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**Department of Infrastructure, Transport,
Regional Development, Communications and the Arts**

**Department of Climate Change, Energy,
the Environment and Water**

Low Carbon Liquid Fuels

A Future Made in Australia: Unlocking Australia's low carbon liquid fuel opportunity

Consultation Paper



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Acknowledgement of Country

First Nations people have the oldest continuing cultures in the world. It is fitting to reflect on the thousands of generations of traditional knowledges that First Nations people hold, and generously share.

We acknowledge the diversity of First Nations cultures, languages and practices across the country and the resilience of First Nations people in keeping these alive. In delivering this consultation paper, we recognise the importance of listening to the voices and perspectives of local First Nations people and responding to the uniqueness of each place.

We thank First Nations people for their continuing custodianship of, and care for, the Country that we live and work on today.

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Introduction

Low carbon liquid fuels are part of a Future Made in Australia

The Australian Government has announced a new *Future Made in Australia Act* to anchor a coordinated package of reforms and initiatives which will support the growth of new industries that will benefit communities and workers. The Future Made in Australia legislative package will boost investment, create jobs, capitalise on our comparative advantages and build sovereign capability in areas that are in the national interest.

The low carbon liquid fuels (LCLF) industry has been identified as a priority as part of the Government's Future Made in Australia agenda. This is because of the important role these fuels will play in Australia's net zero transformation, potential competitive advantage in Australian domestic LCLF production, and the need for public investment in order to align economic incentives with the national interest and unlock private investment at scale. LCLFs will also strengthen Australia's industrial capabilities, including in Australia's regions. It is supported by identified private sector interest in investing in LCLF production in Australia, and expressions of interest from commercial customers.

LCLF can be produced sustainably from waste materials, biomass, or by combining hydrogen from low or zero carbon feedstocks with captured carbon dioxide. Some examples include Sustainable Aviation Fuels (SAF), renewable diesel, and e-fuels. They can be produced in different ways with different resulting fuel properties.

The LCLF being considered in this paper consist of 'advanced biofuels' and synthetic or e-fuels, namely renewable diesel and SAF. One of the key benefits of advanced biofuels, as opposed to conventional biofuels (also known as 'first generation biofuels'), is that they are drop-in fuels, meaning they are compatible with existing fuel infrastructure.

Conventional biofuels are generally considered to be biodiesel produced from vegetable oils, or ethanol produced from sugarcane, corn or wheat and are not typically 100 per cent compatible with existing fuel infrastructure or with existing vehicles, ships and planes.

Advanced biofuels include renewable diesel, green diesel, Fisher-Tropsch (FT) diesel, SAF and bio-gasoline. They can also be referred to as second-, third- and fourth- generation fuels, depending on the feedstock used, and can be produced from non-food feedstocks, such as municipal solid wastes and agricultural wastes and non-food crops.¹

Purpose of this paper

This paper builds on public consultations on the Aviation Green Paper, renewable diesel fuel quality standards, the Electricity and Energy Sector Plan and will support current consultation on the Transport and Infrastructure Net Zero Roadmap – the Transport Sector Plan.

¹ ARENA and CEFC: Biofuels and Transport: An Australian Opportunity

Feedback received through this consultation process will be considered in development of the Electricity and Energy Sector Plan and the Transport and Infrastructure Net Zero Roadmap.

In response to consultation to date, the Australian Government has announced that it is:

- Expanding the Guarantee of Origin scheme to track and verify emissions from the production of LCLFs – a key building block to the use of LCLFs in Australia; and
- Establishing the \$1.7 billion Future Made in Australia Innovation Fund for priority sectors, including to support the development of nascent LCLF production pathways.

The Australian Government recognises the importance of effective policy to support the development of an Australian LCLF industry. This consultation paper focusses on policy approaches to accelerate investment and incentivise efficient production of LCLFs. It seeks views on the optimal policy mix, including the design of production incentives and demand-side options and the interaction of these measures, to ensure Australia has appropriate policy settings to encourage the growth of this important industry in a way that delivers compelling public value while minimising price impacts and promoting competition.

Government is seeking informed views, data and analysis, including from industry, unions, trading partners, and state and local governments. Your response will inform how an Australian LCLF industry will be supported, and be considered alongside responses received through existing consultation processes. Insights from the consultation will inform the Government's development of the Electricity and Energy Sector Plan and a Transport and Infrastructure Net Zero Roadmap, and further regulatory impact analysis on the introduction of an LCLF mandate or other demand measures to support an LCLF industry.

The low carbon liquid fuels opportunity

Today, Australia relies on liquid fuels for more than half of our final energy demand. This is particularly the case for transport, which accounts for around 70 per cent of Australia's consumption of refined liquid fuel products. To achieve Australia's legislated commitment to reach net zero emissions by 2050 and to reach emissions levels of 43 per cent below 2005 levels by 2030, Australia needs a pathway to decarbonise sectors of the economy reliant on fossil liquid fuels.

For many sectors, including medium-long distance aviation, heavy road and domestic maritime transport, and non-transport sectors such as mining, agriculture and construction, electrification and in some cases renewable hydrogen, are not an option. These sectors (excluding international aviation) are projected to represent close to 20 per cent of Australia's emissions out to 2030² and are projected to remain reliant on liquid fuels – particularly aviation fuel and diesel – out to 2050.

LCLFs offer an alternate decarbonisation pathway for these sectors.

LCLFs are currently estimated to be between 2 and 5 times higher in cost than their unabated fossil fuel counterpart, but provide the cheapest available approach to abatement for the aviation industry and

² 68 Mt CO₂-e totalled from: Transport sector (articulated trucks, rigid trucks, rail, domestic aviation and maritime) and stationary energy (mining, agriculture, forestry and fishing, petroleum refining and construction). Source: DCCEEW Australia's emissions projections 2023: [Australia's emissions projections 2023 - DCCEEW](#)

the costs are expected to decrease over time as technology and scale improves. These fuels are expected to be utilised by sectors where performance requirements are high and few alternative emissions abatement options are likely to become available.

CSIRO's Sustainable Aviation Fuel Roadmap (2023) notes Australia's large landmass, temperate climates, advanced farming practices, access to renewable feedstocks, established supply chains and renewable energy potential are all assets in developing a range of feedstocks to support a domestic SAF and renewable diesel industry.

Australia is already a competitive producer of feedstocks used for LCLFs, exporting 400 kt of tallow and approximately 3.4 Mt of canola seed to Europe in 2022. Competitiveness in this segment of the supply chain contributes to broader cost competitiveness as feedstock costs are a primary driver of the total costs of producing LCLFs.

One of the principal challenges of achieving commerciality is aligning sufficient offtake agreements with feedstock providers with demand for sustainable fuels, at a scale that supports establishing a production facility. However, the Australian aviation industry is large enough to provide demand for commercial-scale refineries, provided there is broad adoption of SAF as part of the transition to net zero.

Insufficient alignment of decarbonisation and economic incentives currently poses a barrier to the development of Australia's LCLF industry. The purchasing of Australian Carbon Credit Units is currently a cost-effective approach for fuel-intensive facilities that are captured under the Safeguard Mechanism to reduce their emissions. However, reaching net zero across Australia's economy by 2050 will require greater investment in direct abatement by these industries.

Better aligned demand requirements and production incentives could create the conditions for commercially competitive production of LCLFs at scale in Australia. This would enable facilities where it is difficult to substitute fuel demand to make a greater contribution to emissions reduction, supporting Australia's overall commitment to achieve net zero emissions by 2050.

In a global net zero economy, low carbon liquid fuels will be in high demand

With transport sectors (aviation, heavy vehicles and maritime), and construction, mining and agriculture sectors expected to continue to rely on liquid fuels in the medium term, demand for LCLF is expected to grow.

Currently, Australia does not produce advanced biofuels or e-fuels including SAF or renewable diesel (CSIRO, 2023³). Some airlines which operate in Australia and internationally use a small quantity of SAF in *international* airports, totalling 18 ML in 2022 and 2023 (BNEF, 2023⁴).

The market for drop in LCLFs is expanding rapidly. Production capacity is split across three main categories: SAF, renewable diesel (both in-scope for this consultation) and naphtha (another type of hydrocarbon fuel used in heavy crude oil dilution, as a cooking fuel and in the production of plastics, not in-scope for this paper).

³ CSIRO (2023) Sustainable Aviation Fuel Roadmap

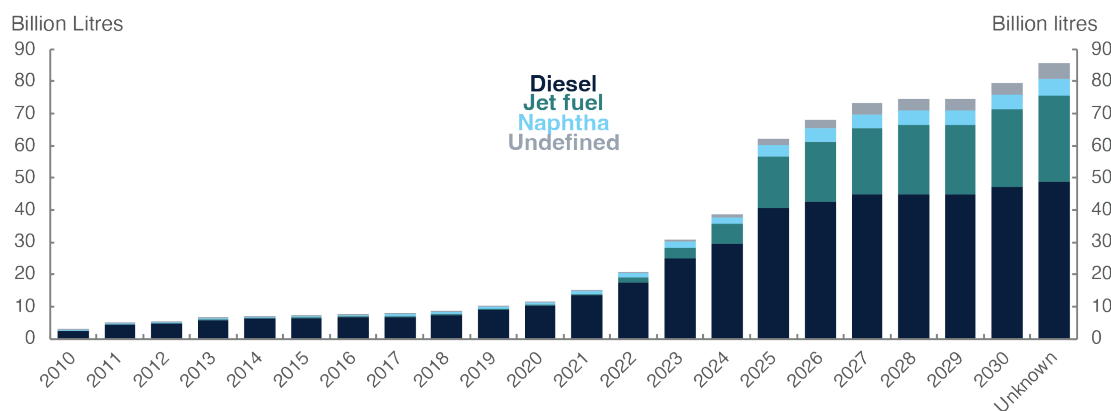
⁴ BloombergNEF (2023) Airline SAF procurement agreement data

Global supply of LCLF is growing rapidly and total global production is expected to quadruple by the end of the decade (Figure 1). In 2023, roughly 24,996 ML of renewable diesel, 3,425 ML of SAF and 1,758 ML of naphtha was estimated to be produced, totalling roughly 30,179 ML of LCLF (BNEF global tracker⁵). An additional 14,763 ML of LCLF is expected to be produced by new projects with no current start date, or a start date after 2030.

A substantial proportion of LCLF production is aimed at producing renewable diesel for heavy vehicle on-road use (more than 82 per cent in 2023) but the number of projects producing SAF and the total quantity of SAF produced is expected to increase (Figure 2). Currently, SAF capacity at the end of 2023 is 9 per cent of global supply, and this is on track to grow to 32 per cent by 2030.

Figure 1: Global production of LCLFs is increasing

Estimated cumulative global production of LCLF



* 'Unknown start date' refers to total additional expected production from projects where there is no announced start date

Source: BNEF 2023⁶

Currently, 99 per cent of global commercial-scale production of LCLF utilises the most mature pathway, hydroprocessed esters and fatty acids (HEFA), due to synergies with traditional oil refining. This technology is expected to dominate for the foreseeable future, but other technologies are expected to grow in use over time. By 2030, alternatives like gas-to-liquids, alcohol-to-jet and power-to-liquids are expected to account for 15 per cent of production (BNEF, 2023⁷).

⁵ BloombergNEF (2024) Global Renewable Fuel Projects Tracker (1.2.5)

⁶ BloombergNEF (2023) Global Renewable Fuel Projects Tracker (1.2.5)

⁷ BloombergNEF (2024) Global Renewable Fuel Projects Tracker (1.2.5)

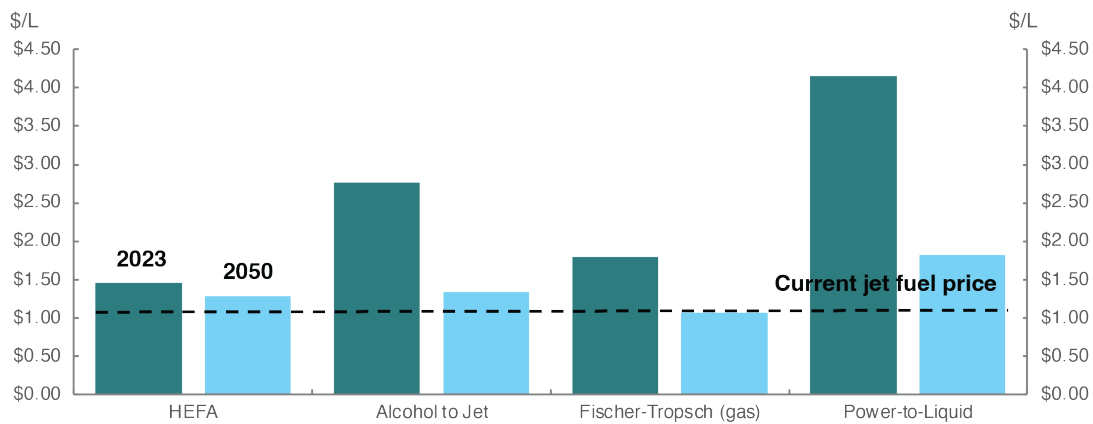
Currently, SAF use represents a very low proportion of total global aviation fuel – 0.2 per cent in 2023. Renewable diesel use was roughly equivalent to 0.86 per cent of total global diesel use in 2021 (IEA 2022a⁸; IEA 2022b⁹).

For LCLF, higher production costs compared to conventional fuels can be driven by difficulties in collecting and aggregating sustainable feedstocks, extra processing steps, and lack of scale in production (CSIRO, 2023¹⁰). Under these conditions, SAF is currently estimated to be 2-5 times more expensive than standard jet fuel (or aviation turbine fuel) (Figure 2). Similarly, renewable diesel is estimated to be roughly twice as expensive to produce as standard diesel (ACCC, 2019¹¹; DPIRD, 2023¹²).

Many steps in the production of LCLFs benefit from economies of scale, so achieving scale in demand for LCLFs will play a key role in unlocking cost-efficient crop production, transport, and fuel production. The higher cost for SAF also depends on the type of feedstock used to produce it, and the technology pathway used. For example, SAF produced with low cost and a relatively simple technology pathway (such as vegetable oil using the HEFA process), is much cheaper than SAF produced through the high-tech Power-to-Liquid process, which includes hydrogen as a key input (Figure 2). Innovation that enables improved production technologies and greater use of cost-effective feedstocks may reduce the cost of LCLFs over time.

Figure 2: SAF production costs are expected to decrease over time

Cost per litre of SAF production, 2023 AUD



Source: CSIRO 2023¹³

⁸ International Energy Agency (2022) World Energy Outlook

⁹ International Energy Agency (2022) Renewables

¹⁰ CSIRO (2023) Sustainable Aviation Fuel Roadmap

¹¹ Australian Competition and Consumer Commission (2018) Report on the Australian petroleum market

¹² Department of Primary Industries and Regional Development (2023) Renewable Diesel Factsheet

¹³ CSIRO (2023) Sustainable Aviation Fuel Roadmap

Where market distortions like green premiums occur, governments can step in to reduce production costs with financial assistance or to facilitate demand through mandates.

Estimates of Australia’s domestic capacity to produce SAF vary substantially, depending on the quantity of feedstocks allocated to SAF, growth rates in domestic feedstock production, and the technological efficiency of production pathways (e.g. high or low jet fuel yield from feedstocks).

Table: Australia’s potential SAF production estimates

		Potential domestic SAF production	Proportion of SAF for estimated total jet fuel demand
<i>Low scenario</i>			
	2025	964.77 ML	10.42%
	2050	1,176.57 ML	7.57%
<i>High scenario</i>			
	2025	5,511.33 ML	59.54%
	2050	13,939.54 ML	89.72%

Source: CSIRO 2023¹⁴

International jurisdictions already have a mix of demand- and supply-side supports in place

Countries around the world have implemented their own set of policies to promote the uptake of LCLF, including the US, EU, Japan and Singapore. Their policy choices have been driven by each country's respective energy demands, environmental agendas, and economic priorities.

Governments have implemented various low carbon liquid fuel policies to achieve these goals, utilising different mixes of policy levers such as carbon intensity standards, blending and volume mandates, tax incentives, and capital grants. The Government is considering the potential effectiveness and impacts of these policy levers in the Australian context.

¹⁴ CSIRO (2023) Sustainable Aviation Fuel Roadmap

International policies examples:

Example 1 - The US Inflation Reduction Act

Under the US Inflation Reduction Act, a SAF Credit was created to support the SAF Grand Challenge (a US Government wide approach working in collaboration with Industry to reduce cost, enhance sustainability and expand domestic production). The credit incentivises the production of SAF that achieves a lifecycle greenhouse gas emissions reduction of at least 50% as compared with petroleum-based jet fuel, and the credit is available from 31 December 2022 to 1 January 2025.

Producers of SAF are eligible for a tax credit of \$1.25 USD to \$1.75 USD per gallon. SAF that achieves a greenhouse gas (GHG) emissions reduction of 50% is eligible for the \$1.25 USD credit per gallon amount, and SAF that achieves a GHG emissions reduction of more than 50% is eligible for an additional \$0.01 USD per gallon for each percentage point the reduction exceeds 50%, up to \$0.50 USD per gallon.

From 2025, SAF producers will instead be eligible for a Clean Fuel Production Credit, this is an extension of the above credit incentive, concluding in December 2027. Producers can demonstrate the lifecycle greenhouse gas emissions rates of their products for the purposes of the SAF Credit using the newly announced 40B SAF-GREET 2024 model or other designated mechanisms.

To support this the US Department of Agriculture announced a pilot program to encourage use of certain Climate Smart Agriculture (CSA) practices for SAF feedstocks. Incorporating CSA practices into the production of SAF provides multiple benefits, including lower overall GHG emissions associated with SAF production and increased adoption of farming practices that are associated with other environmental benefits, such as improved water quality and soil health.

Example 2 – European Union (EU) SAF Mandate

ReFuel EU is an initiative to increase demand, investment and infrastructure for SAF while decreasing the dependency of fuels with high carbon emissions in the EU. The mandate, beginning in 2025, requires the fuel uptake at airports to be at least 2 per cent of SAF. This percentage will gradually increase each year, with the mandate increasing to 6 per cent by 2030, 20 per cent by 2035 and 70 per cent by 2050. These requirements will apply to all flights originating from the EU, regardless of destination.

Thriving industries support thriving communities and workers

Submissions to the Aviation Green Paper process have highlighted the potential of a local SAF industry to create new jobs, many of which would be generated in regional communities. According to ICF modelling supplied by Qantas in response to the Aviation Green Paper, SAF production has the potential to contribute approximately \$13 billion in GDP per year by 2040, while supporting nearly 13,000 jobs in the feedstock supply chain and creating 5,000 new high-value jobs to construct and run the facilities.

Modelling for Australia's Bioenergy Roadmap estimates bioenergy could potentially support between 10,700 - 28,100 additional jobs by 2030 and 13,400 - 35,300 additional jobs by 2050 (depending on the level of industry and government intervention). The modelling for one of the more ambitious scenarios stated that at least one in four additional jobs are expected to be in regional areas.

The Government notes it has recently sought views on the current state of Australia's LCLF market through its consultation on the Electricity and Energy Sector Plan. However, we welcome additional insights into the market, for example:

- Pricing data and the 'green premium' of these fuels
- Production cost data
- Data on the differences between production cost and LCLF sale price
- Potential current and future demand for these fuels under different scenarios of Government intervention, such as the introduction of demand- and/or supply-side policies
- Potential production volumes for Australia under different scenarios of Government intervention, such as the introduction of demand- and/or supply-side policies
- Where fuels are currently being sourced from and used
- Current industry size, value and maturity – in Australia and overseas
- Capacity to source LCLF from global supply chains

What do you think are Australia's comparative advantages as an LCLF producer? Where does Australia face international competition?

Based on the current policy and market environment, to what extent will Australia rely on imports of LCLF, as opposed to domestic production?

Government Actions

The Australian Government is committed to reducing emissions and unlocking Australia's renewable energy potential – driving new manufacturing opportunities, decarbonising our economy, adding more value to agricultural products, and enhancing productivity. To achieve this, the Government is providing substantial investments and creating the enabling policy environment. This will help accelerate the development of LCLF production in Australia.

The Government has sought views on policy settings to drive a domestic low carbon liquid fuel industry

The Electricity and Energy Sector Plan Discussion Paper, released March 14 2024, sought views on barriers and opportunities for building low carbon liquid fuel industries, policies required across supply chains to drive low carbon fuel industries in the short, medium and long term and different fuel production pathways, including biogenic and synthetic, and how these will change over time. Feedback on the paper closed on 26 April 2024.

Feedback on the Electricity and Energy Sector Plan Discussion Paper builds on feedback received on the Aviation Green Paper on challenges and barriers experienced by industry to establish Australian domestic low carbon liquid fuel production. Feedback on the Aviation Green Paper indicated an interaction of supply and demand interventions will need to be considered and calibrated. Feedback

also indicated a range of different mechanisms could be used to deliver production support. This includes tax incentives and production credits, as well as providing support for capital costs.

The feedback highlighted that while aspiring LCLF producers are keen to make investment in Australia, the key barriers are:

- a lack of certainty of demand – making it hard to attract investment
- international subsidies make it hard for Australia to compete for production investment, despite potential to produce some types of LCLF more cheaply than overseas jurisdictions
- clarity of the enabling policy, including how the emissions and sustainability of LCLF will be tracked and monitored and how accounting arrangements for emissions will operate, and
- support for more nascent technology pathways to become commercial.

Overview of announcements in the 2024-25 Budget

In response to the feedback, at the 2024-25 Budget, the Australian Government announced a series of commitments to support a LCLF market in Australia.

This included a commitment to consult on policy approaches to accelerate investment and incentivise efficient production of LCLFs with a key initial focus on producing SAF and renewable diesel. A production incentive could reduce the cost of LCLFs for Australian fuel users in a way that boosts demand and supports more value being added to Australian agricultural products before they are used or exported, growing Australia's domestic industry.

This paper seeks views on potential production incentive mechanisms, including appropriate rates of support, eligibility thresholds and other design features. Reducing the emissions intensity of liquid fuels will be a key design feature.

The Government has also committed to undertake a regulatory impact analysis of the costs and benefits of introducing demand-side measures for LCLF. As an initial first step in this process, the Government is seeking views in this paper on the scope of options that could be considered in the regulatory impact analysis, and how these could interact with production incentives to make domestic production of LCLFs commercial. This will build on views presented from stakeholders through the Electricity and Energy Sector Plan consultation process.

The Australian Government has also committed funding to develop a certification scheme for LCLF through an expansion of the Guarantee of Origin scheme. This will enable Australian LCLF producers to accredit the emissions-content of their fuels, boosting demand for these products and supporting Australian producers to earn a 'green premium' for their low-emissions products.

The Government will build on the Australian Renewable Energy Agency (ARENA) SAF Funding Initiative, including through the funding allocated to the Future Made in Australia Innovation Fund. This is intended to further support the development of more nascent LCLF production technologies, which will open up new feedstock sources.

Existing Policy

Existing policy settings and new measures announced in the 2024-25 Budget create a framework to encourage investment in renewable and low carbon technologies. Existing policy includes demand signals through the Safeguard Mechanism, financing support through the National Reconstruction Fund (NRF) and Clean Energy Finance Corporation (CEFC), measures to lower the cost of inputs, such as the Rewiring the Nation Fund, and certification and regulatory arrangements such as the Guarantee of Origin Scheme and renewable diesel fuel quality standard. Together, these measures aim to create an environment conducive to investment, encouraging demand certainty, lowering initial investment costs and creating the enabling the market for these products.

Next Steps

In addition to the measures agreed to at the 2024-25 Budget, the Australian Government is now seeking your views on:

- supply side options, such as a production incentive potentially delivered through:
 - competitive-grant based production incentive (such as a contract for difference or fixed grant amount), or
 - production tax incentive, and
- demand-side options, including mandates or a low carbon fuel standard.

Domestic low carbon liquid fuel production support options

Supply side options to enable a low carbon liquid fuels market in Australia

In the 2024-25 Budget, the Australian Government committed to consulting on and considering options to support the development of a domestic LCLF industry.

The Government is seeking views on the optimal policy mix and broad design of incentive options, including the potential mechanism to deliver support, the eligibility criteria that would need to be met to receive support and potential timeframes for the delivery of support.

Why should Australia have an LCLF production industry?

CSIRO's Sustainable Aviation Fuel Roadmap (2023) analysis suggests Australia can be a low-cost producer of SAF when compared with potential international competitors.¹⁵ This is particularly the case across certain production methods, with production costs expected to fall over time as the industry scales up. CSIRO notes Australia's large landmass, temperate climates, advanced farming practices, access to renewable feedstocks, established supply chains and renewable energy potential are all assets in developing a range of feedstocks to support a domestic LCLF industry.

Australia currently imports 90 per cent of its liquid fuels (via direct and indirect imports). Australia imported around 85 per cent of its jet fuel in 2023, and about 87 per cent of its diesel.¹⁶ Domestic production of LCLF's would help mitigate the risks of supply interruptions and help diversify Australia's liquid fuel security.

With its advantages in feedstock production, Australia is already a significant producer of feedstocks. In the absence of an Australian LCLF production industry, these feedstocks will likely be exported for LCLF production overseas. In this scenario, Australia would be reliant on LCLF imports to meet demand.

A domestic LCLF refining industry will likely lead to higher demand for agricultural feedstocks presenting positive opportunities for the farming sector to diversify income streams and markets and gain value from otherwise underutilised resources such as marginal land or residues. The agriculture sector is also a prospective consumer of LCLF to decarbonise its on-farm heavy vehicle use. However, consideration will also need to be given to how this changes demand for agricultural land and demand for crops that can also be used for food. Criteria to certify the sustainability attributes of LCLF can be designed to include assessment of land use change impacts. For example, the scheme to certify SAF used by the International Civil Aviation Organization for its Carbon Offsetting and Reduction Scheme for

¹⁵ For example, some analysis has suggested Australia could be a lower cost producer using the hydroprocessed esters and fatty acids pathway (compared with US, Brazil, EU and Singapore), Fischer Tropsch pathway (when compared with Canada, Brazil, EU, Singapore, US and Spain) and Power to Liquid pathway (when compared with the EU, Singapore and UK).

¹⁶ Australian Petroleum Statistics – Data Extract February 2024

International Aviation considers aspects such as food security, water quality and availability, and soil health.¹⁷

Some potential feedstocks, such as pongamia, have the potential to both increase land-based sequestration and provide feedstock for LCLF production, supporting regional jobs and opportunities and local supply chains. These sequestration opportunities are also considered through the Australian Carbon Credit Unit Scheme.

How best to deliver production incentive support?

The Government is considering mechanisms that could be used to deliver production incentive support to Australian sustainable liquid fuel producers. Two mechanisms under consideration are a competitive grant-based production incentive scheme such as a ‘contract for difference’ scheme or a fixed grant amount per production unit and a production tax incentive.

Competitive grant-based production incentives

Production incentives could be provided through a time-limited competitive grant-based production scheme, such as a contract for difference, or fixed grant amount per production unit.

This would provide selected projects with supply side support to help cover the gap between local production costs and the price that they are selling their LCLF.

A contract for difference (CfD) is an agreement between a producer and a second party, which can cover the difference between the market price for a product sold by the producer, and a ‘strike price’ agreed between the producer and second party (e.g. the government). If the ‘strike price’ is higher than the market price, the second party must pay the difference between the strike and market price. If the market price is higher than the strike price, design options include the producer not receiving a payment from Government, or paying back the difference. CfDs provide revenue to producers where the production costs are greater than the market price.

The strike price is generally set through a ‘competitive auction’ process. Producers bid against each other to enter a CfD by nominating their strike price. The buyer can offer the contract based on the lowest price, incentivising producers to bid for the lowest possible strike price.

Delivering funding through a CfD scheme provides revenue certainty for producers, where production costs exceed market prices, or where market prices are highly volatile.

A CfD scheme prevents producers from continuing to rely on Government support where production prices fall below market prices (i.e. where businesses become profitable). This provides governments a clear exit strategy for support, both by preventing the ongoing support of producers as production prices fall below market prices, and by setting defined timeframes through contracts.

There are a number of examples of their use in Australia or equivalent underwriting schemes including NSW’s Long-Term Energy Service Agreements under their Electricity Infrastructure Roadmap, Victoria’s emerging Offshore Wind Energy Scheme, the ACT’s Feed in Tariff scheme and the Commonwealth Government’s Capacity Investment Scheme and Hydrogen Headstart program.

¹⁷ International Civil Aviation Organization (2022), CORSIA Sustainability Criteria for CORSIA Eligible Fuels

There are also a number of other approaches to designing grant-based production incentives. For example, the Government could also consider providing support through a fixed grant amount per production unit. This could involve a process similar to the 'competitive auction' process under a CfD scheme, providing an incentive for producers to nominate the lowest support amount they need.

Alternatively, the Government could consider setting a fixed grant amount, based on an assessment of market conditions.

Production Tax Incentive

Production incentives could alternatively be provided through the tax system as a time-limited incentive per unit of LCLF produced. For example, a production tax credit per litre of SAF or renewable diesel could be provided to the producer for the fuel, at a fixed rate or with increments for the lifecycle emissions of the fuel production as certified through the Guarantee of Origin scheme.

Tax incentives that are delivered through the tax system are more likely to be suitable when there are generally accepted criteria that can be objectively verified and support does not need to be tailored to the specific circumstances of a producer other than in broad terms (such as costs of production or size).

As tax incentives allow all producers who meet criteria to access support, using a tax-based scheme may support a broader range of producers into the market, including those using new types of production methods and newer, less-established producers, encouraging diversity in the market. Tax incentives allow uniform access across eligible entities, and providing certainty to businesses around the rebates they will receive. This approach promotes competitive market dynamics but does not provide scope to tailor the level of support to match the gap between production costs and sale prices for different producers.

It is assumed that production incentives would operate alongside targeted innovation support, such as provided by ARENA and the Future Made in Australia Innovation Fund.

Future Made in Australia Plan - Production Tax Incentives for Hydrogen and Critical Minerals Production

As part of the Future Made in Australia Plan, the 2024-25 Budget included targeted production incentives to scale up priority industries: aligning incentives to invest with the national interest, targeting ‘green premiums’ that are not yet reflected in market prices, and investing efficiently in mitigating the risks of excess supply chain concentration. Support for production is being delivered over timeframes that promote accelerated investment over the next decade, and in ways that are contingent on successful production.

The Hydrogen Production Tax Incentive will provide a \$2 incentive per kilogram of renewable hydrogen produced for up to ten years per project, between 2027–28 and 2039–40 for projects that reach final investment decisions by 2030. This will operate alongside the expanded Hydrogen Headstart program, which supports the early movers investing in the industry’s development in a way that complements the support provided through the tax system.

The Critical Minerals Production Tax Incentive will provide a production incentive valued at 10 per cent of relevant processing and refining costs for Australia’s 31 critical minerals. This incentive will be applicable for up to 10 years per project, for production between 2027–28 and 2039–40 by projects that reach final investment decisions by 2030.

Assessing different options

Production tax incentives, CfDs and fixed-grant amount incentives all offer revenue certainty for producers, helping to provide confidence in establishing facilities.

However, the differences in their design results in different impacts for industry. The different options and their designs can be weighed according to some key dimensions, such as their technology neutrality, how they reduce the green premium and adapt over time, competition and financial impacts.

Contract for difference schemes

- CfD schemes allow producers to nominate an amount of incentive support that reflects their production costs, allowing support to meet their needs and offer more tailored revenue certainty.
- CfD schemes can be responsive to market conditions, providing greater revenue certainty to producers.
- CfD schemes require producers to pay the difference between the strike price and production price where market prices exceed the strike price. To ensure producers are able to retain sufficient profits as the industry becomes more sustainable, careful calibration of longer-term expected sale prices and production costs is necessary during the competitive auction process.
- In contrast to tax incentives, which apply broadly to all producers who meet eligibility criteria, a CfD scheme may favour established operators who have already commercialised operations elsewhere, or have existing refinery capacity, and can nominate lower strike

prices and will be in a position to enter competitive auctions at the commencement of the contract for difference scheme. This may act as a barrier to entry for new producers relative to a more broadly available tax-based incentive.

Fixed-grant amount incentives

- Fixed-grant amount incentives are not responsive to market conditions, and may not be responsive to changing revenue needs of producers, and may not provide sufficient revenue support when market prices fall, or too much support if prices increase.
- Fixed-grant amount incentives require Government to select the most meritorious projects based on applications at the outset of the programs, which may favour more advanced and established operators and act as a barrier to new producers entering the market in the longer-term as they will not be able to receive support following the commencement of the program.

Production tax incentives

- A tax incentive model could allow uniform access across eligible entities, providing greater certainty to businesses of the rebates that will be available.
- Could be designed as a refundable tax offset that is time-limited with defined eligibility thresholds for the production of LCLF. Varying rates of incentive could apply to fuels that meet emissions intensity reduction thresholds.
- How an incentive interacts with other incentives (such as those for hydrogen) would need to be considered to optimise the impact and efficiency of government funding.

The Government is seeking your views on the design of a production incentive scheme:

What mechanism do you think would best support production – through the tax system, contract for difference or grant based funding?

Are there other mechanisms Government could consider to deliver production support, other than a production tax incentive or competitive grant-based payment? What do you think is the highest priority form of support?

What are expected production costs of LCLF in Australia? How would you design production incentives to make production competitive in Australia?

What would an expected rate of support be under a competitive grant-based production scheme (contract for difference or fixed grant amount per production unit)?

How many producers would you expect a production incentive scheme to support in Australia?

How could the introduction of a production incentive scheme affect competition in fuel production and supply markets, and also amongst fuel users?

What are the expected timeframes for when an industry would be sustainable without support from Government?

How should production support be funded, and how could this best be aligned with the beneficiaries of the production support?

Supporting a range of fuels in the Australian market

An LCLF product neutral design of a production incentive or demand-side measure would likely favour production of renewable diesel over SAF due to cheaper production costs. However, aviation will likely require access to SAF in the longer term compared to sectors which rely on renewable diesel, as aviation is less able to rely on alternative abatement measures (such as electrification) in the longer term.

Consideration is being given to whether production incentives need to be designed to incentivise SAF production over renewable diesel production, or to require producers to dedicate specific proportions of their production to SAF over renewable diesel.

Additionally, emerging production pathways may have higher production costs than more established production pathways as these nascent production methods are not yet commercialised. However, fuels produced using these production pathways may offer greater emissions reduction benefits than those produced using more established pathways. Increasing the different types of pathways and feedstocks used towards sustainable liquid fuel production may help build the sustainability of Australia's liquid fuel industry, by avoiding dependence on limited production pathways and feedstocks which may reach supply limits in the medium term.

Therefore, production incentives may need to be designed to provide different levels of support for different production pathways, noting emerging production methods may not be able to compete with established pathways on a purely price-based approach in the shorter term.

The Government is seeking your views on the design of production incentives to appropriately incentivise the production of SAF and renewable diesel and different pathways to produce LCLF:

Would production support need to offer a different rate of incentive for SAF and renewable diesel?

Does a potential production support program need to prescribe certain proportions of production volumes towards SAF or renewable diesel?

Would production support need to provide different levels of support for emerging and established production pathways? What are some of the design considerations Government should consider?

What policy approaches are technology agnostic, applying efficiently to new technologies as they emerge?

Eligibility criteria

Production incentives would need to be supported by eligibility criteria setting out the entities who would be eligible to receive production incentive support.

Eligibility criteria could consider parameters including:

- Emissions reductions offered by the fuels produced.
- Other sustainability factors in the fuel's production.
- Community benefit criteria, consistent with the principles set out in the *Future Made in Australia Act*.

Emissions and sustainability criteria

To provide assurance of the emissions reductions benefits of LCLF produced under a production scheme, the Government suggests fuels produced must demonstrate they meet a minimum emissions reduction threshold (for example, at least a 50 per cent emissions reduction compared to conventional fuels).

In the 2024-25 Budget, the Australian Government announced an expansion of the Guarantee of Origin Scheme to certify the emissions and sustainability profile of low carbon liquid fuels, such as SAF, renewable diesel, ethanol and other synthetic fuels. The Guarantee of Origin Scheme is an assurance scheme being designed to track and verify emissions associated with hydrogen, renewable electricity and other products over time. The Guarantee of Origin Scheme will show where a product has come from, how it was made, and its lifecycle carbon intensity.

The Guarantee of Origin Scheme may include other sustainability factors, such as impacts of land use change. The Guarantee of Origin Scheme will provide the basis for emissions and sustainability criteria for a potential production incentive program.

The Australian Government expects to deliver certification arrangements of some production pathways by mid-2028, and intends that certification arrangements will align with international schemes. For example, the International Civil Aviation Organization (ICAO) has developed criteria to assess fuels eligible under its Carbon Offsetting and Reduction Scheme for International Aviation (CORSA) scheme. CORSA's criteria includes emissions and sustainability criteria.

The Government is seeking your views on the following considerations regarding emissions and sustainability criteria:

Do you support an emissions reduction threshold being included as part of eligibility criteria for fuels to receive support under a production incentive program? What threshold would you seek to be included in eligibility criteria (for example 50 per cent emissions reduction relative to conventional fuels, or another emissions reduction ratio)?

Do you think any threshold should increase over time?

Do you think incentives should be included to encourage emissions reduction in addition to a minimum eligibility threshold?

If you don't support a threshold, what emissions requirements do you think are better?

Do you have views on the sustainability criteria under consideration as part of the criteria? What additional or alternative criteria would you want to see form part of the criteria?

Do you have any other views on emissions and sustainability criteria?

What are the community benefits associated with LCLF production in Australia?

Demand-side options to enable a low carbon liquid fuels market in Australia

In the 2024-25 Budget, the Australian Government committed to undertake a regulatory impact analysis of the costs and benefits of introducing demand-side measures for LCLF such as targets or mandates. Demand-side policy incentives can support efficient demand for products that will be needed to achieve net zero emissions by 2050 and potentially impact the design of efficient production incentives. To inform the scope of the assessment, the Government is seeking initial views on the types of demand-side options likely to support an efficient domestic LCLF industry.

Demand-side interventions can encourage domestic LCLF production, by providing assurance to producers they will have a market for their product.

The Government will consider different demand-side policy options, such as non-mandatory targets, trading schemes connected to low carbon fuel standards, or the introduction of mandates over time as supply chains mature.

Mandates or targets would involve a certain portion of fuel use to come from LCLF. Mandates and targets could be designed to apply to only segments of the economy – for example, only applying to the

aviation market and not to other sectors using liquid fuels, or applying only to operators meeting a certain volume, income, emissions or other operating threshold.

For example, in the aviation sector, mandates could require fuel suppliers to ensure aviation fuels made available to aircraft operators contain a minimum proportion of SAF, with the amount going up over time. The design of a mandate might look different depending on the sector, size of the business, and which fuels could be used to meet the mandate.

Mandates and target design may also consider requirements related to the use of imported instead of domestically produced LCLF, noting such design arrangements would need to consider Australian trade law obligations.

Examples

Mandates are already in place in overseas jurisdictions. This includes:

- The EU's ReFuel EU initiative. Beginning in 2025, it will require fuel uptake at airports to be at least 2 per cent SAF. This percentage will gradually increase each year, with the mandate increasing to 6 per cent by 2030, 20 per cent by 2035 and 70 per cent by 2050. The mandate puts an obligation on aviation fuel suppliers to ensure all aviation fuels made available to aircraft operators at EU airports contains the required minimum shares of SAF.
- The UK has announced a forthcoming mandate. The mandate will start in 2025 at 2 per cent of total UK jet fuel demand, increase on a linear basis to 10 per cent in 2030 and then to 22 per cent in 2040. From 2040, the obligation will remain at 22 per cent until there is greater certainty regarding SAF supply.
- In Singapore, flights departing Singapore will be required to use SAF from 2026, with a 1 per cent SAF uplift target in 2026 and plans to subsequently raise it to 3-5 by 2030.
- Japan has announced a mandate coming into effect in 2030, requiring at least 10 per cent of aviation fuel sold for international flights by wholesalers be SAF.

Unlike volumetric mandates, low-carbon fuel standards are performance standards that require a specific reduction in the carbon intensity of the average fuel mix over time. This allows sellers or producers (depending on who the standard is applied to) to flexibly choose their fuel mix, meeting their standard in the most economical way. Standards can also allow for credit trading between entities similar to the Safeguard Mechanism.

Example

The US state of California has a low carbon fuel standard in place. Fuel producers of higher carbon fuels are required to buy credits from companies selling cleaner fuels if the carbon intensity of their products exceeds mandated targets. Carbon intensity thresholds lower overtime, meaning some credit generating fuels may fall under carbon intensity thresholds, creating an incentive to deploy the lowest emissions fuels.

The Government has already received some feedback on demand signals to establish a SAF industry through the Aviation Green Paper.

For example, Brisbane Airport, the Government of New South Wales, Western Sydney Airport, Australian Airports Association, SkyNRG, Qantas Group, Board of Airline Representatives of Australia, Business Council of Australia, and others advocated for the introduction of the mandated use of SAF and a target using a mix of measures to ensure supply meets demand. Sustainable Aviation Fuels Alliance of Australia and New Zealand (SAFAANZ) advocated for a regulated demand side lever, tied to intensity.

Analysis of demand options will consider elements such as changes in demand (including domestically produced low carbon liquid fuels), operating impacts – including impacts on consumers such as through ticket prices, emissions reductions, competition and specific impacts on specific market segments such as regional operations and consumers.

Analysis will also consider how demand measures may interact with Safeguard Mechanism obligations. A mandate could potentially capture smaller businesses not covered by the Safeguard Mechanism, and may create a stronger ‘demand signal’ for LCLF production.

However, a mandate may result in requiring abatement from sources more expensive than other options available (such as efficiency improvements or offsets), and reduce the opportunity for those subject to the mandate to choose to use offsets, even where offsets are cheaper than the LCLF required to achieve the same abatement. Greater use of LCLF’s would support the legislated safeguard outcome to provide a material incentive to invest in facility level abatement rather than offsets, in a way that is consistent with an efficient pathway to achieve Australia’s overall objective of net zero by 2050.

Assessing different options

Mandates
<ul style="list-style-type: none">• Mandates may create stronger demand signals than non-binding targets, as the uptake of LCLF is enforceable by regulatory arrangements. This may drive greater demand certainty than non-binding targets, and better support investment confidence in LCLF production.• Mandates can be designed to increase over time, providing industry with time to adapt operations to new requirements, and to allow increased supply into the market to meet new demand.
Low carbon fuel standards
<ul style="list-style-type: none">• Low carbon fuel standards allow more flexible compliance than mandates, as fuel producers can choose to comply by lowering the emissions intensity of their products, or purchasing credits from fuel producers whose fuels are below the emissions intensity threshold set under the standard.• By setting emissions intensity thresholds, as opposed to volumetric thresholds, low carbon fuel standards may better drive emissions reductions than volumetric mandates. Low carbon fuel standards may also drive increased ongoing innovation in fuel technologies, as fuel producers are incentivised to continue to produce lower emissions fuels. However, this is dependent on the design of volumetric mandates, which could also be designed to require certain emissions reductions.

Targets

- With their non-binding nature, targets may encourage certainty without imposing additional regulatory costs on businesses. However, their lack of enforceability may not create sufficient demand outcomes, and may limit their effectiveness in driving confidence in LCLF production investment.
- Targets may be effective in sectors where operators will likely adhere to targets without requiring Government regulation or enforcement. For example, targets may be more effective in sectors where there is likely to be strong consumer preferences to favour operators using LCLF.
- Targets may be more appropriate to sectors of the economy where LCLF uptake is less advanced, and mandates may impose higher operational impacts. Targets may offer a starting point to increase LCLF uptake in these sectors, with the option to transition to mandates in future if needed.

The Government is seeking your views on the design of demand-side mechanisms:

What options should the Government consider in its regulatory impact analysis, such as a mandate introduced over time, low carbon fuel standard connected with a trading scheme, a non-binding target or other demand options?

When providing advice to Government, you may like to consider:

What demand-signals would best drive confidence and certainty for a domestic LCLF production industry?

How might demand measures interact with the Safeguard Mechanism for covered facilities?

How would the application of a mandate affect your business/operations?

Should demand-side interventions be designed to only apply to some areas of the market and not others? Which sectors or sub-sectors should demand-side interventions apply? How would the introduction of a mandate or other demand measures affect competition in your industry?

Should design of a mandate, low carbon fuel standard, target or other demand option create requirements for a certain proportion of fuel use be drawn from Australian produced LCLF?

How would the introduction of demand side measures impact the feasibility of domestic production of LCLFs, and what impact would this have on the appropriate design of any production support?

Next steps

Your input on this consultation paper provides crucial information in developing the Government's future approach to supporting an Australian LCLF industry.

Responses will also inform the development of the Transport and Infrastructure Net Zero Roadmap and Action Plan and the Electricity and Energy Sector Plan.

Feedback on this paper will also be sought through roundtables and other processes as part of Transport and Net Zero Roadmap and Action Plan consultation, with consultation on this paper to be concluded by 18 July 2024.

Consultation questions

The low carbon liquid fuels opportunity

The Government notes it has recently sought views on the current state of Australia's LCLF market through its consultation on the Electricity and Energy Sector Plan. However, we welcome additional insights into the market, for example:

- Pricing data and the 'green premium' of these fuels
- Production cost data
- Data on the differences between production cost and LCLF sale price
- Potential current and future demand for these fuels under different scenarios of Government intervention, such as the introduction of demand- and/or supply-side policies
- Potential production volumes for Australia under different scenarios of Government intervention, such as the introduction of demand- and/or supply-side policies
- Where fuels are currently being sourced from and used
- Current industry size, value and maturity – in Australia and overseas
- Capacity to source LCLF from global supply chains

What do you think are Australia's comparative advantages as an LCLF producer? Where does Australia face international competition?

Based on the current policy and market environment, to what extent will Australia rely on imports of LCLF, as opposed to domestic production?

Options to support an Australian domestic low carbon liquid fuel production

The Government is seeking your views on the options for a production incentive scheme:

What mechanism do you think would best support a production credit scheme – through the tax system, contract for difference or grant based funding?

Are there other mechanisms Government could consider to deliver production support, other than a production tax incentive or competitive grant-based payment? What do you think is the highest priority form of support?

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