Australian government's consultation on *Future Made in Australia: Unlocking Australia's low carbon liquid fuel opportunity*

Boeing Australia submission
July 2024

Overview

This submission is prepared by Boeing Australia for the Australian government's consultation on *Future Made in Australia: Unlocking Australia's low carbon liquid fuel opportunity*. We note the range of policy announcements made by the Australian government as part of its May 2024 Budget and welcome the opportunity to provide input into the development of these initiatives to further the ongoing growth of a domestic low carbon liquid fuels (LCLF) sector.

We have structured our response by addressing the need for an optimum policy suite in Australia, including both supply and demand side measures which interact efficiently **to drive domestic production and uptake of LCLF, particularly Sustainable Aviation Fuel** (SAF). The submission responds to the key requirements of the government's consultation paper, specifically providing low carbon liquid fuel market insights, along with input around potential production incentives, emissions and sustainability criteria and demand side mechanisms.

Importantly, we highlight the *Boeing--CSIRO Sustainable Aviation Fuel Roadmap* (2023) which outlines significant opportunities for Australia, such as through the use of large volumes of potential domestic feedstocks for SAF. Modelling indicates that Australia has sufficient feedstock to supply approximately 5 billion litres of SAF production by 2025, but is currently constrained by Australia's limited refining capability. The Roadmap provides a series of recommendations to inform policy settings that achieve sustainability, economic and security benefits for Australia and has subsequently helped to inform our response to this consultation opportunity.

Boeing in Australia

Boeing is one of the world's largest global aerospace manufacturers. Boeing develops, manufactures and services commercial aeroplanes, defence products and space systems for customers in more than 150 countries. Our diverse team is committed to innovating for the future, leading sustainability, and cultivating a culture based on our company's core values of safety, quality and integrity.

Boeing Australia represents the broadest portfolio of products and services in Australia's aerospace industry and one of the company's largest operational footprints outside the United States. With **more than 4,500 employees and a heritage stretching back more than 97 years, Boeing Australia plays an integral role in the region's aerospace and defence industry** as a leader in advanced manufacturing for commercial airplane components, defence systems and sustainment, training and services, research and development, and uncrewed systems. Boeing employees span Australia, New Zealand and the South Pacific, supporting customers regionally and globally.

Boeing has an extensive supply chain to support our programs and operations and continually looks to find ways to engage with and grow Australian industry content in aerospace. We also partner with internationally-recognised and celebrated research organisations, including the CSIRO as well as Australia's leading universities.

The Low Carbon Liquid Fuel Opportunity

Australia relies on liquid fuels for more than half of its overall energy demand and transport accounts for approximately 70 percent of the nation's consumption of refined liquid fuel products. In order to meet both Australia's legislated emissions reduction commitments, and the global aviation sector's commitment to net zero emissions by 2050, swift and comprehensive action is required to develop sustainable, low carbon alternatives to conventionally fossil-fuelled based products.

Boeing believes the future of flight will take 'everything for zero.' To help achieve this, collaborations which foster a diverse portfolio of technologies that mature at different times and be suitable for different aviation segments is based around four key strategies: (i) fleet renewal; (ii) operational efficiency; (iii) renewable energy; and, (iv) advanced technology. Within Australia specifically, the aviation sector will need to be supported by sectoral pathways to decarbonisation which support the transition to net zero. Whilst advanced technologies, including electric and hydrogen, show promise to provide decarbonisation for short-distance regional flights, these opportunities will only be realised over the medium- to longer-term. Significant investment and infrastructure change will also be required to realise the emissions reductions associated with these abatement measures.

The *Boeing--CSIRO Sustainable Aviation Fuel Roadmap* (2023) specifically notes Australia's large landmass, temperate climates, advanced farming practices, established supply chains and renewable energy potential as supportive of domestic SAF (and renewable diesel) industries. Maximising opportunities associated with a LCLF industry, however, **requires a range of integrated policy measures to address the current cost differential when compared to conventional fossil fuels** and to support the ongoing development of viable and economic domestic production.

SAF is both an immediate transition fuel and an important part of the long-term energy mix when considering the decarbonisation of aviation and the long-term energy mix in Australia. SAF is a drop-in replacement for conventional fossil jet fuel that works with existing aircraft. Under ASTM[1] certification SAF currently provides eight approved feedstock and production pathways to produce an immediate drop-in fuel for use up to 50-percent blend.

As a key sustainable liquid fuel, SAF can be refined from waste biomass and hydro-carbon based industrial and household waste as well as used cooking oils and fats; depending on the pathway SAF can reduce emissions across the lifecycle by 80 percent or more compared to fossil jet fuel. As a result, blended SAF can use existing fuel delivery infrastructure, avoiding the need for inefficient bespoke supply chains from the point of origin to an aircraft's wingtip. In the short-term, SAF is the most expedient means by which aviation may be decarbonised and also provides the opportunity to achieve broader sustainability outcomes, including those associated with driving more circular economies.

[1] ASTM International, formerly known as American Society for Testing and Materials, is an international standards organization that develops and publishes voluntary consensus technical standards.

Consultation Response

The *Low Carbon Liquid Fuels A Future Made In Australia Consultation Paper* seeks input across the themes of broad market insights, productive incentives, emission and sustainability criteria and demand side mechanisms. In addressing this request, **Boeing recommends a number of overarching principles be considered** in the development of a comprehensive, integrated and effective suite of policy measures to drive Australia's LCLF industry development, particularly with regards to SAF.

Overarching Principles

Boeing acknowledges that the Australian government seeks additional insights into the LCLF market, across topics including pricing, current and future demand, domestic and international fuel sourcing, domestic and international market maturity and Australia's comparative advantages and disadvantages as a producer.

Despite the significant opportunities that LCLF, including SAF, represent to decarbonise aviation, economic challenges remain for both producers and consumers. Currently SAF is more costly to manufacture than conventional fossil jet fuel and is therefore more expensive to purchase. It is hoped that as technologies advance, policy settings mature, feedstock volumes increase and economies of scale are achieved, that this price differential reduces. Government policies on both the supply and demand side will play a critical role in addressing this price differential, enabling early-stage producers to ensure the economic viability of domestic production.

Boeing recognises the importance of developing a domestic SAF industry, particularly at a time when many countries are seeking to rapidly scale their SAF production potential. The International Civil Aviation Organisation (ICAO) Third Conference on Aviation and Alternative Fuel (CAAF) agreed that in order to support the sector's long-term aspirational goal, ICAO and its member states would strive to achieve a collective global aspirational Vision to reduce CO_2 emissions in international aviation by 5 percent by 2030 through the use of SAF, lower carbon aviation fuels and other cleaner aviation energies. This aligns with demand goals from several airlines, but importantly signals expected future demand from international aircraft operators when they refuel in Australia. Further, there are opportunities to work closely with nearby international neighbours including New Zealand and Papua New Guinea to help them on their own SAF journey.

Globally the SAF industry is in early stages. However, this presents significant opportunities, especially for countries like Australia, with the nation holding a range of competitive advantages in terms of the development of a LCLF industry. Along with the preponderance of biogenic and other feedstocks, Australia has a strong aviation market and high domestic skill level. Australia is also set to capitalise on its renewable energy potential to become a significant renewable energy and green hydrogen producer. Green hydrogen will continue to be a crucial commodity in refining LCLF, as well as being a potential feedstock for the power-to-liquid (PtL) SAF development process.

While liquid fuel security may not be an initial primary driver for establishing a SAF market on its own, it is a valuable by-product to the development of a domestic industry. Given all conventional jet fuel is currently imported, this would assist with mitigating sovereign risks whilst also leading to significant sustainability benefits. It would also be valued by many of Australia's close partners and allies particularly as energy security and independence becomes increasingly competitive in the medium- and longer-terms.

A comprehensive suite of policies is required to develop a local LCLF industry that provides economic benefit to Australia whilst driving down emissions, particularly in more difficult to abate sectors like aviation. As such, it is **Boeing's view that policy development remains cognisant of the following principles**:

- **Integration:** Policy should be integrated, with relevant demand and supply side mechanisms designed to complement one another. This may necessitate the phasing of initiatives over time.
- **Stability**: Policy should be stable, predictable and consistent in implementation in order for the private sector to be willing to make investments
- **Technology-neutral:** This enables diverse production pathways and supply chains to develop. Given the range of feedstocks and number of ATSM approved pathways for LCLF development, policy should drive broad industry development. Importantly, however, whilst policy intent should remain technology neutral, nuanced approaches to application could be considered. For example, HEFA pathways to SAF production are more mature and potentially require less support from a capital cost perspective than other approaches.
- **Timing and Duration:** Policy should be of a sufficient duration to reflect project development timelines. Typically, this will be at least 10 years. Additionally, it is necessary for at least phased implementation of relevant policies to occur in the short-term. Excessive delays will lead to feedstocks being sold offshore, potentially facilitating the development of similar industries in other international locations, at the expense of Australia's economic and sustainability opportunities.
- **Stackable:** Policy support should be "stackable" with other incentives – i.e., allowing credit to be received from multiple reinforcing incentives at the same time.
- **Non-dilutive capital:** Policies should recognise needs of pre-revenue companies through clear access to non-dilutive capital via grants and loans.
- **Sustainability Performance:** The most effective policies link incentives to performance (e.g. higher GHG emission reduction performance should be rewarded in policy design). This is particularly important when considering the role of demand-side mechanisms, including mandates that should prioritise carbon intensity over volume.
- **Compliance value:** Policy design should allow access to a compliance credit market to mediate prices between renewable fuels and fossil fuels by ascribing a compliance value. There are several examples of this globally, one such is the Low Carbon Fuel Standard in California, USA.
- **Scope:** The broadest policy scope should be targeted. This allows innovation and project development where most effective. Subnational (states or regions) may be useful, but should complement a national approach.
- **Customised:** Policy should be customised to the unique resources, economic and social factors, political barriers and existing regulatory structure. There is no single path to successful SAF policy implementation.

Boeing reiterates the recommendations made in the *Boeing--CSIRO Sustainable Aviation Fuel Roadmap* (2023) to inform policy development. These a series of phased recommendations designed to build on industry progress over time:

Immediate term to 2025:

- Consider policy frameworks and tools that support domestic distribution and use of certified SAF with clear long-term support strategy for industry.
- Encourage the signalling of local demand for SAF across government, commercial and defence users, giving investors certainty to establish new plants.
- Educate consumers on the role and benefits of SAF, building social license for investment and demand for fuels
- Invest in R&D to support emerging technologies and improve feedstock availability and sustainability understanding.
- Scale-up of biogenic SAF production in appropriate locations, increasing market supply and driving cost reductions.

Medium term 2025-2035:

- Build on immediate term progress by scaling-up second-generation biogenic feedstock collection and processing, including supporting the commercial readiness of domestic projects.
- Invest in research and development to reduce the costs and logistical hurdles for biogenic supply chains and continue scaling up of power-to-liquids demonstrations.

Longer term: 2035+

- Pursue a portfolio approach of technologies, including increased commercialisation of large- scale power-to-liquids productions at locations across Australia.

<u>Supply-side Mechanisms and Production Incentives</u>

Supply-side policy mechanisms and incentives, are important, particularly at early stages of a domestic LCLF industry development. They help to reduce the cost to end-users, including air travel passengers, assist prospective projects to progress towards financial close and encourage additional private industry investment in LCLF. Boeing recognises the need for a phased, time-sensitive implementation of government-funded supply-side initiatives. Ensuring a balanced, stackable mix of incentives is necessary in the short-medium term, however likely reduce over time as a domestic industry develops and greater confidence in LCLF investment is achieved within the private finance sector. **Boeing recommends the following principles are considered** as part of the development of such initiatives:

- **Broad but nuanced application across feedstocks and production pathways**. To meet the growing LCLF needs, policies should support production across the variety of both biogenic and other feedstock types. Possibilities should, however, be investigated to nuance policy implementation to support a range of feedstocks production pathways, that differ according to current technological maturity and sustainability performance, including the Carbon Intensity (CI) of SAF produced.
- **Targeted grants to support project development in the short-medium term**. A significant hurdle for many prospective Australian SAF producers is the cost associated with progression through Front-End Engineering and Design. As a result, many projects become economically inviable well before potential production, and in some cases even capital construction, can commence. In the short-medium term, government grants, similar to those currently being delivered through the Australian Renewable Energy Agency (ARENA) remain necessary. It is important, however,

that the broader policy framework recognise that such mechanisms alone are insufficient to promote and accelerate the growth of a domestic LCLF sector.

- Short-term funding (in the form of grants or direct government investment) could also be considered to support producers to remove other barriers to SAF production through the funding of a **SAF Clearing House** that could be delivered in conjunction with research and industry partners. In place in the United Kingdom and under development in the European Union, SAF Clearing Houses support potential producers to efficiently obtain ASTM standard evaluation, through services including pre-screening, testing, capacity building and report writing.
- **Financial stabilisation mechanisms** to supplement direct funding through grants should also be included as an important element in a suite of supply-side policy mechanisms. An example of such that Boeing recommends considering is **Contracts for Difference** (CfDs). CfDs have been utilised in various aspects of the energy sector globally, including in low carbon electricity projects in the United Kingdom and in renewable energy programs across Europe. Under this mechanism, a CfD holder receives a fixed strike price minus a reference price. The strike price reflects the total income required by the project. A CfD is formal contract for a period that ensures that project finance investment in capex is recovered within the life of the contract. CfD help to ensure price certainty, and present potential for driving down costs and provided commercially sustainable funding. Whilst they can be more complex to administer than other, more traditional funding mechanisms, they should be considered as a key mechanism to drive increased LCLF supply.

Sustainability and Emissions Criteria

Australia's policy settings should encourage robust sustainability criteria for SAF and other LCLF. Multiple elements should be taken into consideration when determining the sustainability characteristic of SAF.

The ICAO Carbon Offsetting and Reduction Scheme for International Aviation has established a comprehensive set of sustainability criteria, addressing issues such as life cycle emissions, direct and indirect land use change, water, air and soil considerations, as well as social factors. **Boeing recommends drawing from international standards and aligning and adapting these**, only deviating when absolutely necessary in the Australian context. This is practical and efficient when noting that airlines operate internationally and having to seek multiple certifications for fuel batches would add unnecessary complexity and expense.

Complementary supply and demand side policy initiatives should also incorporate emissions and sustainability criteria as fundamental to eligibility and implementation, including but not limited to carbon intensity metrics. Lifecycle assessment (LCA) frameworks should be the foundation for quantifying the competitive emissions intensity of Australian produced SAF in a manner which is feedstock neutral. Domestic production is likely to be competitive from an LCA perspective, resultant from the range of domestic feedstocks and the use of renewable energy in production.

Boeing also recommends concurrently developing SAF accounting mechanisms to be incorporated as part of the broader suite of policy development. This includes exploring flexible accounting mechanisms that can allow the environmental attributes of SAF to be detached from the physical fuel. Further, being able to recognise scope 1 and scope 3 SAF credits can encourage participation of the corporate sector in helping accelerate commercial

deployment of SAF. SAF accounting, including **'book and claim'** is being developed globally including in ICAO's Fuels Task Group and Boeing recommends the Australian Government actively contributes to shaping this discussion.

A flexible but robust SAF accounting mechanism could open opportunities for Australia to explore bilateral SAF agreements or 'green trade lane' opportunities. This would open up further markets for Australian-produced SAF, whilst also ensuring robust guarantee of origin mechanisms provide certainty over sustainability claims.

Emissions and sustainability criteria, should also be centred in the design of any demand-side policies as outlined further below.

Demand-side Mechanisms

Policy mechanism provide a critical means to create and maintain demand for LCLF and help to provide greater investment certainty, particularly for the private sector. Boeing is supportive of such mechanisms as part a broader, comprehensive policy suite that addresses the range of requirements required to grow a domestic LCLF industry.

A range of demand-side mechanisms could be introduced in the Australian context, ranging from a mandate to a low carbon liquid fuel standard or a national emission intensity scheme for liquid fuels. Setting any demand-side policy, however, requires careful consideration of climate goals and ambitions, existing domestic refining capacity and cost implications. Any policy requiring compulsory purchase of SAF, whether this be a mandate or LCLF standard, should be designed to account for possible competitive distortions and to minimise loss of consumer surplus. It is, therefore, Boeing's view that a demand-side policy (or combination of policies) consider the following:

- **Carbon Intensity (CI) prioritised in accordance with volume**. Internationally, several jurisdictions have introduced SAF mandates. In the European Union, for example, this measure is volumetric, whilst other jurisdictions have included mechanisms to recognise and reward carbon intensity. Given the ultimate objective of meeting Australia's legislated climate commitments, along with the aviation sector's long term aspirational goal of net zero by 2050, CI metrics should be centred in the design of mandates (or LCLF standards).
- **The role of government signals and procurement**. Government procurement, including through defence, provides a strong opportunity to signal ongoing demand for LCLF and drive local production. A commitment to procuring a certain volume (and CI) of SAF over a significant time frame for such use would provide greater industry certainty.
- **Cost implications and potential un-intended consequences**. A mandate that is too high may have significant non-compliance outcomes for obligated parties and a range of cost implications for airlines and end users. One that is too low may delay emissions reduction progress and drive investment into other global jurisdictions with more ambitions and short-term objectives. This also underscores the need for demand side mechanisms to appropriately interact with supply side incentives and support, particularly in the short to medium term as domestic industries are established.
- **Ongoing monitoring, evaluation and, if necessary, iteration of demand-side mechanisms**. The progress towards such policy initiatives should be reviewed regularly to ensure they remain targeted and effective. Additionally, global action to drive SAF/LCLF production and uptake may also affect domestic industry

development and policy implementation should remain cognisant of and responsive to such developments.

Conclusion

The policy announcements and intent set by the Australian government provide a strong foundation for developing a strong domestic industry with the potential to deliver significant economic, sustainability and security benefits for Australia. A suite of policies is required to realise this opportunity, underpinned by a series of core principles as outlined in this submission. These should consider the need for both supply and demand side mechanisms, with transparent and robust sustainability criteria as foundational.

In summary, Boeing recommends the following guide effective policy development around low carbon liquid fuels:

- An integrated policy suite should be pursued that contains relevant demand and supply side mechanisms designed to complement one another and, where required, phased overtime.
- Whilst a technology neutral approach to feedstock and production pathways is required, nuanced application of measures should be considered over time, particularly to support less established pathways to SAF production.
- Both demand and supply-side mechanisms should be implemented in the short-term to maximise the environmental, economic and social benefits for Australia, however these must be supplemented by longer-term policies that recognise the need for ongoing regulatory and market flexibility. As such, a balanced, stackable mix of incentives is required over the short-medium term as a domestic industry development and greater private sector finance is attracted.
- Sustainability performance should underpin policy development, particularly any consideration of demand side mechanisms, including mandates.
- The role of government procurement of SAF, particularly relating to defence, should be considered as an effective demand signal.

Boeing welcomes the opportunity to provide input into the Australian government's policy development around low carbon liquid fuels, through this submission, as well as our ongoing involvement in relevant forums including the Jet Zero Council.