Low Carbon Liquid Fuels

Response to Consultation Paper

About the Author:

Peter Gunthorpe is an independent consultant working on the development of low carbon fuels and providing risk management expertise. He has spent over 30 years in the downstream fuels industry across four countries specialising in renewable fuels, operations management, business development, strategic planning, safety & risk management, and emergency preparedness & response. Recently he was based in Houston and was responsible for federal and state renewable fuels and compliance programs in the US and Canada including the RFS, LCFS, Cap & Trade, and Carbon Pricing programs.

1. Low carbon liquid fuels - the opportunity

Australia has a unique opportunity to develop a low carbon liquid fuels (LCLF) industry which will provide an important contribution towards the energy transition, will create employment and economic development, will strengthen fuel supply security, and will support corporate net zero objectives.

Whilst it is acknowledged we are well behind other countries in this industry, we have the ability to learn from what policies have worked over the past 10-15 years, and which we should adopt to unlock this opportunity.

Governments must play a role in enabling private industries to invest in LCLF and start down the learning curve to drive technology investments. Such policies need to be transparent and stable. Australia cannot afford to pay for decarbonization in the absence of technology development and carbon market development.

When we think about low carbon fuels we need to consider their ongoing use for the long term. We cannot just abandon the liquid fuel market (and the opportunity for emissions reduction) while electrification progresses over the coming decades. There will be ongoing demand for liquid fuels beyond 2050 in numerous sectors including transport, agriculture, mining and construction that cannot be readily decarbonised by electrification.

We need to think about the whole system or value chain for low carbon fuels and consider how to overcome numerous challenges to enable production. We must avoid the temptation to solve only a piece of the problem.

Policymakers need to build a legal framework that is balanced and provides a mix of demand-side and supply-side measures. Other countries have had the opportunity to define new low carbon fuels

policies in addition to their baseline of existing mechanisms such as the UK ETS, EU RED II, and US RFS. Australia does not have the benefit of such foundational emissions reduction policies to build on and must develop a suite of new policies for liquid fuels that are broad and effective.

2. Policy principles

In order to develop the right set of policies, we need to consider some foundational principles for how and why this industry should be developed.

1. Liquid fuels and chemicals will be needed by society for the long term
2. Be deliberate and not hasty in policy implementation
3. Focus on decarbonisation of liquid fuels and enable all liquid fuels to participate
4. Start with existing technology and incentivise new technology development
5. Incentivise use and development of domestic feedstock
6. Create long term policy certainty with ability to adjust course to meet objectives
7. Certification and sustainability standard is required for social licence to operate

3. Policy recommendations:

A combination of targeted polices across the industry are needed to develop this industry for the long term including:

a. **Fixed capital grant incentives**

b. **Production tax incentive based on carbon intensity (CI), requiring use of domestic feedstock**

c. **Low Carbon Fuel Standard with obligation on fuel producers and importers**

d. **Percentage use mandates for domestic airlines and domestic marine**

e. **Research grants to evaluate expanding oilseed, forestry and cover crops**

4. Consultation questions

The low carbon liquid fuels opportunity
Potential demand and production **Capacity to source LCLF from global supply chains** If the Australian government is to provide incentives for the development of low carbon liquid fuels, it makes sense that the resulting emissions reduction will be included in Australia's Nationally Determined Contributions (NDCs) under the Paris Agreement.

An aspirational goal for the development of a domestic LCLF market should be to stimulate supply in country to meet the total in country demand for liquid fuels. As the market develops over time there will be potential for import of feedstock and LCLF, or export of feedstock and LCLF, but the incentives for the domestic market should be for the benefit of the taxpayer to meet Australia's NDCs. We should not design a policy setting for a *Future Made in Australia* that has unintended consequences of subsidizing offshore operations instead of supporting domestic production of LCLF.

It is also important to consider all types of low carbon liquid fuels, and not just focus on Renewable Diesel and Sustainable Aviation Fuel. The best policy approach is to enable domestic production of all types of LCLF to displace petroleum derived products and hence reduce emissions. Policies should equally apply to bio-based products such as:

- Ethanol
- Biodiesel
- Renewable diesel
- Bio-methanol
- Sustainable aviation fuel
- Bio-naphtha
- Di-methyl ether

Blending mandates are the main market-pull policy used to create and expand biofuels markets. Countries with a mixture of market-pull and technology-push policy instruments have been most successful at increasing biofuels production plus developing and deploying less mature advanced biofuels. While many older policies were originally developed to promote energy security, more recent policies, such as low carbon fuel standard, have reduction in the carbon intensity of transportation fuels as a primary goal.[1]

Australia's comparative advantages as an LCLF producer? Where does Australia face international competition?

In the absence of well-designed policy, Australia does not currently have any comparative advantages as an LCLF producer. It is well known that a large proportion of feedstocks for LCLF are exported in the form of tallow, canola and UCO to international competitors in the US, EU and Singapore. For Australia to retain these feedstocks for use in country, there must be sufficient incentives in place such that the seller willingly chooses to sell domestically.

[1] https://www.sciencedirect.com/science/article/abs/pii/S0301421520306182

At the same time it is acknowledged globally that bio-based fuels are expensive. Without substantial policy support there would be little if any bio-based products produced or consumed.[2] Targeted policies primarily in the EU and US have driven the expansion of LCLF production and supply.

One comparative advantage that Australia has its availability of sunshine and wind to generate renewable electricity. This provides the opportunity to produce green hydrogen, which is an essential enabler in the production process for most LCLF.

The second comparative advantage has been well defined by the CEFC, that Australia's role as a major global agricultural producer means we have the potential to be a significant producer of biofuels feedstocks. It makes sense to move up the value chain into onshore bioenergy production, rather than exporting the raw materials and paying a premium to import refined products.

If Australia can leverage its strengths and experience to add value to the sustainable fuels supply chain, we can establish a new industry that will help us reach our net zero emissions target and position the economy for a low emissions future.[3]

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

Until Australia has a suite of supply and demand policies across the value chain that enable economic production of LCLF, Australia will continue to be exposed to the importation of liquid fuels, whether they be petroleum based or LCLF.

Options to support an Australian domestic low carbon liquid fuel production

Any supply or demand side policies need to be targeted at the primary policy objective to be successful. The most effective way to reduce emissions from low carbon fuels is to define the policies based on the reduction in Carbon Intensity (CI) across the lifecycle of the fuel.

The lifecycle CI is used to show reduction compared to petroleum diesel and jet fuel measured in gCO_2e/MJ. The 'life cycle' greenhouse gas emissions are associated with the whole supply chain of the product including feedstock, production, transportation, and combustion of a given fuel. The life cycle assessment (LCA) would include direct emissions from using these

[2] https://farmdocdaily.illinois.edu/2023/02/biodiesel-and-renewable-diesel-its-all-about-the-policy.html

[3] https://www.cefc.com.au/insights/the-green-files/the-green-files-alternative-fuels-are-key-to-australia-achieving-net-zero/

fuels, as well as indirect effects such as changes in land use for some feedstocks. Dedicated tools and robust systems are required to calculate the LCA of each fuel.

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

As mentioned above, Australia needs a combination of policies to support a long term LCLF industry.

The **capital grant incentive** as defined in the consultation paper and webinar is a suitable mechanism to provide up-front support for new facilities to enable them to offset construction costs. Whilst it requires Government to select the most meritorious projects, providing these grants for commercially available technologies such as HEFA would enable a pathway to production in the shortest possible time. These types of grants could be provided through the ARENA Advancing Renewables Program or similar mechanisms.

As well as construction grants, there needs to be long term production incentives for domestic manufacturing that offsets the cost of production. In absence of an economy wide carbon tax, petroleum fuels will continue to be lower cost than renewable fuels, so a mechanism is required to bridge this "green premium".

Contracts for Difference (CfD) are considered as one way to support production, however these are complex to manage and administer over time and can favour established operators who have already commercialized operations. Whilst they can be responsive to market conditions, they require the Government to effectively underwrite selected production facilities with a CfD, and those without will have a higher risk of failure.

Production tax incentives have been used successfully overseas to support biofuels programs and are the most efficient way of supporting domestic production. In the US there has been a federal $1/gallon biodiesel blending tax incentive for many years, which has helped to bridge the cost of biodiesel. Unfortunately this applied to the blender of the biofuel and as a result significant quantities of biodiesel were imported for years and still qualified for the tax credit. This will be changed in 2025 to a producer's tax credit. [4]

The benefit of a production tax incentive is that it is available to all eligible domestic producers, it does not require government outlay, and it is low complexity to manage through the tax system. In addition, eligibility for the production tax credit can be defined such that it only applies when using domestic feedstock. This provides an incentive for feedstock to be

[4] https://afdc.energy.gov/laws/13321

maintained in country instead of exported, without creating contentious export tariffs or export controls.

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?

On the Supply side the key risks for investors are:

1. Technology performance risk
2. Construction cost and time risk
3. Feedstock and supply risks
4. Revenue consistency risk

Technology risk can be managed by selecting mature production processes and experienced technology providers.

Enabling fixed capital grant incentives will support new facilities with construction costs, however timing risk must be managed.

Other than the production tax incentive, the highest priority form of support is to provide the investment certainty for these policies. Whilst it is understood there are varied opinions on the use of LCLF with decision makers, investors will need confidence in these support mechanisms to enable the significant investments that are required.

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

As defined above, a production tax incentive that is available to domestic producers when using domestic feedstock would assist to develop competitive production in Australia. It would need to be significant enough to enable feedstock to be purchased at global market rates and avoid this feedstock being exported. Without doing a detailed analysis of feedstock markets, a production tax incentive equivalent to the US federal blenders tax credit of $US1/gallon would be an indicative rate, equivalent to ~$A0.40/litre.

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

A production tax incentive should equally be available to all domestic producers who meet the qualification criteria. This tax incentive should initially be available for a period of 10 years to enable the development of a strong low carbon fuels industry.

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

A production tax incentive for LCLF made in Australia would enable a level playing field for all domestic producers and suppliers, while also creating a competitive advantage over equivalent imported fuels. Overseas producers would likely object to this type of domestic incentive, but it is the type of scheme that is required to support a *Future Made in Australia*.

The production tax incentive should also be targeted to reduce CI of LCLF with a sliding scale for the incentive based on reduction in emissions. This is similar to the SAF tax credit in the US with $1.25 for each gallon of SAF that has a minimum reduction of 50% in lifecycle greenhouse gas emissions, plus a supplemental credit of one cent for each percent that the reduction exceeds 50% up to $0.50 per gallon (total credit $1.75 per gallon).[5]

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

In the absence of a carbon price on petroleum fuels, LCLF will require ongoing policy support for at least 10 years. Capital grants could be made available for a defined period up to 2035 in order to establish this new industry, but production tax incentives will be required for 10 years following startup. This is aligned with the proposed Hydrogen Production Tax Incentive and the Critical Minerals Production Tax Incentive which are applicable for up to ten years.

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

Capital grants should continue to be funded from ARENA's Advancing Renewables Program or similar mechanisms, however production tax incentives do not require cash funding. Once the economic benefits of developing a LCLF industry in Australia are thoroughly modelled and understood, it will become evident that the GDP benefits will be significant.

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?

[5] https://www.irs.gov/credits-deductions/businesses/sustainable-aviation-fuel-credit .

Production support should provide higher rates of incentive for lower CI fuels, and not differentiate between production outputs. Supply side policies should incentivise the domestic production of a range of LCLF, and allow demand side policies to be market segment specific. Having too many nuanced policies makes the investment and regulatory environment more complex.

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

Production support programs should incentivise production of LCLF without being prescriptive on volume output of certain grades. Demand side policies which enable the market to determine production volumes are more suitable. It needs to be understood that producing LCLF is effectively running small refineries, which are complex operations that cannot precisely control output volumes. Refineries need to have the flexibility to manage output at the lowest unit cost, without having unnecessary prescription of production volumes.

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?

Providing different levels of support for different production pathways does not enable the market to freely develop with the most efficient pathways to reach commercialization. Instead, government should provide a separate grant opportunities for research and development of emerging production pathways.

An example is the US systems where the Bioenergy Technology Office (BETO) within the Department of Energy provides funding of technology R&D[6] and the US Department of Agriculture (USDA) which has schemes for funding R&D for advanced bioenergy feedstock development[7].

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 be included in eligibility criteria (for example 50 per cent emissions reduction relative to conventional fuels, or another emissions reduction ratio)?

Emissions reduction threshold should be a minimum 50% based on lifecycle assessment.

[6] https://www.energy.gov/eere/bioenergy/bioenergy-technologies-office-funding-opportunities

[7] https://www.nifa.usda.gov/grants/programs/bioeconomy-bioenergy-bioproducts-b3-programs

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?

Policies should be set to incentivise emissions reduction, such as a sliding scale for the production tax incentive mentioned earlier. Similarly demand side policies should incentivise reductions in CI for LCLF. The minimum threshold will effectively become obsolete once lower CI becomes the defining criteria for LCLF.

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?

Australia must develop sustainability standards for LCLF that are credible and widely accepted to have a social licence to operate. The sustainability standard should consider the broader impact of the product and its supply chain including the greenhouse gas emissions impact, along with other environmental and social sustainability elements. Recent challenges to ACCU methods have reinforced the criticality of having a robust compliance and verification scheme.

The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) has established sustainability criteria for SAF that provides a good starting point for developing an Australian standard that can be defined for Australia's unique circumstances, reflecting our domestic laws and social expectations.

A sustainability standard should be included in the measurement, verification and certification program which is being developed under the Guarantee of Origin Scheme. This will primarily show where a product has come from, how it was made, and its lifecycle carbon intensity, but should also include the sustainability criteria for the production of the fuel.

The Australian sustainability standard for LCLF should consider potentially adverse impacts on the food and fibre system. This includes the important environmental impact of land use change that occurs as a result in the shift of demand for agricultural commodities because of an increase in demand for LCLF feedstocks.

This can be direct land use change (DLUC) if new agricultural land is created (e.g. by converting forests) to grow biofuels. These DLUC emissions reduce the emissions savings from the LCLF when compared to petroleum alternative. DLUC can also have other adverse impacts including on biodiversity.

There can also be indirect land use change (ILUC) that occurs when agriculture land used for the production of food and feed is repurposed or reallocated to LCLF feedstock production, which creates an incentive to extend agriculture land into areas not currently cultivated to

satisfy the same food and feed demand. Given Australia's notable agricultural export volumes, there should be strategic consideration of substitution of exported commodities for domestic refining feedstocks.

Depending on the feedstock and geography, this can lead to the repurposing of land with high carbon stock such as forests, wetlands, and peatlands. Clearing or changing these ecosystems can result in the release of greenhouse gas emissions (by reducing stored carbon from trees, soil, etc) and are indirect emissions associated with the original feedstock's diversion to fuel end-use (ILUC emissions). ILUC emissions can negate or drastically reduce the emissions saved from the use of LCLF compared to petroleum alternative. It can also have other significant sustainability impacts (for example, on biodiversity).

Emissions associated with land use change, including estimates of ILUC must be incorporated into the LCA model that is adopted. An Australian sustainability standard could apply the ILUC methodologies that have been adopted by organisations such as CORSIA, making sure that Australian data is included where appropriate.

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

LCLF will primarily require feedstocks from regional locations, so the development of LCLF production in Australia will provide investment, employment and economic development within regional communities.

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?

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

The best way to consider demand side policy is to look at the success (or failure) of LCLF policies over the past 10-15 years in the US and EU in reducing emissions and developing a low carbon fuels industry.

In the US the Renewable Fuels Standard (RFS) has been a mandate in place since 2008 that has required fuel refiners and importers to blend defined quantities of biodiesel, renewable diesel and ethanol into their fuels each year. This has resulted in significant quantities of biofuels being sold each year, including imported biofuels. The challenge with the RFS is that it was set

up as part of the Energy Independence and Security Act (EISA), which is not specifically targeted at reducing carbon emissions. The resulting reduction in emissions from the RFS are not measured and improved as it is a volume based mandate. [8] [9]

Similarly in Europe there are numerous biofuel related targets including the Renewable Energy Directive (EU RED) which mandates that at least 14% of all energy in road and rail transport fuels be produced from renewable energy sources by 2030. Within the transport target there are sub-targets for advanced biofuels produced from certain feedstocks, including double counting towards certain targets. Biofuels produced from a list of feedstocks in what is called Annex IX are capped. The maximum contribution of biofuels produced from food and feed crops will be limited in future.[10]

In addition to EU policy, Member States have developed their own emissions reduction policies which are a mixture of biofuel blend targets and CI reductions.

A 2023 analysis by the European Court of Auditors (ECA) has found that the EU's complex policy approach to biofuels lacks a long-term outlook and risks undermining the bloc's transport decarbonisation targets. It found that the ever-shifting web of policies have led to an unclear road ahead for the fuels. The changeability of the EU's biofuels policies has reportedly affected investor confidence, with the report finding that the lack of policy predictability may increase risks for private investments and reduce the attractiveness of the sector. [11]

A successful demand side policy that has been in place in California since 2011 is the Low Carbon Fuel Standard (LCFS) which has resulted in 10% reduction in emission to 2018[12] and 50% of the state's diesel being low carbon in 2023[13]. The LCFS is a CI based policy that requires the fuel producers and importers to reduce the average CI of their petroleum fuels each year to meet declining targets. The obligation on the fuel suppliers ensures the regulatory compliance burden is on a limited number of large corporations, and not on customers or consumers. The fuel suppliers then compete for the lowest cost LCFS generation, and can buy credits from third parties on a trading platform.

The value of the LCFS is that there are no financial demands on the Government - the costs of these credit are incurred by the petroleum suppliers, who compete to recover the costs across the whole liquid fuels market.

[8] https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=IO&dirEntryId=341491

[9] https://afdc.energy.gov/data/categories/biofuels-production

[10] https://joint-research-centre.ec.europa.eu/welcome-jec-website/reference-regulatory-framework/renewable-energy

[11] https://www.euractiv.com/section/agriculture-food/news/eu-is-driving-without-a-map-on-biofuels-policy-auditors-find/

[12] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6141099/

[13] https://ww2.arb.ca.gov/news/first-time-50-california-diesel-fuel-replaced-clean-fuels

Similarly for the US RFS - analysis by the Environmental Protection Agency found that more than 90 percent of the costs of complying with the RFS are associated with bio-based diesel fuels. These costs are spread across all the diesel fuel consumed, adding 13 to 15 cents per gallon (~6 Acpl) to the cost of diesel according to EPA. [14]

The LCFS program provides a range of defined methods to create credits including the use of low carbon products. The LCFS does not rely upon assumptions about the technical or commercial feasibility of any particular technology but provides regulatory certainty for innovators and investors in emerging low carbon fuel technologies without picking winners among these technologies. Over the past 13 years, the basic framework of the LCFS has worked well and continues to support growth in an increasingly diverse and low-carbon transportation fuel pool. Since implementation, the LCFS has helped displace over 25 billion gallons of petroleum fuel.[15]

An LCFS provides an incentive for the ongoing use of mature biofuels technologies that including fermentation for ethanol, transesterification for biodiesel, and hydrotreating for renewable diesel and SAF. In addition to supporting the domestic production of low carbon fuels, the LCFS can also provide an incentive to invest in new technology.

Thermochemical technologies that use lignocellulosic materials (eg. forestry residue, crop residue, sawmill residue) as a feedstock for low carbon fuels are currently in pre-commercial production in numerous countries. The low CI of these feedstocks creates the opportunity to generate higher revenue under an LCFS, which provides an incentive to develop the technology. Australia has significant agriculture and forestry industries with lignocellulosic residues and byproducts as outputs that could be processed into low carbon fuels with advanced technologies. The LCFS creates an incentive to develop such technologies to produce liquid fuels, which have potential CI at least 80% lower than petroleum fuels.

The ongoing demand for low carbon fuels together with an LCFS could also enable the development of drop-in synthetic fuels or e-fuels (electro-fuels). These e-fuels are produced from renewable power sources, water and captured CO_2, and on a lifecycle basis have a very low CI. The LCFS could enable a pathway to produce such low carbon liquid fuels which can also be used with existing logistics and infrastructure.

<u>For Australia, a well design LCFS with trading would enable investment in LCLF production, with certainty of demand side policy which is directed at emissions reduction.</u>

[14] https://blog.ucsusa.org/jeremy-martin/a-cap-on-vegetable-oil-based-fuels-will-stabilize-and-strengthen-californias
[15] https://www.biocycle.net/californias-lcfs-update

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

The adoption of LCFS can enable Safeguard entities to meet their annual emissions reduction targets through the use of lower emissions fuels. Whilst the LCFS uses the lifecycle emissions of the fuel as its measure for reduction in CI, a Safeguard entity can use the reduction in combustion emissions compared to petroleum fuels for their Scope 1 Safeguard reporting. Other emissions included in the lifecycle assessment of LCLF including transport and production are reported by those entities (not the end use customer) as their own Scope 1 emissions.

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

Australia has had the experience of biofuels mandates in NSW since 2007 and Queensland since 2017 that have proven to be less than effective. The uptake of ethanol and biodiesel blends has not met the targeted percentages since the programs were introduced, primarily as a result of insufficient customer uptake. The obligation is on the fuel suppliers to sell blended biodiesel and ethanol in their products, however this is not aligned with customers who are unwilling to buy these products due to lower energy density or higher cost. There have also been no penalties for non-compliance by any of the fuel suppliers.

If mandates are to be used in Australia, they must be targeted at the most impacted obligated party, and have enforceable penalties for non-compliance. The challenge for production of Renewable Diesel (RD) and Sustainable Aviation Fuel (SAF) is that a biorefinery can produce either product from the same feedstock, however RD has a higher yield so is the more attractive output. For manufacturers to produce SAF, there must be an additional incentive for the supplier or a mandated obligation with the buyer.

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?

In a 2023 study on the impact of blending mandates on biofuel consumption, production, emission reductions and fuel prices in the EU, they found that mandates are driving biofuel consumption in the EU and correlate with emission reductions. They also found that reduction mandates have been effective in encouraging high-performance biofuels.[16]

Similarly in a 2023 study by IEA Bioenergy to compare and contrast biofuels policies found that mandates continue to be an important policy tool that have been successfully used to encourage the production and use of biofuels, by establishing markets and facilitating market

[16] https://www.sciencedirect.com/science/article/pii/S0301421523004202

entry. Policies such as the US Inflation Reduction Act (IRA) have had a significant impact as they have helped promote the production and use of low-CI fuels such as SAF.[17]

The primary drive that airlines in Australia have to buy large quantities of higher priced SAF than petroleum Jet (and pass on the cost to consumers) is if they are equally mandated to do so. There is already the obligation for international airlines to meet the CORSIA requirements, so the focus in Australia should be on domestic use of SAF. A mandate for the use of SAF by domestic airlines is a suitable policy to drive adoption of low carbon fuels. Similarly for domestic marine fuels, a mandate for the use of LCLF would drive demand in this sector.

There are likely to be competition impacts as a result of some companies being more readily able to pass on the costs to consumers, however it is clear from overseas experience that mandates are the most effective way to increase demand for higher cost LCLF in these sectors.

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?

Demand side policies should be designed in conjunction with other complementary policies (eg. production tax incentive) that provide an incentive for LCLFs to be produced in Australia. Requiring explicit proportions of fuel to be drawn from Australian product is cumbersome and does not enable the market to determine the best solutions.

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?

We need to think about the whole system or value chain for low carbon fuels and consider how to overcome numerous challenges to enable production. We must avoid the temptation to solve only a piece of the problem as a specific supply or demand side issue, and instead should implement a suite of policies that enable production.

The most successful LCLF penetration is in California where they have stacked incentives that work together to drive increased production, including:

- Federal Renewable Fuels Standard (RIN credits)
- Federal blenders tax credit (for biodiesel)
- Low Carbon Fuel Standard (LCFS credits)
- California Cap & Trade program (offset credits)

[17] https://www.ieabioenergy.com/wp-content/uploads/2024/01/Implementation-Agendas-Compare-and-Contrast

In addition to the policies described above, there also needs to be consideration of Infrastructure connectivity plans. In order for a whole new LCLF industry to develop efficiently, there needs to be careful thought put into development of plans to integrate the many parts of the supply chain. This will enable the most efficient and timely development of LCLF production in Australia.

As a final comment, it is instructive to read about the proposed Californian LCFS from 2009 and consider how its three policy principles has enabled it to meet its objectives.

> *To succeed, any policy approach must adhere to three principles:*
>
> 1. *It must inspire industry to pursue innovation aggressively;*
> 2. *it must be flexible and performance-based so that industry, not government, picks the winners;*
> 3. *it should take into account all GHG emissions associated with the production, distribution, and use of the fuel, from the source to the vehicle.*[18]

[18] https://issues.org/sperling-4/