Sugarcane Bioenergy Inquiry 2025

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Jet Zero

Inquiry into Sugarcane Bioenergy Opportunities in Queensland

Jet Zero Australia Consultation Paper

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1. Overview

Jet Zero Australia Pty Ltd (Jet Zero) thanks the Primary Industries and Resources Committee for resolving to establish an inquiry into this important emerging industry for Queensland and welcomes the opportunity to provide a written submission.

Jet Zero is an Australian bioenergy company supported by investment from the Queensland Government, the Australian Renewable Energy Agency (ARENA), Qantas, Airbus and Idemitsu of Japan. Our flagship Sustainable Aviation Fuel (SAF) project in Townsville — the most advanced SAF development on Australia's east coast — is Project Ulysses, which is expected to produce 113 million litres per year of low carbon liquid fuels by 2028 using a first-of-its-kind Alcohol-to-Jet (ATJ) technology.

Since its inception in 2021, Jet Zero has completed feasibility studies, secured project sites, established domestic ethanol feedstock supply from agricultural sources, secured SAF offtake agreements, and commenced Front-End Engineering and Design (FEED) activities. To date, the company has invested more than $60 million in private capital, supported by $15 million in government grants, and aims to reach Final Investment Decision (FID) on Project Ulysses in 2026.[1]

ATJ is a proven technology pathway for producing both SAF and Renewable Diesel (RD) and is well suited to ethanol derived from starch-based feedstocks such as sugarcane. Commercial-scale production is expected to commence shortly at LanzaJet's Freedom Pines facility in the United States (Project Ulysses' reference facility), providing a strong foundation for global scale-up. Other potential ATJ feedstocks include waste wheat starch, corn, agricultural residues, forestry waste and certain industrial waste gases.

The environmental and social benefits of this industry are substantial. SAF produced via the ATJ process has the potential to reduce lifecycle CO_2 emissions by up to 80 per cent compared with conventional fossil jet fuel. Project Ulysses will create more than 1,000 jobs during peak construction and around 100 ongoing skilled regional jobs during operations, while strengthening domestic fuel security and supporting development across the aviation, agriculture, tourism and energy sectors.

2. SAF & RD as Strategic Fuels for Queensland

2.1 Low Carbon Liquid Fuels (LCLFs) as Decarbonisation Catalysts

Australia's transport sector—particularly aviation and heavy transport—remains among the most challenging to decarbonise. SAF and RD provide globally recognised solutions for emissions reduction in these hard-to-abate sectors by enabling:

- Immediate emissions reductions with minimal infrastructure changes
- Drop-in compatibility with existing aircraft and diesel engines

[1] Jet Zero is also pioneering a Queensland-based biofuels biorefinery initiative, Project Mandala, utilising HEFA (Hydroprocessed Esters and Fatty Acids) based feedstocks such as fats and oils used to produce low carbon liquid fuels through a hydrotreating process.

- Operational alignment with Defence platforms, as recognised in the Australian Defence Force's *Future Energy Strategy*.

Together, SAF and RD offer practical, near-term pathways to reduce emissions across aviation, freight, mining and agriculture—sectors that are fundamental to Queensland's economy and export base. Importantly, Australia's domestic aviation industry is the eighth largest in the world, creating a substantial local market for SAF demand. This differentiates SAF from other energy industries, such as liquefied natural gas (LNG), whose economics are primarily export-driven.

2.2 New Employment for Regional Queensland

SAF production has the potential to contribute $13 billion to Australia's GDP each year by 2040, supporting nearly 13,000 jobs across the feedstock supply chain and creating a further 5,000 high-value operational roles in production facilities, primarily in regional areas. [2]

This emerging industry enables local agricultural producers to generate new revenue streams from agricultural residues and waste materials, while becoming an integral part of a high-value national SAF supply chain. Nowhere in Australia stands to benefit more than North Queensland, which is uniquely positioned to capture the economic, employment and export opportunities associated with the development of a domestic SAF industry.

2.3 Policy Support & Frameworks

The Queensland Government continues to lead Australia's biofuels agenda through its $180.6 million Sovereign Industry Development Fund and the *Biofutures 10-Year Roadmap*. These programs provide targeted capital support and investment incentives for advanced biomanufacturing, positioning Queensland's sugarcane regions as the nation's SAF production hub and a key contributor to Australia's energy transition.

Commonwealth Government policy and funding mechanisms for SAF are also accelerating, underpinned by:

- $1.1 billion Cleaner Fuels Program, which will provide production incentives for LCLFs
- $250 million for (LCLFs) through the Future Made in Australia Innovation Fund
- $30 million SAF Funding Initiative, administered by the Australian Renewable Energy Agency (ARENA) to support early-stage projects.

Together, these initiatives establish a clear national framework to close the price gap between SAF and conventional jet fuel while de-risking private investment.

The Commonwealth Government has also established the Jet Zero Council to coordinate industry partnerships and accelerate domestic SAF deployment, alongside the Department of Climate Change, Energy, the Environment and Water (DCCEEW), which is developing a national LCLF strategy and certification scheme aligned with international standards. These initiatives provide policy certainty across both the supply and demand sides of Australia's emerging SAF market.

[2] Qantas & Airbus (ICF). "*Developing a SAF industry to decarbonise Australian aviation*" (November 2023)

2.4 Sugarcane: A High-Potential Feedstock

Queensland's sugarcane industry produces more than 30 million tonnes of cane annually, generating a diverse range of potential biofuel feedstocks, including:

- Molasses for ethanol production (SAF via the ATJ pathway)
- Bagasse for cellulosic ethanol or Fischer–Tropsch diesel
- Tops and trash for renewable gas and cellulosic biofuels.

Of these, SAF produced via ATJ using bioethanol derived from sugarcane is currently the most commercially viable option when compared with traditional jet fuel cost structures. Based on existing production volumes, Queensland's sugarcane industry has a theoretical feedstock potential of approximately 238 petajoules per year, equivalent to about one-tenth of Australia's total theoretical biofuel potential. [3]

It is important to acknowledge this is a theoretical SAF production potential only and other ESG and social licence requirements need to be taken into consideration, but it illustrates the scale of the opportunity available.

Sugarcane is also recognised as one of the world's most efficient photosynthetic crops for carbon capture, providing added environmental value. It is a particularly high-potential feedstock for SAF production via ATJ because it yields large volumes of fermentable sugars that can be efficiently converted to ethanol with low carbon intensity and high land-use productivity.

3. Current State & Future Opportunity for Queensland Sugarcane

3.1 Global Demand Forecasts

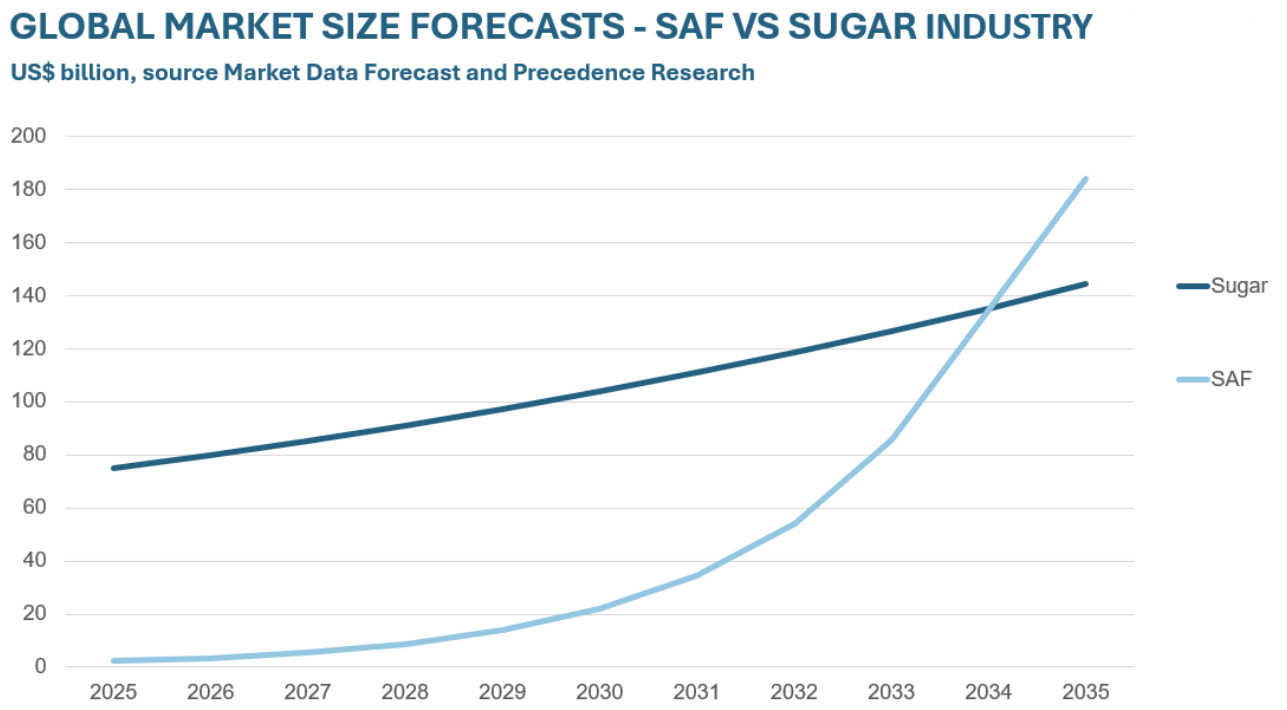
Driven by government mandates and airline commitments, the international market for SAF is projected to be worth US$134 billion by 2034.[4] This strong growth means that within the next decade the global SAF market is forecast to overtake the value of the international sugar industry. Queensland's sugarcane industry must therefore invest now to position itself ahead of this transition, similar to efforts being pioneered by bioethanol producers in the United States and in Brazil.

The scale of opportunity is substantial — meeting Qantas's voluntary target of 10 per cent SAF use by 2030 alone would require approximately 15 million tonnes of sugarcane fermented to ethanol for the ATJ process, equivalent to around half of Australia's total current sugarcane crop.[5]

By leveraging this structural shift in global energy markets, the sugarcane industry can stimulate new investment, enhance regional exports and secure long-term benefits from the energy transition. However, the sector faces a critical juncture, with ageing infrastructure, tightening margins and volatile

[3] Bioenergy Australia (Deloitte). "*Transitioning Australia's Liquid Fuel Sector: The Role of Renewable Fuels*" (May 2023)
[4] Market Data Forecast & Precedence Research
[5] SAF production via the ATJ process requires approximately two litres of ethanol to one litre of SAF

returns. For Queensland to grow a viable biofuels industry, ethanol feedstock must deliver a return equal to or greater than that from crystal sugar. The biofuels sector will also require long-term price stability in feedstock supply arrangements with growers. Encouragingly, Queensland's modern cane rail network and experienced regional workforce provide a strong foundation to support future SAF and RD production.



Source: Market Data Forecast & Precedence Research

For ethanol production to become a viable and scalable alternative in Australia, its market value must consistently exceed that of raw sugar. Without a clear price incentive, millers and growers have little motivation to transition away from traditional crystal sugar production, particularly given the high capital and operational costs associated with ethanol facilities. This challenge is especially relevant for SAF, a key end use for ethanol in a decarbonised aviation sector. For SAF to be commercially attractive, producers must be both willing and financially able to purchase ethanol at a premium that reflects its higher production cost compared with sugar.

This pricing dynamic has broader implications across the supply chain. The higher cost of ethanol must ultimately be absorbed downstream, most likely through a combination of slightly higher fuel prices, SAF blending mandates or government-backed incentive mechanisms. In this context, targeted policy support is essential to bridge the gap between production costs and market returns, enabling ethanol and SAF to compete with conventional fuels while delivering enduring emissions reductions, regional employment and economic resilience for Queensland.

3.2 Industry Benefits of Transition

Transitioning Queensland's sugarcane industry toward biofuel production offers a range of interconnected economic, environmental and operational benefits that strengthen both the sector and

the regional communities that depend on it. By adopting a dual-product model, sugarcane can supply both traditional sugar markets and ethanol for SAF production. This diversification expands market opportunities for growers and provides revenue stability independent of global sugar price fluctuations.

Sugarcane offers one of the most efficient pathways for biofuel production, owing to its high fermentable sugar content and strong agronomic performance. Its ability to thrive across a range of climatic conditions ensures consistent yield reliability, while its tops—traditionally left in the paddock to preserve commercial cane sugar (CCS) levels—contain reducing sugars that can also be converted into ethanol. This currently untapped portion of the crop, representing around six per cent of total biomass, provides an additional energy resource that can increase ethanol output per tonne and improve overall land-use efficiency.

The industry benefits of transitioning the sugar cane sector towards biofuels production are as follows:

#	Benefit	Supporting Detail
1	Greater Crop Demand	Two Products: Sugar & Ethanol (for SAF)
2	Stronger Industry Growth	Forecast 28% YoY Growth In SAF Demand to 2050
3	Better Productivities	Simpler Mill Process (less downtime)
4	Lower Fertiliser Costs	Significant Bio Dunder Production
5	Available CO_2 Credits	Carbon Credits Valued by End Customer
6	Lower Freight Costs	Decreased Final Product Handling and Freight Costs
7	Lower Price Volatility	Flexible Long Term Offtake Pricing (optional)
8	Asset Renewal	Much Needed Investment in Sugar Industry

Source: Jet Zero

Australia's established sugar industry provides a strong foundation for this transition. With existing transport and processing infrastructure and a skilled workforce already in place, the shift to large-scale ethanol production can be achieved with relatively low capital intensity. Converting sugar mills to ethanol production simplifies operations and can reduce plant maintenance and operating costs. The distillation process also consumes less energy than sugar crystallisation, freeing surplus bagasse for use in cogeneration or as feedstock to power SAF facilities.

In addition, biofuel production generates valuable co-products such as bio-dunder and filter cake, which can be reused as nutrient-rich soil conditioners. This reduces the cost and environmental footprint of fertiliser use while closing the nutrient loop in cane cultivation. Producing ɬLCLFs also enables access to carbon credits that hold tangible value for offtake customers seeking verified emissions reductions. These credits provide an additional revenue stream and enhance project bankability.

Locating ethanol and SAF production close to feedstock sources further reduces freight and handling costs compared with bulk sugar exports, supporting more efficient logistics and regional value capture.

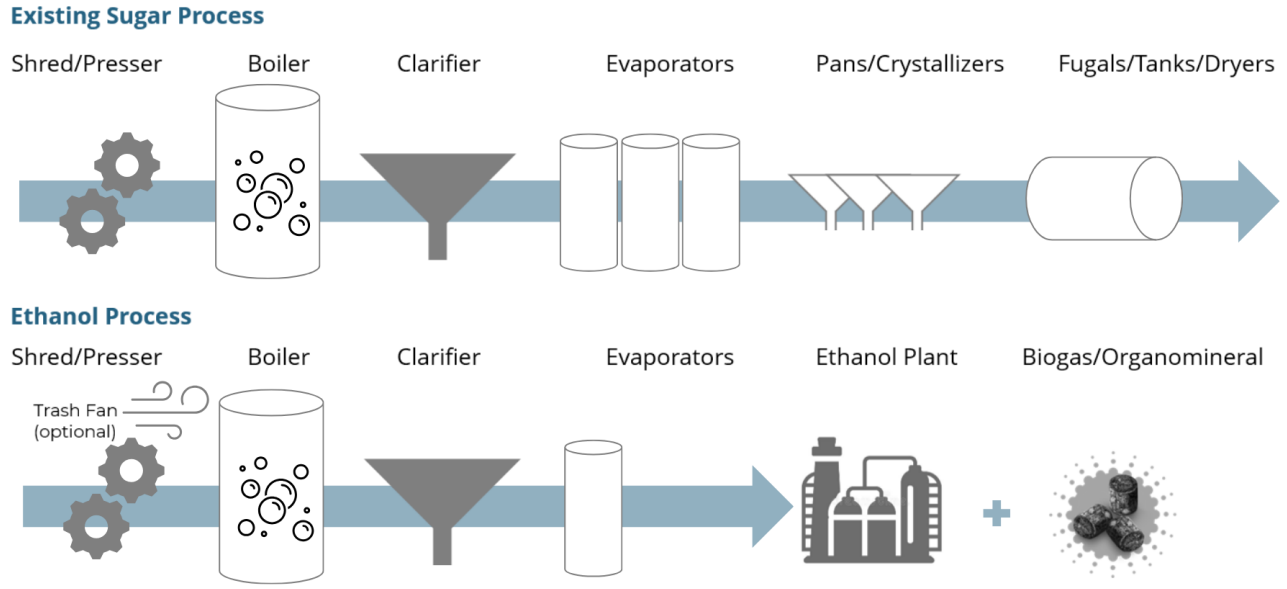
Biofuel markets also enable long-term offtake agreements with fixed or flexible pricing structures, providing protection against the volatility that characterises global sugar markets. Finally, the shift to biofuel production will stimulate investment and asset renewal across Queensland's sugar milling network. Modernising these facilities extends their productive life, strengthens regional employment and positions the industry as a cornerstone of Australia's emerging low-carbon economy.

4. Transitioning the production process

4.1 Sugar mill conversion

The distillation of cane juice to ethanol is a far simpler process than traditional sugar production, eliminating the need for high-capital-cost crystallisation, separation, drying and shipping equipment. In addition to operational efficiencies, this simplified process reduces annual capital replacement expenditure. Current sugar milling infrastructure often relies on ageing assets that require continual overhaul or replacement of high-cost components such as vacuum pans, centrifuges and crystallisers. A streamlined distillation process involves fewer moving parts and less complex equipment, reducing wear and tear and extending asset life cycles.

While every sugar mill in Queensland is different, the conversion of existing milling infrastructure to advanced biofuel production can generally be achieved through targeted modifications to the conventional sugar manufacturing process. The front-end stages of sugarcane processing — including shredding, pressing, juice clarification and evaporation — remain largely unchanged. The key transition occurs after juice concentration, where crystallisation and sugar drying are replaced by fermentation and distillation processes to produce ethanol.



Source: Jet Zero

In a traditional sugar mill, clarified juice is evaporated to syrup, crystallised into raw sugar, and separated in centrifugals before drying and storage. In contrast, an integrated ethanol pathway diverts

the concentrated syrup to a fermentation and distillation facility, producing anhydrous ethanol suitable for downstream conversion into SAF or RD. The modified process maintains the mill's energy self-sufficiency, with bagasse continuing to fuel the boiler system. Residual materials such as dunder, filter cake and cane trash can be repurposed through anaerobic digestion or composting to generate biogas. These co-products create additional value streams while supporting a circular, low-waste operating model.

Ethanol produced through this pathway serves as a direct feedstock for the ATJ process. Through catalytic dehydration, oligomerisation, hydrogenation and distillation, ethanol is upgraded into SAF and RD that meet international ASTM fuel standards. This modular adaptation enables existing sugar milling assets to be progressively retrofitted into low-carbon fuel production hubs, allowing mills to flex between sugar and ethanol production in response to prevailing financial and market conditions. The result is a scalable transition pathway that leverages Queensland's established agricultural supply chains, strengthens regional employment and positions the state at the forefront of sustainable aviation and renewable fuel manufacturing.

4.2 Dunder Management

In developing a biofuels industry from sugarcane, a critical consideration is the management of dunder—known internationally as vinasse—a valuable by-product of the ethanol production process that must be managed sustainably to comply with Australia's strict environmental regulations.

The feasibility of distributing dunder as fertiliser depends on several factors, including the availability of sufficient cane land for application, the proximity of the distillery to farmland, and the region's soil and nutrient requirements. Regions with limited cane-growing areas or logistical challenges in transporting and applying dunder are less suitable for large-scale ethanol production.

The distillation process for ethanol generates substantial quantities of dunder. For every litre of ethanol produced, approximately 6.1 litres of dunder is created. This dark brown liquid, with a pH of between 3.5 and 5, has a high organic content, a distinctive odour, and contains water, organic solids and minerals such as potassium, calcium and magnesium. Managing the disposal and reuse of dunder in an environmentally sustainable way is therefore a key challenge for the development of a biofuels industry.

Queensland's sugarcane industry operates under some of the world's most stringent environmental regulations, particularly those designed to protect the Great Barrier Reef. Legislation such as the *Great Barrier Reef Marine Park Amendment Act 2008*, the *Environment Protection and Biodiversity Conservation Act 1999*, and the *Environmental Protection (Great Barrier Reef Protection Measures) and Other Legislation Amendment Act 2019* ensures strict management of potential pollutants, including effluents from ethanol production.

Effective dunder management also presents opportunities for value creation. Revenue from dunder reuse or fertiliser production could be shared among industry participants, helping to offset input costs and improve the overall sustainability of biofuel operations.

5. Further Information

Jet Zero welcomes the opportunity to support the Queensland Parliament in its consultation on the development of a local biofuels industry. For further information, please contact us at enquiries@jetzero.com.au.