

Queensland

Good jobs
Better services
Great lifestyle

Sustainable liquid fuels strategy

OPTIONS AND OPPORTUNITIES PAPER

May 2023



Minister's foreword



It's never been a more exciting, challenging, or opportune time to be working in the energy industry. Not since the industrial revolution have we sat on the precipice of such a monumental transformation of our global economy. A transformation that promises abundant access to clean energy; thousands of new highly skilled and secure jobs; and a safeguard for a healthy climate for generations to come.

The Queensland Government is delivering transformational opportunities through the Queensland Energy and Jobs Plan, which will deliver clean, cheaper, secure electricity across the Queensland SuperGrid, to be powered by 70 per cent renewable energy by 2032.

It is this same ambition, partnered with Queensland ingenuity, that propels our commitment to decarbonise our transport and mobility sector too.

Action 1.7 of the Queensland Energy and Jobs Plan commits our government to partner with industry, consumers, and the federal government to deliver a sustainable liquid fuels strategy.

Queensland is already leading the way with rapid uptake of E10 and biodiesel, following the Queensland Government's fuel mandates to drive consumer uptake and support feedstock suppliers and refineries in Queensland.

As alternatives such as electrification and hydrogen mature, we now face the next challenge to identify long-term growth opportunities for Queensland's sustainable liquid fuels industry. While electrification and hydrogen will unlock enormous emissions reduction potential in light and commercial vehicles, sustainable liquid fuels will provide the long-term solution in hard to abate sectors, such as aviation and marine transport.

Critical to realising these solutions will be input from a broad range of stakeholders, including consumers, producers, and suppliers. This paper is the first step in developing the sustainable liquid fuels strategy and is targeted towards receiving your input. This input will shape the strategy and ensure it captures and reflects stakeholder experiences and opportunities. Importantly, it will also help identify the key priorities and actions that should be included in the draft strategy that we will develop and release for consultation in the future.

Mick de Brenni MP
Minister for Energy, Renewables and Hydrogen
and Minister for Public Works and Procurement



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Have your say

This paper sets out 18 questions for stakeholders to prompt feedback and information sharing. You are encouraged to answer the questions that are relevant to you or your organisation. Please email feedback submissions to fuelsstrategy@epw.qld.gov.au to have your say.

Following consultation, we will consider feedback provided to inform ongoing industry engagement on the options and opportunities raised by stakeholders. A draft sustainable fuels strategy will be developed throughout 2023 and released for consultation in 2024.

1. Objectives

The Queensland Government is committed to an economy-wide 30 per cent emissions reduction below 2005 levels by 2030, and zero net emissions by 2050. Our renewable energy targets will provide more renewable energy and will benefit sectors that electrify and transition to hydrogen fuels. Other Australian governments, industries and customers have their own emissions reduction commitments.

The scale of existing petroleum fuel use is significant, representing about half of Australia's energy consumption. Recognising that Queensland's existing energy footprint includes significant reliance on liquid fuels, the Queensland Energy and Jobs Plan commits to the development of a fuels strategy to accelerate the uptake of sustainable liquid fuels. These liquid fuels have a lower carbon footprint than petroleum fuels and are from renewable sources. Some of these include renewable diesel, biodiesel, ethanol and sustainable aviation fuel (SAF).

Some customers may switch to lower carbon or renewable fuels either as a transition fuel (as other technologies like electrification and hydrogen mature) while others may use it as an ongoing fuel source. It is expected that users of existing petroleum fuels will, over time, transition to a mix of sustainable liquid fuels, renewable electricity and hydrogen. It is therefore important to recognise and acknowledge the linkages and synergies between the sustainable liquid fuel strategy and other relevant strategies. For example, hydrogen can provide an important input into the production of SAF.

With this in mind, it is critical that the sustainable fuels strategy contributes to decarbonisation by:

- expanding options and availability of cleaner fuels for petroleum customers in key sectors
- leveraging Queensland's significant resources, capability and industry to provide an economic opportunity for Queensland by reducing fuel imports and boosting domestic fuel production
- unlocking downstream and customer demand to support the sustainable liquid fuel industry.

A domestic sustainable fuels industry will be supported by local feedstocks, providing further opportunities for agriculture.

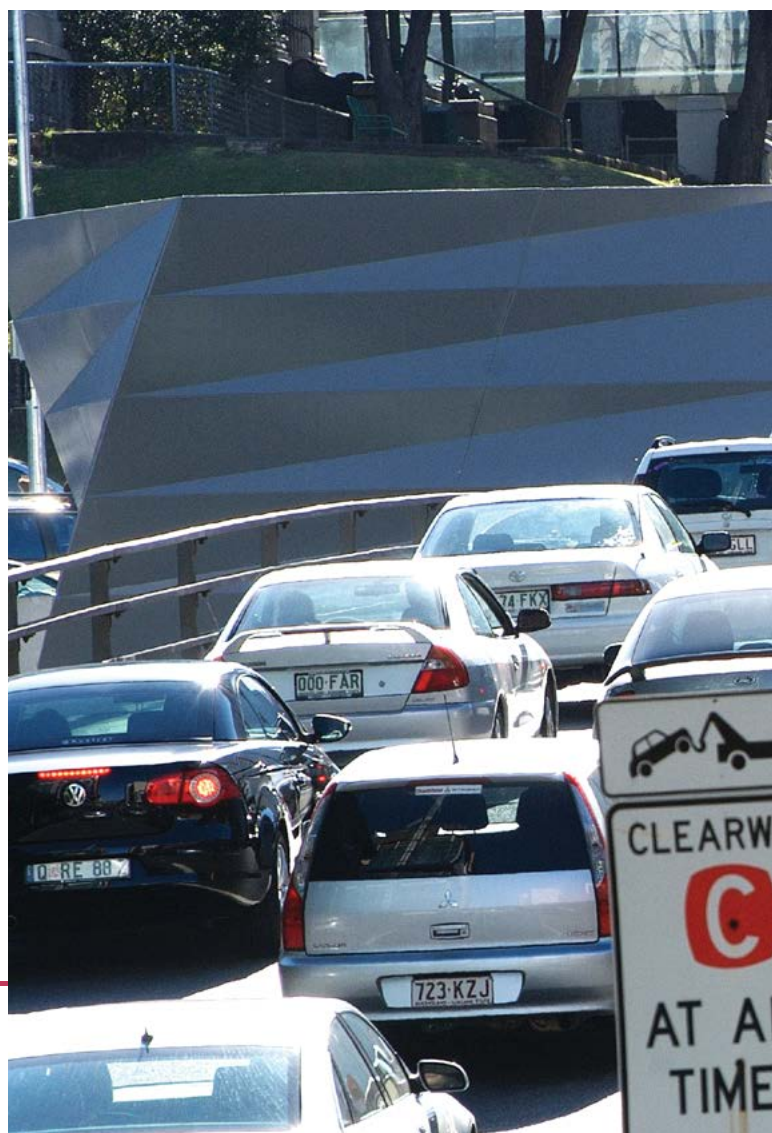
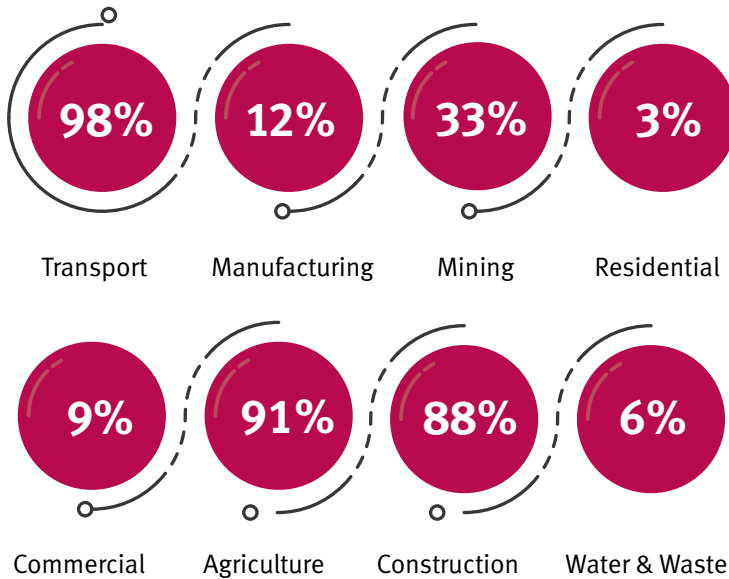


Figure 2.1 Industry reliance on petroleum



Source: final energy consumption in Australian Energy Statistics 2018-19

Consultation questions: objectives

1. Are there other objectives that you think should be included?
2. How should a 'sustainable' liquid fuel be defined to contribute to decarbonisation objectives?

2. Switching to cleaner energy sources

We anticipate that sustainable liquid fuels will have different roles in different sectors.

Many Australian industries and their customers rely now on petroleum to fuel their businesses and lifestyle.

For some customers, sustainable liquid fuels will be useful as a **transition fuel** while alternative technologies are developed, such as electrification or hydrogen. Customers in **hard to abate sectors** will likely require sustainable liquid fuels, both on the path to net zero and beyond in their long-term future state. The final future fuel sources across Australia are not clear and are likely to differ between sectors and user cases. For example, future fuels could include hydrogen based liquid fuels such as e-fuels, e-SAF, ammonia, or fuels derived from different sources such as renewable diesel, SAF, other biofuels, or electrification.

Some customers will **move directly** to electrification or hydrogen. Electric vehicle uptake of light vehicles in Queensland is expected to accelerate. Queensland's Zero Emission Vehicle Strategy 2022-2032 sets targets of 50 per cent of new passenger vehicle sales to be zero emission by 2030, moving to 100 per cent by 2036, with electrification and hydrogen expected to play a key role.

Based on market analysis, anecdotal evidence and stakeholder feedback, it is expected that the aviation, marine, construction and heavy industry (e.g. mining) sectors, as well as heavy transport and agriculture are likely to require liquid fuels in the medium to long-term, albeit to different degrees. Figure 2.2 illustrates those sectors more likely to rely on liquid fuels through to those with less reliance.



Figure 2.2 Sector reliance on liquid fuels

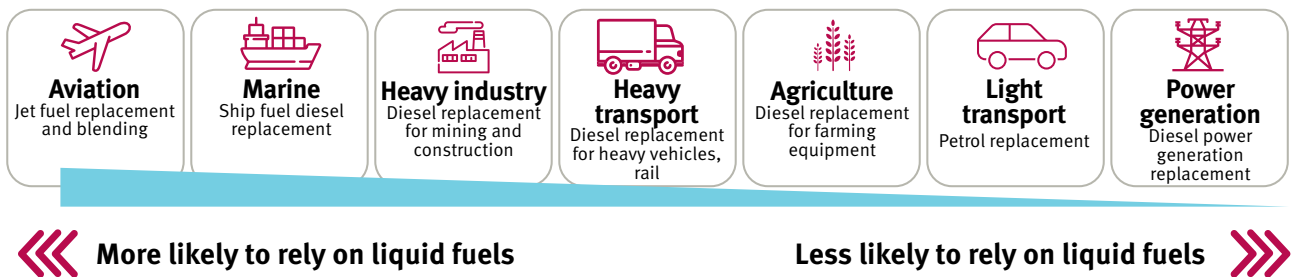
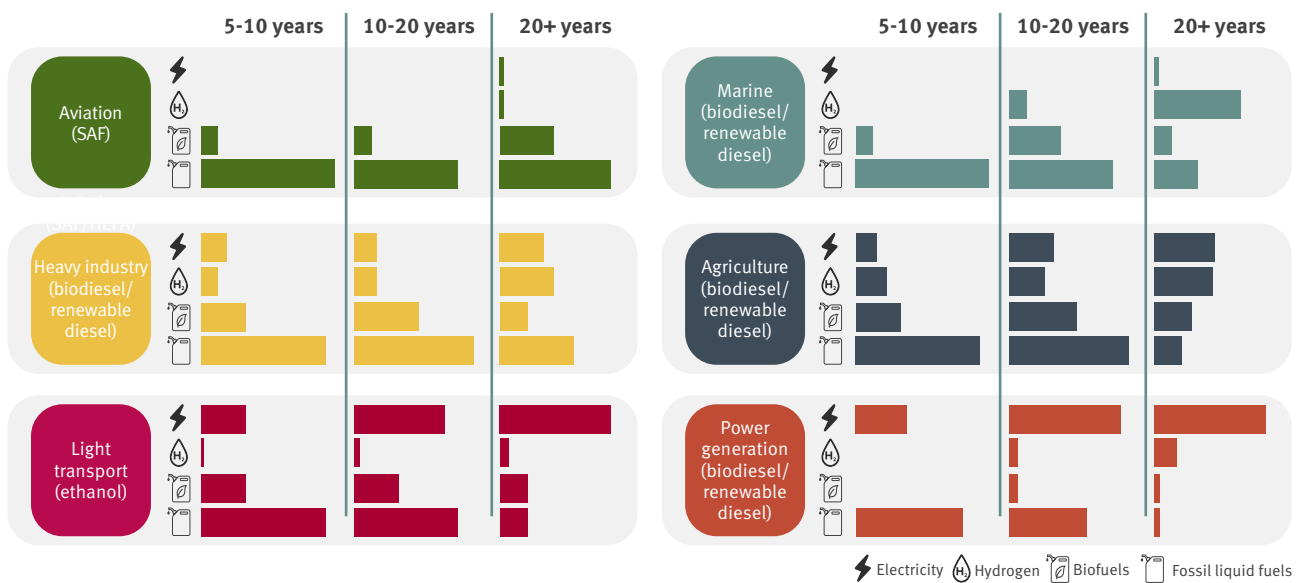


Figure 2.3 Fuel source transition and primary fuel type





Consultation questions: switching to cleaner energy sources

Figure 2.3 shows that some sectors are likely harder to abate and will continue to rely on liquid fuels, with some indicative timeframes.

The Queensland Government has supported growth of domestic sustainable liquid fuels, such as E10 and biodiesel, including through the biofuels mandate. The government has also supported a number of sustainable liquid fuels trials with construction companies (B20), shipping operators (B20) and public transport networks (E95) to demonstrate to end users the operational benefits of these fuels.

In the aviation sector, the government is working closely with the Australian Government's Department of Infrastructure, Transport, Regional Development and Local Government on a Jet Zero-style Council, which will complement the Aviation White Paper and set the scene for the next generation of growth and development across this sector. One of the priority areas is how to maximise the contribution of the aviation sector to achieving net zero, including through SAF and emerging technologies.

In the defence sector, the Australian Government has agreed with the recommendation in the Defence Strategic Review 2023 that it should accelerate its transition to clean energy to increase the country's energy resilience, with a plan to be presented to the Australian Government by 2025.

The global Original Equipment Manufacturer's (OEMs) markets are continuing to respond to the demand for decarbonisation, including the use of sustainable liquid fuels which will, over time, flow through to vehicles and equipment across all sectors.

3. Do you agree that the sectors identified as 'hard to abate' are likely to continue to rely on liquid fuels in the medium to long-term?
4. Are there any transitional and/or long-term fuels that should be prioritised to leverage timeframes and Queensland's resources, capabilities and industrial base?
5. Where and when do you see the opportunities for the following types of sustainable liquid fuels, both as transitional fuels and as long-term fuels?
 - Sustainable aviation fuel
 - Renewable diesel
 - Biodiesel blends (B5, B20, etc)
 - Ethanol-blended fuels (E10, E85 etc)
 - Other sustainable fuel types (please describe)
6. Will sustainable liquid fuels be an important part of your decarbonisation journey?
7. Where do you see customer demand for sustainable liquid fuels, with reference to different fuels and industry sectors?
8. What do you/your customers need now, and what will you require in the future?

Ethanol blended fuel retail sales have grown by 12 per cent in Queensland since the biofuels mandate commenced in 2017. Sales have grown from 513 million litres in 2017 to 574 million litres in 2022.

This growth occurred in spite of overall retail petrol sales declining by 10%, from 3.2 billion litres in 2017 to 2.9 billion litres in 2022.



3. Adoption of sustainable liquid fuels

Petroleum fuels currently dominate liquid fuels supply. Petroleum jet fuel accounts for about 98 per cent of fuel use in aviation and more than 20 per cent of costs. The use of SAF is in its infancy with growth expected to be driven by industry-led commitments of 10 per cent SAF by 2030, and local and global climate policies. Sustainable fuels make up less than 1 per cent of marine fuels with growth expected to be driven by International Marine Organisation requirements, industry commitments and climate policies. Mineral diesel in heavy industries has a small share of biobased diesel use, with renewable diesel showing potential as a sustainable ‘drop-in fuel’.

The government is aware of some stakeholder concerns about cost, availability and OEM compatibility as potential barriers to the adoption of sustainable liquid fuels, as well as a range of challenges across the supply chain (see table 3.1).

It is critical in developing the strategy that government clearly understands the barriers to the uptake of sustainable liquid fuels, and the priority in which those barriers should be addressed (to the extent they can be by government). Also, it’s critical to understand the drivers of customer uptake, including economic and corporate environmental, social, and governance goals, and how these are valued in the costs to customers of using sustainable liquid fuels (e.g. costs to lower greenhouse gas).



Consultation questions: adoption of sustainable liquid fuels

9. What do you consider to be the most fundamental barriers to sustainable liquid fuel uptake? Do you expect these barriers to change over time?
10. How do you think potential feedstock or production trade-offs should be managed to prioritise resources where competition exists between transitional and emerging sustainable fuel types?
11. Does the lower carbon content of sustainable fuels justify a cost premium relative to traditional fuels? If so, what is the value proposition?
12. Are there any fuels that should be prioritised on a 'least regrets' basis?

Table 3.1 Sustainable liquid fuels adoption challenges.

	Near-term challenges	Mid to longer-term challenges
Customer procurement	Consumer uptake of sustainable liquid fuels is low in Australia, primarily driven by cost difference and perceived operational capability. Ultimately sustainable fuels will need to be cost competitive and technically compatible to increase uptake.	In the long-term, sustainable liquid fuels will likely be in competition with hydrogen and electrification solutions, with the market share likely to decrease. Sustainable fuels will need to compete in the future, as customers consider comparative carbon abatement costs between available options.
Supply chain	Numerous short-term supply chain issues impede the growth of the industry, including the ability to procure, blend and store renewable fuels in sufficient quantities. Current supply chains are not designed in the way required to connect the energy, agriculture and industry sectors to encourage low-cost production and distribution of sustainable liquid fuels.	The key challenges will revolve around the development of second and third generation sustainable liquid fuel types as adjustments to existing supply chain issues. Key supply chain challenges include enhancing capabilities for bulk shipping, blending, and storage, and distribution to optimise logistics.
Feedstock	Current Queensland first generation sustainable liquid fuel feedstock is a by-product of a food crop or a post-consumer food waste product. However, current global sustainable liquid fuel technologies can directly conflict with agriculture for water and land use, raising concerns for the impact its production will have.	Advanced biofuels that are developed from non-food feedstocks or by-products can avoid these externalities. They are expected to be a significant share of global biofuel production until the 2030s. However, non-food feedstocks are not immune to market externalities as international subsidies increase renewable fuel take up.
Standardisation	Sustainable liquid fuel standards are already in place in the aviation industry, but it may be early for standardisation of production in other sectors, due to current industry immaturity. Existing Australian fuel quality standards do not align with international standards for next generation fuels (e.g. Euro 6, ASTM D975). Domestic standards will have to ensure that the need for exemptions are reduced.	Meeting certification standards for new processes can take up to 4-10 years depending on the technological maturity of the fuel, raising concerns for the pace of implementation of standards in other industries. It is assumed all vehicles imported to Australia with modern Euro 6 engine designs will require Euro 6 compatible fuels.
International competition	Other countries have significant incentives to support sustainable liquid fuels. Australia will need to ensure its sustainable domestic renewable fuels industry is internationally competitive.	



4. Policy, regulatory and standards settings

The government is committed to reducing Queensland's greenhouse gas emissions. There are a wide range of government policies that are related or aligned to this strategy. These include:

- 30 per cent reduction on 2005 emissions by 2030, and zero net emissions by 2050
- 50 per cent renewable energy by 2030, 70 per cent by 2032, and 80 per cent by 2035 under the Queensland Energy and Jobs Plan
- a climate positive Brisbane 2032 Olympic and Paralympic Games.

There are also a range of policies that directly relate to, or will impact sustainable fuels, including:

- Queensland Hydrogen Industry Strategy 2019-2024
- Queensland Biofutures 10-Year Roadmap and Action Plan (June 2022 update)
- Queensland's sustainable biofuels fuels mandates (Liquid Fuel Supply Act 1984)
- Queensland's net-zero emissions transport roadmap, currently under development
- Queensland Freight Strategy – Advancing Freight in Queensland (10-year strategy)
- Queensland Low Emissions Agriculture Roadmap 2022–2032
- State Infrastructure Strategy 2022–2042. A clear vision for infrastructure requirements over the next two decades.

The Australian Government also sets key liquid fuel and sustainability legislative and policy settings. Recent commitments will also influence the role of, and demand for, sustainable liquid fuels, including expanding the Safeguard Mechanism, and its ongoing proposals for new fuel efficiency and quality standards.



The reformed Safeguard Mechanism sets emissions baselines for scope 1 emissions of the highest emitting facilities captured under the regime. These baselines will be reduced annually in line with Australia's climate goal to reduce national emissions to 43 per cent below 2005 levels by 2030, and to achieve net zero emissions by 2050. The Australian Government proposes to include definitions in the National Greenhouse Gas Emissions Reporting regulations for biodiesel, renewable diesel and renewable paraffinic kerosene, with a zero carbon dioxide emissions factor to allow use of these fuels to reflect a reduction in emissions.

Proposed fuel efficiency standards announced as part of the National Electric Vehicle Strategy to lower the average carbon emissions of new vehicles, also presents a potential opportunity for lower carbon fuels and cleaner fuel sources.

The Australian Government also sets technical fuel standards and the fuel excise and duty rates for petroleum and sustainable liquid fuels, and the rules for fuel tax credits, which influence the relative costs of petroleum liquid fuels to sustainable liquid fuels.

Queensland's sustainable biofuels mandates

The *Liquid Fuel Supply Act 1984* requires some fuel sellers (fuel retailers and fuel wholesalers) to sell sustainable biobased fuel, such as E10 or biobased diesel. Sustainable biofuels mandates, which commenced on 1 January 2017, set minimum amounts for the sale of biobased petrol and biobased diesel. Both mandates are separate from each other.

The biobased petrol mandate requires that at least 4 per cent of the total volume of regular unleaded and ethanol blended petrol sales by liable fuel retailers, must be biobased petrol (e.g. ethanol). This means that, on average, at least four in 10 retailer customers need to choose E10 over regular unleaded petrol for the retailer to meet the mandate. Prior to 1 July 2018, the biobased petrol mandate was set at 3 per cent.

The biobased diesel mandate requires 0.5 per cent of all diesel fuel sold by fuel wholesalers to be biobased diesel (biodiesel). The biobased diesel mandate does not apply to fuel retailers.



Prescribed sustainability criteria are in place to mitigate unintended environmental impacts of biofuels. This includes greenhouse gas savings of at least 20 per cent when compared to regular petrol or diesel, and recognised certifications under environmental sustainability standards.

Over time, these mandates have supported an uplift in supply and availability of biofuels and an increase in the percentage of biofuels sold in Queensland. However, as these mandates are focused on supply by wholesalers and retailers, the ability for fuel retailers to sell the mandated amount is determined by a range of factors, including customer demand.

Roadmaps and strategies

The **Advance Queensland Biofutures 10-year Roadmap and Action Plan** identifies the critical role of sustainable liquid fuels. Since 2016, the government has contributed \$31 million towards supporting 42 biofutures projects around the state. Biofutures brings together old and new industry by finding solutions for traditional industry challenges, and creating opportunities around energy, waste and emissions.

Queensland is now home to several Australian firsts, including biofuel trials for aviation, containerised shipping, construction, public transport and a 100 per cent renewable diesel engine trial with Swedish vehicle manufacturer Scania. The government is continuing to work with these sectors to transition them to more sustainable fuel sources, demonstrating Queensland as a leading destination for clean energy investment.

The Biofutures Roadmap was refreshed in June 2022, to recognise changing global attitudes and the industry advances that have created new challenges, while opening up new opportunities for market diversification. As global demand for cleaner fuels grows, Queensland is seizing the opportunity to secure jobs by partnering with sectors including aviation, maritime and heavy vehicles to help decarbonise and transition to more sustainable fuel sources.

Oceania Biofuels has chosen Gladstone to establish its \$500 million biorefinery, which will be Australia's first commercially SAF biorefinery, creating around 60 direct jobs and indirectly supporting an estimated 500 regional jobs during construction and operation. Queensland has considerable advantages for biofutures, including an ideal climate, mature and modern agricultural industry, well established supply chains, a highly skilled workforce, and innovative research institutions. These advantages are why Queensland can be a world-leading and sustainable region for the biofutures industry.



Growing global demand for clean energy to power our way of life, provides an opportunity to create more jobs here in Queensland and grow our economy. Complemented by the development of local, reliable sources of green hydrogen through the Queensland Hydrogen Industry Strategy, Australians will benefit from increasing supplies of reliable, affordable and renewable energy.

The Queensland Low Emissions Agriculture Roadmap 2022–32 includes pathways to assist the sector to explore and transition to alternative on-farm fuel and energy sources.

The Queensland Government also has a range of other strategies that will interact with existing users of liquid fuels. In particular, the **Queensland Zero Emissions Vehicle Strategy 2022-32** targets a significant uplift in use of zero emissions vehicles (e.g. electric or hydrogen powered transport), specifically light vehicles, government fleets, as well as actions to mature zero emission technologies for light commercial, heavy vehicles and marine craft.

The **Queensland Hydrogen Industry Strategy 2019-2024** reflects the diverse uses of hydrogen, including transport and stationary energy. Use of hydrogen in transport is recognised as an area where hydrogen could be cost-competitive with existing transport fuels, particularly in the heavy vehicle sector where refuelling times are comparable to conventional diesel vehicles. Renewable energy producer Ark Energy and freight operator Aurizon are being supported with funding through the Hydrogen Industry Development Fund to trial semi-trailers in their Townsville fleets.

There is also increasing investment interest in hydrogen, both for direct combustion/power generation and as a feedstock for the production of sustainable fuels particularly for shipping and aviation. Global shipping giant A.P. Moller – Maersk aims to achieve net zero greenhouse gas emissions in 2040 across the entire business with 19 dual fuel vessels ordered that can run on green methanol. Global aircraft manufacturers Boeing and Airbus have announced plans for hydrogen powered commercial aircraft, whilst Boeing subsidiary InSitu is developing hydrogen powered unmanned aerial vehicles for defence applications where they are expected to deliver longer range, increased power availability, as well as lower acoustic signature.

5. Conclusion

The future fuels landscape in Queensland is presenting new and diverse challenges as energy demand pivots to low-carbon, sustainable, and economical future fuels. The strategy seeks to maximise the opportunities for sustainable liquid fuels produced in Queensland to contribute to a decarbonised future fuel mix. This will support the Queensland Energy and Jobs Plan's vision to deliver clean, reliable, and affordable energy.



Consultation questions: policy settings

13. Are the existing mandates supporting uptake of sustainable liquid fuels? If so, how can they be improved? If not, what should change?
14. What other policy or regulatory options that should be considered?
15. How should the strategy interact with Australian Government commitments?
16. Do any of the following act as an enabler or a barrier to using sustainable liquid fuels in your industry/business?
 - Industry standards
 - Australian Government standards
 - International standards
 - State regulatorion or policy
17. What is needed for you to produce/ invest/use sustainable liquid fuels in Queensland?
18. What lessons can we learn from other Australian states or internationally about the future fuels transition?



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2023