s largest market for tallow is in Singapore, with over 223,000t of tallow exported in 2021/22 for biofuel production.<sup>52</sup>
  - As of 2021/22, around 156,000t of Australian tallow is exported to the US, up from 7,500t five years previously. This recent growth could continue with the Inflation Reduction Act 2022 including numerous incentives for SAF production, such as a US\$1.25/gal blending credit which aim to meet the annual domestic production goal of 3 billion gallons.<sup>53</sup>

Australia possesses significant domestic feedstock capacity. However, without supporting domestic production, Australian feedstock will continue to be exported to international markets, processed into LCLFs, and then re-imported for domestic use, sacrificing significant economic, environmental, and fuel security opportunities.

## 18. The Australian Government is engaging in consultation as part of the development of the Maritime Emissions Reduction National Action Plan and those consultations will also inform the final Roadmap and Action Plan.

### 18.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce maritime emissions?

**Government:** We refer to the government intervention mechanisms recommended in our response to question 12.

**Industry:** Industry must play an active role in developing the LCLFs industry. Industry has already shown its readiness to engage in this transition through various actions and commitments, including:

- In 2023 Queensland company EcoTech Biodiesel provided biodiesel as part of the ANL, Woolworths Group, the Port of Brisbane, bp Marine and EcoTech collaboration to undertake a 42-day trial voyage between South East Asia and Australia powered by locally produced biodiesel. For this trial, the container ship was powered by 500 metric tonnes of biofuel made up of bp Marine’s Very Low Sulphur Fuel Oil blended with a biodiesel produced by Brisbane-

<sup>49</sup> [United States Department of Agriculture: Foreign Agricultural Service, 'Biofuels Annual' December 2022](#)

<sup>50</sup> [Canegrowers, 'Australia now second biggest raw sugar exporter' \(2021\)](#)

<sup>51</sup> [Snapshot of Australian Agriculture 2023 - DAFF](#)

<sup>52</sup> [CSIRO Sustainable Aviation Fuel Roadmap \(2023\)](#)

<sup>53</sup> Ibid.

based company EcoTech Biodiesel from recycled cooking oils, fats and grease. Preliminary data showed the voyage could reduce emissions by approximately 17% as well as reducing nitrous oxides and sulphur oxides (air and marine pollutants).<sup>54</sup>

- Canada Steam Ship Lines (CSL) launched its biodiesel demonstration program in 2019.<sup>55</sup> It has now completed a cumulative 75,000 running hours on B100 biofuel over the past four years and determined:
  - It is technically viable - over 60,000 running hours on B100.
  - It is reliable - 0hrs of downtime.
  - Reduction of well-to-wake GHG emissions of ~70-80%.
  - 12% increase in consumption of fuel due to calorific value.
  - NOx within Tier II limits.
  - 5% below detectable limit of equipment.
- In May 2022, Rio Tinto announced a partnership with BP in which they trialled a biodiesel blend to power its marine fleet for 12 months. Using a combination of biodiesel and very low sulphur fuel oil, it was estimated that this blend could reduce emissions by 26% in comparison with standard marine fuel oil.<sup>56</sup>
- Svitzer is one of the world's largest towage and marine services providers, servicing approximately 140,000 tug assists globally annually. They are seeking to achieve a 50% reduction in the CO2 intensity by 2030 and to have fully carbon neutral operations by 2040. They have expressed that biofuel and green diesel represent an accessible and pragmatic pathway to achieve these goals by 2030 and beyond.
- MIAL has shown its strong support for the revised IMO strategy to be net-zero by 2050 and supports an international market-based mechanism that helps address the cost delta between conventional and net-zero carbon fuels through a combination of pricing carbon emissions and rewarding early movers.
- Maersk one of the world's largest shipping companies has a 2040 target of net zero GHG and aims to transport a minimum of 25% of ocean cargo using green fuels by 2030 and are already placing orders for renewable diesel and renewable methanol.

More information is available in our submissions to the [MERNAP Issues Paper - Energy Sources and Technologies](#) and [MERNAP Issues Paper: Regulation and Standards](#).

## 18.2. How would these actions address the identified challenges and opportunities to reduce maritime emissions?

These actions could address the following key barriers:

- **Creates an LCLF market:** Supply and demand-side support can enable the development of a local LCLF industry, ensuring that these fuels are produced and available domestically.
- **Cost Disparity:** Addressing the cost disparity between LCLFs and traditional fossil fuels, which currently results in higher fuel prices for LCLFs purchasers and users. This adjustment can

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<sup>54</sup> [Queensland Government, 'Queensland welcomes home successful biofuel shipping trial'](#)

<sup>55</sup> <https://www.bunkerspot.com/americas/60715-americas-csl-hits-b100-biofuel-milestone>

<sup>56</sup> <https://www.bp.com/en/global/bp-trading-and-shipping/news/press-releases/>

make LCLFs more competitive in the market, encouraging their adoption and reducing emissions in vehicles.

- **Investment certainty:** Clear and consistent policies can provide regulatory certainty and incentives for investment in LCLFs, fostering industry growth and emission reductions.
- **Leveling the Playing Field:** Addressing the uneven playing field compared to fossil fuel alternatives through incentives and market mechanisms. This includes promoting fairness in pricing and support structures to encourage the transition to LCLFs.
- **Promotion of Domestic Industry:** Creating a robust domestic industry that retains economic value within Australia for growers and feedstock producers. This supports local economies and reduces reliance on overseas markets, enhancing sustainability and economic resilience.
- **Market and Investment Certainty:** Addressing market and investment uncertainty, which acts as a barrier to project development. Clear investment signals and targeted support can mitigate risks and attract investment in LCLFs projects.
- **Enable decarbonisation of existing fleets:** Development of a domestic LCLF industry would enable these fuels to be utilised within existing marine technology. This would achieve emission reductions in the short term without the time or cost required to update or modify marine technology or refuelling solutions.
- **Existing LCLF supply underutilised:** This can support the existing biodiesel production in Australia, which is currently underutilised, presenting an immediate opportunity for increased production.
- **International connectivity:** Ensures Australia maintains international connectivity by enabling the refuelling of international fleets with LCLFs that meet global decarbonisation standards and mandates.

## 19. Do you agree with the proposed net zero pathway for aviation?

We agree that SAF is the primary pathway to decarbonise aviation.

Under any scenario for the introduction of future advanced aircraft products with new energy carriers, Australia will need vast amounts of SAF, and soon, to meet the civil aviation's commitment to net zero by 2050. SAF is widely accepted today as a drop-in replacement for fossil jet fuel that works with existing airplanes and offers the largest potential to reduce carbon emissions over the next 20 to 30 years in all aviation segments. Hydrogen and electric flight concepts are in early-stage development and not likely to be commercially available for long distance flights - where 70 per cent of aviation emissions are generated - for decades.<sup>57</sup> SAF is certified technology ready to scale. Currently, SAF is an ASTM certified aviation fuel that is ready to use with all existing aircraft and infrastructure at a blend rate of 50% with fossil jet.<sup>58</sup>

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<sup>57</sup> [Airlines for Australia and New Zealand \(A4ANZ\), 'The Australian Roadmap for Sustainable Flying: Reaching Net Zero by 2050' \(2023\).](#)

<sup>58</sup> <https://www.energy.gov/sites/prod/files/2020/09/f78/beto-sust-aviation-fuel-sep-2020.pdf>

SAF is proven technology, having powered over 700,000<sup>59</sup> commercial flights and demonstrated success in 100% SAF test flights. With no alternative technologies available or feasible to meet our 2050 target for reducing aviation emissions in time, SAF stands as our most significant opportunity for reducing emission in the aviation sector.

With respect to concerns regarding the reliability of feedstock sources, SAF can be refined from a diverse array of Australian sustainable feedstocks, including fats and oils (such as oilseeds, tallow, rendered animal fats, and used cooking oil) and lignocellulosic materials (like straw, cotton trash, sugarcane bagasse, forestry residues, urban waste streams, sugarcane, grasses, woody biomass, and algae). There are also emerging solutions and innovations in agriculture that will further enable Australian farmers to meet the rapidly rising demand for these renewable feedstocks while improving their productivity and sustainability. Industry also recognises the need for the development of high quality and harmonised sustainability standards that will enable our feedstock to support Australia's food, fibre, and fuel security.

Additionally, Australian ethanol could be utilised as an essential feedstock to produce SAF through the Alcohol-to-Jet pathway. This pathway not only offers LCLF producers a readily available and economically viable feedstock but also creates a new revenue stream for ethanol producers seeking to diversify and meet the demands of a rapidly expanding aviation market. Australia's ethanol refineries are already producing approximately 175 million litres of ethanol but has the capacity to produce 440 million litres annually.<sup>60</sup> A local SAF industry would create further demand, increasing supply and strengthening domestic production capabilities.

A domestic SAF market would also incentivise the recovery and use of the energy, nutrient, and heat values of Australian agricultural residues rather than allowing this feedstock to decay in fields, burnt off or exported to international markets, thus, failing to secure this value domestically. Australia has a significant and reliable feedstock capacity that should be capitalised upon.

SAF is the most viable technology/decarbonisation option available to significantly reduce emissions across the aviation sector and the development of a domestic SAF industry should be considered a key opportunity and priority.

**20. The Australian Government has already engaged in consultation on aviation decarbonisation through the development of the Aviation White Paper and those consultations will also inform final Roadmap and Action Plan.**

**20.1. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce aviation emissions?**

**Government:** There are several government intervention mechanisms that can be implemented to support emission reductions in aviation:

- A regulated demand side lever tied to carbon intensity including:
  - Low carbon fuel standard connected with a trading scheme.
  - A mandate introduced over time.
- Government procurement targets such as:
  - Defence commitment to 10% domestically produced SAF by 2030

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<sup>59</sup> [Sustainable aviation fuel: Aviation: Benefits Beyond Borders \(aviationbenefits.org\)](https://aviationbenefits.org)

<sup>60</sup> [Report: Biofuel Consumption In Australia Remains Minimal In 2022 \(2023\)](#)

- Funding to support Federal Government staff flights to include 10% domestically produced SAF by 2030
- Implementation of supply-side support, including:
  - Capital and development grants to expand funding available for SAF projects.
  - Production tax incentives/production credits
  - Contract for Difference.
- Extending excise/fuel tax mechanism to support SAF.
- Development of sustainability standards aligned with existing global systems (yet reflects the Australian context) to preserve the social license and maximise Australian specific feedstock and production characteristics.
- Research support for feedstock supply.
- Provide knowledge-sharing campaigns and resources to raise awareness and help consumers understand the role, compatibility, and sustainability of SAF.

We recommend a combination of these intervention mechanisms be developed alongside each other to ensure they complement each other effectively.

**Industry:** Industry must play an active role in developing a local SAF industry. Industry has already shown its readiness to engage in this transition through various actions and commitments, including:

- Qantas and Airbus committed a joint US\$200m fund to invest in locally developed and produced SAF and feedstock initiatives to accelerate SAF in Australia.<sup>61</sup>
- Qantas targeting a 10 per cent SAF blend by 2030 and 60 per cent by 2050.<sup>62</sup>
- Boeing and Virgin Australia prioritising joint advocacy for the development of an Australian SAF industry, supporting domestic policy and supply chain investment to accelerate SAF production.
- GrainCorp and IFM Investors have agreed to undertake a feasibility study to explore the potential of establishing SAF production facilities around Australia. The study will examine the use of agricultural feedstocks to produce SAF, which will then contribute to the decarbonisation of the industry.<sup>63</sup>
- Jet Zero Australia and LanzaJet have announced the development of Project Ulysses, a North Queensland Sustainable Aviation Fuel project using LanzaJet's Alcohol-to-Jet technology, that converts the bioethanol into SAF and renewable diesel. The project is the first LanzaJet ethanol to SAF plant in the country and will help position Australia as a leader in sustainable aviation.<sup>64</sup>
- Bp has committed to transitioning its former oil refinery site at Kwinana into an energy hub that produces sustainable aviation fuel (SAF) and Hydrogenated Vegetable Oil (HVO), also known as renewable diesel.<sup>65</sup>

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<sup>61</sup> [Qantas Sustainability Report 2022, 'DRIVING SUSTAINABILITY TO PROTECT THE FUTURE OF TRAVEL'](#)

<sup>62</sup> Ibid

<sup>63</sup> [IFM Investors & GrainCorp announce renewable fuels initiative to help decarbonise the aviation sector \(2023\)](#)

<sup>64</sup> [LanzaJet & Jet Zero Australia Sign Licence & Engineering Agreement to Advance Australia's First Ethanol to Sustainable Aviation Fuel Plant \(2024\)](#)

<sup>65</sup> [https://www.bp.com/en\\_au/australia/home/accelerating-australia/hydrogen/kwinana-energy-hub.html](https://www.bp.com/en_au/australia/home/accelerating-australia/hydrogen/kwinana-energy-hub.html)

- Toowoomba Wellcamp Airport owner Wagner has signed a memorandum of understanding with Boeing to help develop a local SAF industry. Wagner Sustainable Fuels has started design and construction on a new SAF blending facility at Wellcamp and will work with Boeing to collaborate on growing SAF capabilities to meet rising local airline demand for jet fuel, which is tipped to grow by 75 per cent over the next 25 years.<sup>66</sup>
- MicroBioGen, an Australia-based biotechnology company, in partnership with Novonosis, is creating unique yeast strains that efficiently convert non-food biomass into biofuels. These strains exhibit enhanced metabolic capabilities and tolerance to the harsh conditions of second-generation biofuel production. For example, a yeast strain co-developed has achieved a 29% reduction in CO2 emissions, an 11% decrease in fossil energy use, and a 75% reduction in water use compared to benchmark commercial second-generation yeast strains.<sup>67</sup>
- FutureEnergy Park will utilise waste lignocellulose biomass as feedstock which will undergo pyrolysis to produce advanced biofuels. FEA's Narrogin Biorefinery is scheduled to be operational in mid-2026 with the potential to produce 18 to 27 million litres of renewable diesel per year.<sup>68</sup>
- Australis Biofuels Facility plans to undertake biomass handling, biochar production, cellulosic ethanol and SAF production and bioenergy production along with future bio-based agri-chemicals and fertilisers. The Facility will create over a 100 permanent jobs and 100's of support services, suppliers and contractors.<sup>69</sup>

**Individuals:** Individuals can play a significant role in promoting public acceptance, raising awareness, and supporting policies that encourage the adoption of SAF, as well as choosing to purchase SAF over fossil fuels.

## 20.2. How would these actions address the identified challenges and opportunities to reduce aviation emissions?

These actions could address the following key barriers:

- **Creates an LCLF market:** Supply and demand-side support can enable the development of a local SAF industry, ensuring domestic production and availability. Establishing domestic production will strengthen fuel security, noting that Australia currently imports 90% of its liquid fuels.
- **Production costs:** Supply-side support will reduce the cost premium for these fuels, lessening the impact on consumers and businesses as the production cost curve decreases.
- **Offtaker assurances:** Demand-side interventions create certainty regarding SAF adoption, leveling the playing field for offtakers and preventing competitive disadvantage for early adopters. Without a demand mechanism, offtakers are unlikely to purchase SAF due to the price premium.

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<sup>66</sup> <https://www.boeing.com.au/news/2024/boeing-wagner-advance-australias-saf-industry>

<sup>67</sup> [MicroBioGen achieves technology breakthrough in 2G biofuels \(2021\)](#)

<sup>68</sup> [Narrogin Selected As FEA's First Project Location - FutureEnergy Australia \(futureenergyaust.com.au\)](#)

<sup>69</sup> [Australis Biofuels Facility, Esperance, Western Australia](#)

- **Supply chain support:** Australia has an array of stakeholders across the entire SAF supply chain who are ready to act and progress development of a local industry. There is a unified level of support across feedstock suppliers, fuel producers, airports, and airlines providing a low-risk political environment in supporting the industry.
- **Cost disparity:** Supply and demand-side interventions can address the cost disparity between SAF and traditional jet fuel, making SAF more competitive in the market and encouraging its adoption.
- **Domestic economic benefits:** Creating a robust domestic industry retains economic value within Australia for growers and feedstock producers, supporting local economies and reducing reliance on overseas markets, enhancing sustainability and economic resilience.
- **Market and investment certainty:** Addressing market and investment uncertainty, which acts as a barrier to project development. Clear investment signals and targeted support can mitigate risks and attract investment in SAF projects.
- **Enable decarbonisation of existing fleets:** A domestic SAF industry can decarbonise our aviation sector in both the short and long term.

A domestic SAF industry offers the following opportunities:

- The potential to add A\$13 billion to GDP annually by 2040.<sup>70</sup>
- Gaining nearly 13,000 jobs in the feedstock supply chain and 5,000 new high-value jobs for facility construction and operation.<sup>71</sup>
- Reducing liquid fuel importation from 90% to 61% in 2040 and just 21% in 2050, strengthening national fuel security and energy independence.<sup>72</sup>
- The ability to significantly reduce emissions from flying, with SAF estimated to contribute around 65% of the reduction needed for aviation to reach net-zero by 2050.<sup>73</sup>
- Capitalising on our domestic feedstock supply, which could meet 60% of local jet fuel demand and potentially grow to 90% by 2050.<sup>74</sup>
- Significantly reduces emissions, including non-CO2 sulphur and ultrafine particulate matter, thereby enhancing local air quality and public health.<sup>75</sup>
- Ensures Australia maintains international connectivity by enabling the refuelling of international flights with SAF that meet global decarbonisation standards and mandates, thereby preserving robust and uninterrupted international tourism connectivity aligned with global decarbonisation efforts.

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<sup>70</sup> [ICF Report, 'Developing a SAF industry to decarbonise Australian aviation' \(November 2023\), p2.](#)

<sup>71</sup> Ibid.

<sup>72</sup> Ibid p3.

<sup>73</sup> [IATA, 'Net zero 2050: sustainable aviation fuels' \(December 2023\)](#)

<sup>74</sup> [CSIRO, 'Sustainable aviation fuel roadmap' \(2023\), p8.](#)

<sup>75</sup> [Rhodium Group, 'Sustainable Aviation Fuels: The Key to Decarbonizing Aviation' \(2023\)](#)

## 21. Do you agree with the proposed net zero pathway for transport infrastructure?

Fast-tracking LCLF production provides a near-term decarbonisation solution that will deliver immediate emission reductions across the entire transport sector while new transport infrastructure is being developed.

LCLFs will also play an essential role in the decarbonisation of construction vehicles and transport. Although electrification represents a promising long-term solution for reducing construction emissions, electric alternatives are estimated to be available for only 40 percent of construction equipment (by energy use) by 2030.<sup>76</sup> Additionally, construction firms face significant economic disincentives in abandoning existing assets before the end of their useful life, slowing the transition to electric.<sup>10</sup> Thus, LCLFs are an essential solution, being a proven technology compatible with existing assets.

Renewable diesel is already being used extensively across the globe in the construction sector to decarbonise existing equipment, machinery, and infrastructure, and is supported by Original Equipment Manufacturers at full concentration. In Australia, over 162,000L of renewable diesel has been used by Australian construction companies, including in projects such as Lendlease's NSW Government Powerhouse Parramatta and the Queensland New Performing Arts Venue.<sup>77</sup> Biodiesel can also reduce emissions in construction, with manufacturers generally limiting blends with mineral diesel to up to 20 percent biodiesel.<sup>78</sup>

As stated in the Roadmap, decarbonising infrastructure must be considered throughout all stages of the infrastructure lifecycle. We emphasise the role LCLFs will play in decarbonising the construction vehicles and technologies required to develop new transport infrastructure.

**23. The Australian Government invited views on aspects of the energy transformation that represent the most material challenges and opportunities for the electricity and energy sector. Submissions closed on Friday 12 April 2024 (AEDT). This feedback will be used to inform the development of the Electricity and Energy Sector Plan and Net Zero Plan. The Australian Government will be undertaking targeted consultation to identify options for production incentives to support the establishment of a made in Australia low carbon liquid fuel industry, including through the release of a low carbon liquid fuels consultation paper. Feedback heard through this process will also inform development of the final Transport and Infrastructure Net Zero Roadmap and Action Plan. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure the energy mix is ready to support transport emissions reduction?**

We refer to our submission to the Electricity and Energy Sector Plan available [here](#).

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<sup>76</sup> [ACA, ENVIRONMENTAL SUSTAINABILITY](#)

<sup>77</sup> [Ibid](#)

<sup>78</sup> [ACA, 'Renewable Diesel: Position Paper' \(March 2024\)](#)

## 24. How should the use of low carbon liquid fuels be prioritised across different transport modes over time to achieve maximum abatement?

As addressed in the above responses, LCLFs will play a leading role in the reducing emissions across all transport modes both in the immediate term and out past 2050. They represent a solution that can decarbonise existing transport modes so that Australia can achieve emission reduction in time for it to meet its 43% emission reduction by 2030 and net zero by 2050. Without prioritising LCLFs as the most promising near-term solution for reducing emission throughout our hard to abate sectors, Australia not only risks missing its decarbonisation targets but also forgoes key opportunities such as improving local air quality and public health, establishing a domestic fuel supply chain, strengthening energy security, future proofing our international connectivity and tourism industry, and creating regional jobs and economic development.

LCLFs should be prioritised as an immediate solution in the heavy road, rail, marine, aviation and construction transport sectors.

We provide the following comments on the Roadmap's timeline of LCLF.

### Short-term:

**Sustainability standards and certification scheme:** There is urgent need for the development of clear sustainability standards and certification scheme. Sustainability standards are essential for assuring consumers and the public that LCLFs produced and used in Australia are effective in reducing emissions and meeting environmental and social expectations. These standards should consider the overall impact of the product and its supply chain, including carbon intensity, water and land use change, and social impact. We also support lifecycle assessment (LCA) models to determine the overall environmental impact of feedstocks and fuels across their entire lifecycle.

We also support the expansion of the Guarantee of Origin Scheme to include LCLFs. Inclusion in the GO Scheme ensures that LCLFs can compete on equal footing with other energy sources in energy markets. This recognition will stimulate market competition, foster investor confidence, accelerate project development, and lead to increased uptake and reduced emissions

Development of sustainability standards and certification scheme is imperative for project developers to understand the standards they will need to meet and their CI scores for business cases and investment decisions. Delaying the development of sustainability criteria and certification will lead to more investment being directed to international jurisdictions with standards in place, causing Australia to fall further behind in the LCLF space.

**Supply-side and demand-side policy mechanisms:** There is also urgent need for the development of a suite of **both** supply-side and demand-side policy mechanisms. Supply-side support is crucial for standing up a domestic industry, driving the development of domestic feedstock supply, derisking long term investment, and supporting decarbonisation of crucial sectors of Australia's economy. Supply side support will reduce the cost premium for the production of these fuels and reduce the impact on consumers and businesses as the cost curve for production reduces. This support is critical for kickstarting our domestic production capacity and driving its continued success.

Implementing demand-side measures is crucial for ensuring a stable and guaranteed market demand. This predictability encourages local producers to expand their production capacities, knowing there will be a consistent market for their products. Without such measures, producers may hesitate to invest in new projects or maintain current production levels due to market uncertainty, while off-takers are unlikely to purchase LCLF because of the price premium. Therefore, demand-side measures play a critical role in supporting business case for LCLF adoption.

We stress the importance of developing both supply-side and demand-side support in tandem. This approach is critical to ensure the industry has clarity on timing and requirements, which are essential for securing project investment. Committing solely to one type of support—whether supply-side or demand-side—will not be effective. Integrating both forms of support will provide investors and off-takers confidence in project development and adoption, distribute costs across the industry, and establish a coherent and effective framework for long-term growth.

Without prompt and effective policy action that clearly commits to domestic LCLF development, Australia will fall further behind international competitors. This could result in more feedstocks being exported to support overseas LCLF industries, investment being lost and leaving domestic transport sectors vulnerable to international supply availability and market pricing.

We also recommend that Australia's existing ethanol and biodiesel industries be recognised and supported as immediate decarbonisation opportunities for the maritime, shipping, and construction transport sectors.

**Medium term:**

Throughout the medium term, Australia should support a variety of feedstock and production pathways to maximise domestic production capacity.

Approximately 85% of LCLF facilities expected to come online in the next five years will utilise HEFA production technology, relying on inedible animal fats (tallow), used cooking oil, and industrial grease as feedstocks.<sup>79</sup> HEFA is presently the most mature, lowest cost and investment-ready technology pathway for renewable diesel and SAF production using oil-based feedstocks.<sup>80</sup>

However, there is a need to diversify and scale up LCLF production through a range of technologies and feedstocks to meet growing demand. This includes expanding production through emerging technologies such as Alcohol-to-Jet (AtJ), which uses ethanol or butanol fuels; pyrolysis of biomass; and Fischer-Tropsch (FT), which utilises bio/agricultural wastes and residues as well as commercial, and MSW waste which would otherwise be left to decompose in landfill sites. Looking further ahead, Power-to-Liquid (PtL) technologies, which produce liquid hydrocarbons synthetically using renewable electricity, water, and carbon dioxide (CO<sub>2</sub>), will also contribute to expanding capacity.

To maximise the immediate and medium-term potential of LCLFs, it is crucial for governments to fully leverage HEFA's technological and commercial readiness. At the same time, it is essential to support and recognise in policy design emerging technologies to ensure continued future production growth.

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<sup>79</sup> <https://www.iata.org/en/pressroom/2023-releases/2023-12-06-02/>

<sup>80</sup> ['Analysis of the Potential of Meeting the EU's Sustainable Aviation Fuel Targets in 2030 and 2050' \(2023\)](#)

Therefore, a combination of mechanisms that support established pathways, as well as those that specifically de-risk emerging technology, could be effective to maximising domestic production capabilities.

**Long-term:**

LCLFs will continue to play a long-term role in transport sectors where electrification and hydrogen are not practically or economically feasible, as well as in existing liquid fuel-reliant technologies with long operational life spans. While electrification may become feasible for some diesel-reliant technologies in the long term, many heavy vehicles and marine technologies will still require renewable diesel due to Australia’s long-distance freight routes and the high cost and difficulty of replacing existing liquid fuel refuelling infrastructure. SAF will also still be required in aviation beyond 2050, as there is currently no viable alternative for decarbonisation.

Therefore, LCLFs will remain a priority in decarbonising Australia’s transport sector past 2050 and should be considered a long-term solution in our transport decarbonisation plan.

**25. What are the best ways for the Australian Government to work collaboratively with industry, business, governments and communities to implement the proposed pathways?**

We commend the Government for its engagement with industry during the consultation process for the various sector plans and believe that ongoing collaboration will result in effective outcomes. To strengthen this collaboration among industry, business, governments, and communities, we urge the Government to implement the proposed pathways through clear, consistent, and timely policy commitments that strategically align across different sectors. This approach will ensure a clear understanding of requirements, facilitating long-term investment and decision-making.

**25.1. What are good domestic or international examples of partnership and collaboration on transport and transport infrastructure emissions reduction that could inform the final Roadmap and Action Plan?**

Examples of international policies and collaborations:

- The success of “stackable” LCLF policies has been demonstrated in the US, where incentives such as the Blenders' Tax Credit (production tax incentives), the Renewable Fuel Standard (RFS) (as a demand side policy) at the national level, and state-level low-carbon fuel standards (LCFS) (also driving demand) like California's, contribute significantly to the cost competitiveness of LCLF products.<sup>81</sup> These incentives, when stacked further enhances the financial attractiveness of LCLF production and consumption for investors and consumers alike.
- **U.S cross department support:** In the U.S, both USDA (Agriculture) and US DOE (Energy), administer loan guarantee programs intended to reduce the risk of constructing first of a kind scaled up commercial facilities. The Biorefinery, Renewable Chemical, and Biobased Product Manufacturing Assistance Program assists companies in the development, construction, and retrofitting of new and emerging technologies for advanced biofuels, renewable chemicals

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<sup>81</sup> [Deloitte, 'The Transitioning Australia’s Liquid Fuel Sector: The Role of Renewable Fuels Report' \(May 2023\)](#)

and bio-based products by providing loan guarantees of up to \$250 million, for first of kind commercial facilities. An example of this was the US\$105 million loan guarantee to Fulcrum to help build the US\$266 million Sierra project in Nevada.<sup>82</sup>

- **The US Inflation Reduction Act (IRA)** introduces an array of measures to stimulate the adoption of LCLFs. This includes incentives for biodiesel, renewable diesel, SAF and advanced fuels production as well as support for renewable fuels infrastructure. The IRA includes the Biofuel Infrastructure and Agriculture Product Market Expansion Act and continues existing tax credit schemes.<sup>83</sup>
- **UK SAF Mandate:** New targets to ensure 10% of all jet fuel in flights taking off from the UK comes from sustainable sources by 2030 (approximately 1.5 billion litres). This includes a 2% SAF Mandate for 2025 and a progressive trajectory of related caps and obligations on industry.<sup>84</sup> Some key design elements of this Mandate include:
  - Periodical Review Assessment: Targets will be continuously assessed and formally reviewed at least every five years. The government will immediately review the mandate in case of a shortage causing significant unexpected price increases or potential buyout.
  - Stability, predictability and sufficient duration: Target is currently set for 15 years, from 2025 to 2040 to provide certainty to SAF producers and investors.
  - Recognise and promote emissions reduction performance: The Mandate will deliver carbon savings by setting annual targets on fuel suppliers to blend in a proportion of SAF into their fuel supply. It will operate as a tradeable certificate scheme where the supply of SAF is rewarded in proportion to its GHG emissions reductions.
  - Harmonisation and interplay with other domestic and international policy (stackability): The mandate will operate alongside the UK ETS, RTFO scheme, EU ETS, and CORSIA, allowing airlines to make emissions reduction claims under the UK ETS for eligible SAF.
  - Access to financing instruments to create price certainty (de-risk investment and provide stability): Government announced plans to design and implement a revenue certainty mechanism to attract private investment and enable SAF projects to be deployed at scale in the UK. The announcement also clarified that any mechanism will be industry-funded.<sup>85</sup>
- **Singapore SAF Target:** The Civil Aviation Authority of Singapore (CAAS) has launched the Singapore Sustainable Air Hub Blueprint as part of its efforts to decarbonise Singapore's aviation sector while enabling sustainable growth. This Blueprint includes the required use of SAF in flights departing Singapore starting in 2026. The requirement is expected to phase in starting at 1% in 2026, increasing to 3-5% in 2030, subject to global developments and the

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<sup>82</sup> [Biorefinery, Renewable Chemical, and Biobased Product Manufacturing Assistance Program | Rural Development \(usda.gov\)](#)

<sup>83</sup> [Deloitte, 'The Transitioning Australia's Liquid Fuel Sector: The Role of Renewable Fuels Report' \(May 2023\)](#)

<sup>84</sup> [UK Government 'Aviation fuel plan'](#)

<sup>85</sup> IATA, 'Supply push vs demand-pull: What is the right policy approach for upscaling SAF?' (SAFAANZ) & CFA Information Session (July 2024)

wider availability and adoption of SAF.<sup>86</sup> CAAS will also introduce a SAF levy on users (i.e. passengers and cargo) for the purchase of SAF. Key design considerations:

- Passenger levy will vary based on factors such as distance travelled and class of travel
  - Cargo levy will vary based on factors such as distance travelled and cargo weight
  - A fixed cost envelope approach will be adopted where the SAF levy will be set at fixed quantum based on SAF target and projected SAF price.
  - As an indication, for a 1% SAF uplift in 2026, CAAS estimates that the levy for an economy class direct flight from Singapore to Bangkok, Tokyo and London to be SGD3, SGD6 and SGD16 respectively. Levies for premium classes will be higher.
- **California's Low Carbon Fuel Standard (LCFS):** Low Carbon Fuel Standards are a variant of a mandate where volumes are based on an emissions intensity reduction trajectory and apply across all fuel use, not just jet fuel. Implemented in California, with success observed in reducing emissions in line with stated targets and delivering regional economic benefits to value chain participants. Recent analysis suggests the Californian LCFS has increased fuel prices for consumers by around 8c/L.<sup>87</sup>
  - **British Columbia, Canada, Low Carbon Fuel Standard:** The BC-LCFS Program sets carbon intensity reduction targets for transportation fuels, and these targets are gradually increased over time. Fuel suppliers are required to meet these targets by either blending lower-carbon fuels into their products or purchasing credits from other suppliers who have succeeded to exceed their targets. This program covers both road and aviation but implements a slower reduction schedule for aviation (given the nascency of the SAF market relative to renewable diesel) and includes a volumetric sub-mandate for SAF (starting at 1% in 2028, 2% in 2029 and 3% in 2030) to ensure SAF adoption.<sup>88</sup>
  - In Sweden more than 95% of gas used in natural gas vehicles comes from biomethane because there is value in using biomethane to support transportation greenhouse gas objectives<sup>89</sup> (Swedish Biogas Research Centre, 2020). Sweden aims to phase out the remaining natural gas in gas vehicles by 2030, transitioning entirely to 100% biogas.<sup>90</sup>
  - In the U.S, biomethane development has been driven by the transport sector and supported by schemes such as the Renewable Fuel Standard (RFS) and California's Low Carbon Fuels Standard (LCFS). The new RFS Set Rule aims to double biomethane supplies in the next three years. Given the obligation volumes proposed, the pipeline of projects under development and California's targets for injected biomethane, biogas and RNG supplies combined are expected to expand rapidly in the next five years.<sup>91</sup>

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<sup>86</sup> [The Civil Aviation Authority of Singapore \(CAAS\), 'Singapore Sustainable Air Hub Blueprint' \(2024\)](#)

<sup>87</sup> Deloitte, prepared for the Queensland Department of State Development, Infrastructure, Local Government and Planning 'Preparing for take-off: the case for public-private collaboration to catalyse an Australian SAF value chain' (September 2023).

<sup>88</sup> [British Columbia's Low Carbon Fuel Standard: Pioneering Clean Fuel Standard Programs](#)

<sup>89</sup> Swedish Biogas Research Centre, 2020

<sup>90</sup> [EBA, 'Sweden: More biogas is necessary for fossil-free transportation'](#)

<sup>91</sup> [IEA, 'Renewables 2023 - Special section: Biogas and biomethane' \(2024\)](#)


**25.2. What opportunities can the government leverage to show leadership in Australia and internationally?**

Australia's geographic location provides access to key export markets in the Asia and the Pacific region, making it a leading demand centre for international carriers. With its prime feedstock position, agricultural capabilities, refining potential, renowned ingenuity, and array of stakeholders across the entire value chain who are ready to act, Australia should be a key leader in supplying LCLFs across the Asia-Pacific. A domestic LCLF industry not only strengthens national fuel security and energy independence by reducing our reliance on imports but also supports regional energy security initiatives.

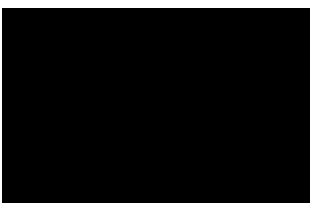
**26.1. What other data and evidence could governments use and how could this offer further insights on the pace, scale and location of transport emissions reduction pathways?**

We recommend the Government capitalise on international learnings to develop a transport decarbonisation plan with social license and sustainability at its core. While Australia currently lags behind its global peers in decarbonising the transport sector and establishing a LCLF industry, we have a unique opportunity to learn from nations that have made significant strides in this area. By studying international examples, successes, and challenges, we can develop a more effective policy framework that maximises Australia's inherent advantages while ensuring development aligns with social license principles.

We strongly recommend that the Government prioritise LCLFs as an essential short- to long-term solution for reducing emissions across Australia's transport sector.

Thank you for taking the time to consider our submission. Any questions or request for further assistance are welcome and can be directed to 

Sincerely,



CEO Bioenergy Australia