Project Swift - Knowledge Sharing

Lessons Learnt Report No.1

February – July 2025

Project name:

Licella - Project Swift - SAF from Sugarcane Residues Feasibility Study

Organisation:

Licella Holdings Limited

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Acknowledgement

This Project received funding from the Australian Renewable Energy Agency (ARENA) as part of ARENA's Advancing Renewables Program.

This Lessons Learnt Report has been prepared by Licella as part of knowledge sharing.

It provides an overview of the challenges and lessons learnt by Licella from *Project Swift*, during the reporting period (February – July 2025), that could be useful for the broader industry undertaking or considering similar opportunities.

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Executive Summary

<u>Licella - *Project Swift* - SAF from Sugarcane Residues Feasibility Study</u>

Licella has been working on an innovative biorefinery project ("*Project Swift*" or "the Project") utilising its patented and Australian-developed Cat-HTR™ (Catalytic Hydrothermal Reactor) hydrothermal liquefaction (HTL) technology to convert biomass residues to significant volumes of low carbon liquid fuel (LCLF), including sustainable aviation fuel (SAF).

Between February and July 2025, Licella has completed feasibility work for the Project as part of the pre-FEED (pre-Front End Engineering Design) phase. This report details the lessons learnt from the pre-FEED stage of the Project. These lessons have emerged across six core areas of the Project:

- Commercial
- Financial
- Technical
- Social
- Regulatory
- Risk

Key learnings include:

1. **The Carbon Intensity–Cost Trade-Off:** There is a cost trade off when targeting SAF with a low carbon intensity, particularly in emerging markets and for facilities that represent a scale-up of deployed technologies.
2. **The Importance of Feedstock Risk Management:** A mixed feedstock strategy reduces project risk, particularly for biomass feedstocks associated with seasonal and/or degradable supply.
3. **Laying the Groundwork for Social Licence Early:** Defining measurable social indicators and establishing a local baseline early helps identify risks and guide the planning of meaningful community consultation for projects in emerging markets.
4. **Engaging Early with Evolving Regulatory Landscapes:** Early and proactive policy engagement helps de-risk SAF projects and supports shaping a more enabling regulatory environment for LCLF.
5. **Early Risk Assessments Support Effective Project Planning:** Investment in early assessments during the Pre-FEED stage has allowed Licella to identify and mitigate key risks related to permitting, project phasing and product development.

While these lessons are grounded in the specific experience of the Project, they are intended to support broader knowledge sharing across industry and help shape future decision-making for SAF and other LCLF projects.

Project Background

The aim of *Project Swift* ("The Project" – a Feasibility Study that includes Pre-FEED and FEED for the proposed biorefinery) is to achieve a Final Investment Decision (FID) to commence building the Cat-HTR™ biorefinery (the "Deployment Project").

The proposed biorefinery will utilise Licella's Cat-HTR™ HTL technology to process biomass residues, including bagasse (targeting processing a total feedstock volume of 150,000 dry tonnes per annum) to a bio-intermediate (renewable oil). The Project will investigate the bio-intermediate being upgraded on-site, using adapted versions of commercially available refining technologies from Shell and green hydrogen, to produce significant volumes of LCLF including SAF (and to a lesser extent, naphtha, renewable diesel, and very low sulphur fuel oil).

The Project's Feasibility Study and FEED is scheduled to run for 1.5 – 2 years, with the Deployment Project commencing post FID. As such, Licella is currently targeting commencing construction of the biorefinery in 2027.

This report details the lessons learnt from the pre-FEED stage of the Project, from February – July 2025.

Figure 1: Licella and Isis Central Sugar Mill (ICSM) team members on-site at the sugar mill

Lessons Learnt

Lesson Learnt 1: The Carbon Intensity–Cost Trade-Off

There is a cost trade off when targeting SAF with a low carbon intensity, particularly in emerging markets and for facilities that represent a scale-up of deployed technologies.

Category: Commercial / Financial

There is a cost trade-off when targeting low-carbon intensity SAF, particularly for projects that represent a technology scale-up, and within emerging markets where supply chains and policy settings are not yet mature.

During the pre-FEED phase of the Project, Licella evaluated the relationship between the carbon intensity of the final products (including SAF) against the anticipated production costs. This informed the development of a "Carbon-Price Efficiency Frontier", a framework that maps the maximum achievable emissions reduction relative to production cost.[1]

As shown in Figure 2 below, reducing the carbon intensity[2] of SAF often increases production costs, particularly where a facility is a First-of-a-Kind (FOAK) in the local market, as is the case in Australia.

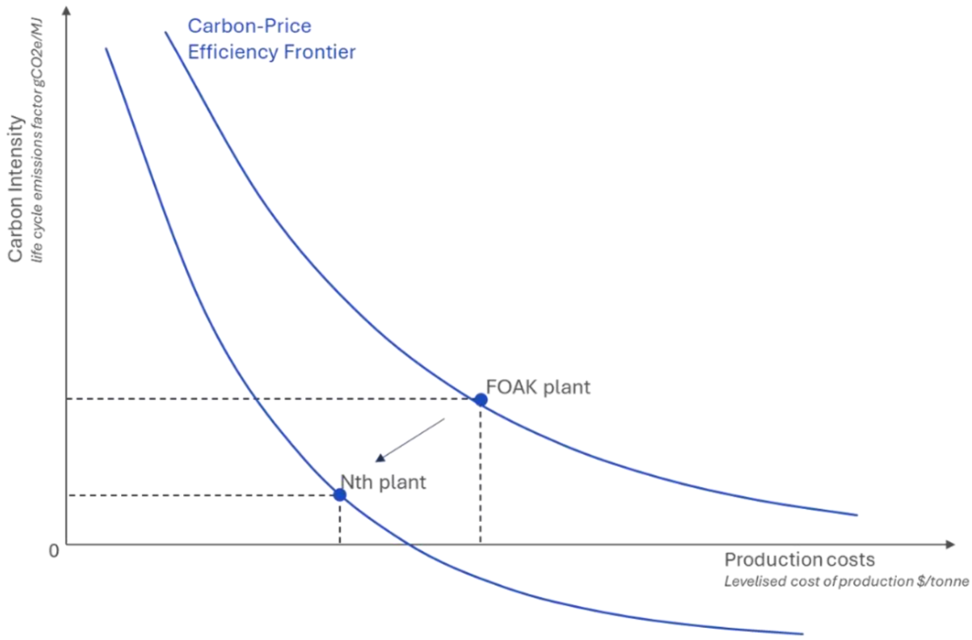

Figure 2: Carbon-Price Efficiency Frontier. Source: Licella

[1] Production costs, represented by 'Levelised Cost of Production', is defined as the average cost of producing a unit of fuel over the lifetime of a production process. This includes considering costs associated with producing the product, such as capital, raw materials, labour, energy, and other production inputs.

[2] Carbon intensity, represented by 'Lifecycle Emissions Factor', is defined as total greenhouse gas (GHG) emissions per unit of energy (usually gCO_2e/MJ) associated with a fuel across its full lifecycle. This includes feedstock production, transport, processing, distribution, and combustion, and also an inclusion of Indirect Land Use Change (under CORSIA).

Key learnings

Carbon-cost trade-off is significant: There is a lack of availability or maturity of low carbon inputs in the Australian market, such as renewable energy (electric and thermal), green hydrogen, sustainable feedstock and co-product markets. These inputs significantly impact both the production cost and emissions profile of the final SAF product.

FOAK cost challenges: Where a facility is a FOAK within the market (i.e. in Australia), it will generally sit higher on both the cost and carbon intensity curves due to:

- Absence of economies of scale
- Limited infrastructure for low-carbon inputs (e.g. renewable energy and green hydrogen)
- Higher financing and development risks
- Immature policy and offtake frameworks

Cost efficiency is anticipated to improve with scale and maturity: Over time, “nth-of-a-kind”[3] (NOAK) facilities can move inward along the “Carbon-Price Efficiency Frontier”, achieving more emissions reduction for less cost. This could be driven by:

- Access to more mature and cost-effective low-carbon inputs
- Technology and process optimisation through learning-by-doing
- Lower investment risk due to proven technology performance and market validation
- Stronger policy support, including demand-side signals

Finding the right balance: Project developers need to strike a strategic balance, pursuing meaningful decarbonisation while maintaining commercial viability. Over time, through reinvestment, innovation, and policy evolution, projects can shift further along (and ideally inward) on the “Carbon-Price Efficiency Frontier”.

These learnings reinforce the importance of long-term policy stability and targeted support mechanisms to help early projects close the cost gap and accelerate the path to commercially competitive, low-carbon fuels.

[3] In the context of biorefineries, the term "nth plant" refers to a commercial-scale facility that utilises established and well-understood technologies, contrasting with a "pioneer plant" which uses newer, less proven technologies.

Implications for future projects

Licella's experience has highlighted that projects should approach early technology deployments within the SAF market with a strategy that prioritises carbon reduction measures offering the best value for cost. Project developers, including Licella, can plan for progressive decarbonisation as their technologies scale and markets evolve.

Using the "Carbon-Price Efficiency Frontier" as a tool has allowed Licella to communicate these trade-offs to investors, policymakers, and other stakeholders. This has encouraged more informed, pragmatic decision-making, particularly in the emerging local LCLF market.

To further support future projects, governments also have a critical role to play in enabling cost-effective decarbonisation pathways, including SAF.

Licella will continue to engage with Federal and State governments to reinforce the importance of:

- Driving down the cost of renewable electricity through energy policies that prioritise deployment and grid decarbonisation
- Ensuring access to competitively priced green hydrogen and low-emissions thermal energy
- Supporting streamlined, lower-energy intensity processes through innovation and regulatory simplicity
- Providing targeted, long-term policy mechanisms that help de-risk early-stage investments and improve project bankability

Ultimately, the cost of achieving low-carbon intensity SAF is significant. A balanced, staged approach to project development that is aligned to available policy support, is essential for scaling domestic SAF production in a commercially viable way.

Lesson Learnt 2: The Importance of Feedstock Risk Management

A mixed feedstock strategy reduces project risk, particularly for biomass feedstocks associated with seasonal and/or degradable supply.

Category: Technical / Risk

One of the key lessons from this stage of the Project was recognising the practical limitations of relying on sugarcane bagasse as a year-round feedstock for producing LCLF.

Bagasse is the fibrous material (biomass) left over after sugarcane is crushed to extract its juice. While it is available in large volumes during the sugarcane harvest season (usually from around June-November each year), Licella's research and technical studies have found that it cannot be reliably stored for use during the off-season (which lasts around six months).

Key learnings

Licella conducted both desktop studies and on-site trials to explore how different types of biomass perform, and to assess the feasibility of a mixed feedstock strategy. This work formed a key part of Licella's early technical studies during the pre-FEED (pre–Front-End Engineering Design) phase.

The results of Licella's on-site trials at the Isis Central Sugar Mill (ICSM, the proposed site of the Project), alongside testing at the University of Queensland, highlighted the risk of relying on bagasse as a feedstock all year round. Due to the high moisture content of the bagasse (around 50% by weight), it is prone to microbial breakdown when stored, which reduces its quality and usability over time.

As microbes degrade the organic components of the bagasse, its mass and quality decline. Licella's feedstock studies and published industry data (including by IEA Bioenergy[4]), suggest that significant breakdown of the feedstock can occur within weeks, with up to 30–50% dry matter loss over several months if left unmanaged. This not only reduces the amount of bagasse available for fuel production but also impacts its energy value and suitability for processing.

A key finding of Licella's own trials on-site at ICSM was that storing bagasse in moist, tightly packed piles leads to microbial breakdown almost immediately.

This microbial breakdown within the stored bagasse feedstock leads to two main issues:

- Loss of usable feedstock material – often referred to as dry matter loss.
- Greenhouse gas (GHG) emissions – including CO_2, CH_4, and small amounts of nitrous oxide (N_2O).

Figure 3 shows a typical large stockpile of bagasse at a sugar mill. Even when covered, microorganisms feed on the leftover sugars in the bagasse, producing heat and carbon dioxide (CO_2). As oxygen is used up inside the pile, parts with little or no oxygen (called anaerobic zones) form, where methane (CH_4), a potent greenhouse gas, is produced. Meanwhile, the outer layers of the pile still have oxygen (aerobic conditions) and continue to emit CO_2.[5]

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[4] IEA Bioenergy Task 43. (2019). Dry matter losses during biomass storage.

[5] BMC Biotechnology. (2020). A snapshot of microbial diversity and function in an undisturbed sugarcane bagasse pile.

In parallel, these emissions undermine the environmental credentials of bagasse as a sustainable feedstock outside the harvest season. Methane and nitrous oxide are particularly important due to their high global warming potential (GWP). GWP measures how much heat a greenhouse gas (GHG) traps in the atmosphere compared to CO_2 over 100 years: methane has 28 times the GWP of CO_2, while nitrous oxide is 265 times higher.[6]

Figure 3: Large open-air stockpile of sugarcane bagasse covered with a polyethylene tarp. Source: AI generated

Figure 4: Bagasse (close-up)

Figure 5: Bagasse in bulk bags (as received from the Isis Central Sugar Mill)

Figure 6: Bagasse feedstock preparation at Licella's facility in Somersby, NSW

Licella explored drying bagasse immediately after production (to below 25% moisture content, the threshold for microbial stability) as a potential solution. In theory, this would allow long-term storage by preventing microbial activity. However, drying is both energy and capital intensive, particularly in humid climates. There is also the ongoing challenge of avoiding rewetting during storage, which was a challenge observed during Licella’s own on-site trials, which would reinitiate microbial breakdown.

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[6] Clean Energy Regulator. (2024). Global Warming Potential

Implications for future projects

A mixed feedstock strategy is emerging as the most practical and resilient approach for SAF and other LCLF projects, especially in regions with highly seasonal biomass availability.

Licella's findings reinforced that while sugarcane bagasse is abundant during the harvest season, its high moisture content and vulnerability to microbial breakdown make it unsuitable for reliable long-term storage. Projects that rely solely on bagasse year-round would face significant risks: loss of usable material, declining feedstock quality, and emissions that undermine environmental credentials / the products carbon intensity.

To address this, a diversified feedstock model has been embedded into the Project. For future projects, Licella will consider a mixed feedstock strategy from the outset, particularly where projects are targeting biomass feedstocks that are seasonal in nature.

When considering feedstocks that are seasonal in nature, projects could consider:

- Using bagasse while it is fresh and directly after the milling process, during the sugarcane harvest season (typically June to November).
- Switching to alternative, storable feedstocks, such as woody biomass residues during the off-season.
- Designing flexible logistics and supply chains to accommodate seasonal shifts and ensure continuous, high-quality feedstock supply.

This approach reduces reliance on costly storage and drying infrastructure, lowers technical and environmental risks, and supports more stable year-round operations. It also strengthens the overall resilience of the fuel supply chain and enhances project bankability by improving input certainty - an important factor for investors, partners, and regulators.

For future projects, particularly in regions with similar agricultural profiles, the key takeaway is clear: feedstock flexibility is an operational advantage and is a critical success factor for a project's commercial viability and carbon footprint.

Lesson Learnt 3: Laying the Groundwork for Social Licence Early

Defining measurable social indicators and establishing a local baseline early helps identify risks and guide the planning of meaningful community consultation for projects in emerging markets.

Category: Social

As part of early-stage project planning, Licella developed a social impact framework to identify potential social impact risks and opportunities, and to measure the Project's potential contribution to the local community. This included considering both experienced and perceived impacts, positive and negative, with clearly defined, quantifiable indicators to track social impact over time. Whilst still under development, a summary of the key social impact measurements being considered by the Project are listed below in Table 1.

In developing the Project's social impact framework, Licella explored various systems in place to measure social impact, including the UK's National TOMs (Themes, Outcomes, and Measurements) Framework, which provides practical tools to measure and report social value across areas such as employment, skills, and local economic contribution.[7] Licella also utilised Queensland's Social Impact Assessment (SIA) guidelines to help shape the methodology for assessing and reporting community impacts within the local market.[8]

Using Australian Bureau of Statistics (ABS) Census data, available regional planning documents and local economic indicators, an initial social baseline was established to build a preliminary profile of the host community and its infrastructure landscape.

Key learnings

For the Project, this process has helped to proactively identify:

- Housing and accommodation pressures in the Bundaberg region
- Road and transport infrastructure considerations
- Workforce access and regional capability planning
- The need for respectful and early engagement with the local First Nations communities

Table 1: Summary of key elements from the Project's social impact framework

Stakeholder	Potential Impact	Nature	Measurement
Local Community	Local employment opportunities	Positive (Experienced)	• % of full time equivalent (FTE) jobs created within the local community • Change in local employment rate
Local Community	Increased demand on short-term accommodation	Negative (Experienced)	• % of project workforce that require short-term accommodation in the local area • Vacancy rate change in local accommodation
Local Community	Increased road traffic from truck movements	Negative	• Daily traffic volumes changes • Number of road incidents

[7] UK Local Government Association. (2019). National TOMs Framework for Social Value Measurement

[8] Queensland Government. (2025). Social impact assessment

Stakeholder	Potential Impact	Nature	Measurement
		(Experienced)	• Shuttle bus utilisation data
First Nations Peoples	Respectful and early engagement with First Nations communities	Positive (Experienced & Perceived)	• Number of engagement sessions • Number of complaints received
Local Community	Electricity and water access issues due to resource competition	Negative (Experienced & Perceived)	• Grid outage data before and after project connection • Number of utility complaints

Although full implementation of the social impact framework is pending further project advancement, developing the framework early had already delivered valuable insights for the project.

Establishing a baseline early has helped inform Licella's project team and reduced the risk of relying on assumptions about the local landscape. It has provided a foundation for more effective engagement and supported early identification of risks and opportunities.

While formal community consultation is yet to commence, Licella's early presence, through participation in local events and engagement with key regional stakeholders, has demonstrated the value of building authentic relationships from the outset. Discussions with local and state government representatives have highlighted the importance of public education around biofuels and the broader bioeconomy, particularly in demystifying emerging technologies. Feedback from local stakeholders has also reinforced that early education efforts help lay the groundwork for more meaningful, long-term relationships with the wider community, including First Nations peoples.

As such, Licella plans to embed the insights gained from its early social impact framework into its planning for the next phase of the Project's broader community consultation. Licella also intends to revisit the framework later in the Project to assess progress and review measurable outcomes from its ongoing community engagement.

Implications for future projects

Early-stage social investigations can lay the foundation for a potential full Social Impact Assessment (SIA) at a later stage in the Project. They provide a structured approach to understanding the local context, anticipating potential risks, and designing meaningful community and stakeholder engagement strategies that are fit for purpose.

Social licence is never guaranteed, it must be built deliberately and from the outset. For Licella, the process of developing a preliminary social impact framework, before formal community consultation, enabled a clearer understanding of local issues and expectations, and highlighted where early engagement would be most valuable.

Embedding social considerations at the start supports community consultation and acceptance of innovative bioeconomy projects, particularly in regional communities.

Lesson Learnt 4: Engaging Early with Evolving Regulatory Landscapes

Early and proactive policy engagement helps de-risk SAF projects and supports shaping a more enabling regulatory environment for LCLF.

Category: Regulatory / Risk

A key lesson over this phase of the Project is the importance of early and sustained engagement with policymakers. Licella has closely monitored LCLF policy under development with the aim to submit feedback to those out for consultation that might materially impact the Project. Even during this relatively short period, it became clear that newer conversion pathways, such as HTL, are often overlooked.

Therefore, a key lesson for the Project is the need to strongly and consistently advocate for clear and inclusive LCLF policy development that includes next-generation technologies like HTL.

Engaging early with policy developers has been identified as a key risk mitigation strategy for the Project. Such engagement aims to reduce uncertainty around project approvals, feedstock classifications, and eligibility under future LCLF standards. It also ensures that the unique challenges and opportunities of all LCLF projects under development are better understood decision-makers and more fairly represented.

Since the commencement of the Project, Licella has made submissions to:

- Queensland's $30 billion by 2030 Blueprint for Primary Industries[9]
- Queensland Waste Strategy 2025–2030[10]
- Department of Climate Change, Energy, the Environment and Water (DCCEEW) - Guarantee of Origin (GO) Scheme – LCLF Expansion.[11]

Implications for future projects

- Given the evolving regulatory landscape both globally and in Australia, Licella has found that active policy engagement is essential for projects utilising innovative technologies, serving as a key risk mitigation tool.
- Early involvement helps to identify regulatory gaps and proactively advocate to address these barriers before they cause delays or deter investment.
- Projects that invest in shaping policy environments accelerate their own development, while paving the way for broader growth of the domestic SAF and LCLF industries.

As such, Licella will continue to actively lobby for the inclusion of HTL as a recognised LCLF pathway for hard-to-abate sectors, including the aviation and maritime sectors. Licella will also continue to advocate and support the work of peak bodies, such as Bioenergy Australia, in promoting the role of LCLF in national fuel security and the clean energy transition.

[9] Queensland Government DPI. (2025). Queensland primary industries 25-year blueprint

[10] Queensland Government. (2025). Draft new Queensland Waste Strategy Consultation

[11] DCCEEW. (2025). Guarantee of Origin Scheme

Lesson Learnt 5: Early Risk Assessments Support Effective Project Planning

Investment in early assessments during the Pre-FEED stage has allowed Licella to identify and mitigate key risks related to permitting, project phasing and product development.

Category: Regulatory / Risk

Licella's engineering team, with the support of its engineering and permitting partners, conducted several risk assessments during the pre-FEED stage of the Project. These assessments helped identify key risks across these three areas:

1. Permitting
2. Project Phasing
3. Product Development

Permitting

Licella conducted a Fatal Flaws Assessment early in Project, which has been instrumental in shaping the pre-FEED phase. This assessment acted as a preliminary risk screening exercise that identified several critical issues that could prevent the Project from proceeding as planned.

This work identified potential environmental constraints at the Project's preferred site. In response, Licella engaged an external consultancy, EMM, to develop a tailored approvals strategy. This was viewed as particularly important given Queensland's complex permitting landscape.

EMM identified two key risks at the proposed site. The first was a covenant related to vegetation close to the proposed site layout. The second related to the potential impact on the local waterway. Both aspects had the potential to negatively impact the Project's permitting timeline. As a result of this early risk identification, Licella was able to change the site's plot plan layout with minimal re-work.

Based on these findings, EMM have also recommended that Licella conduct a baseline ecological survey to further de-risk the proposed Project site. The work is currently still ongoing as part of the Project's pre-FEED stage.

Project Phasing

Early in the pre-FEED phase, Licella and engineering partner Technip Energies identified that the Project's complexity (particularly the number of technical interfaces) posed a risk to the Project's overall timing and capital requirements. To mitigate this risk, a phased approach to the Project's execution is being assessed as part of the detailed feasibility. This approach seeks to reduce upfront risk and improve bankability by breaking the Project into manageable stages, enabling better control of capital cost and technology risks, and helps to simplify the Project's permitting and approvals strategy.

Product Development

The phasing of product development for the Project was also identified as a key consideration during this stage. Through technical sessions with Licella's upgrading partner, Shell Catalyst & Technologies, Licella identified the timing of the ASTM certification pathway for its SAF product as a key risk to achieving FID within the Project's timeframes. As such, we have identified other LCLF products, including maritime biofuels and potentially renewable CO_2, as having lower technical barriers and therefore faster routes to market for the first phase of the Project. While SAF remains the key target product for the Project, this phased approach to product development helps to improve project bankability (through securing earlier project revenues) and prevent potential delays to the Project achieving FID at the end of 2026.

Implications for future projects

- Projects could consider prioritising a fatal flaws assessment early during the feasibility stage.
- Early identification of environmental and regulatory risks can better inform site selection and helps reduce the likelihood of approval delays.
- For complex or novel technologies, external expertise may be required to effectively design an approvals pathway and secure permits to progress towards FID.

Conclusion

Lessons from the front line of LCLF project development

Project Swift is one of Australia's first biorefinery projects dedicated to producing LCLF, including SAF, from regionally sourced biomass residues. As an innovative biorefinery project, it has and will continue to navigate a range of challenges and opportunities across areas including commercial, financial, technical, social, regulatory and risk.

Many of the lessons presented in this report reflect the early-stage realities of pioneering a new LCLF project within an emerging sector. These include the need for flexible feedstock strategies, early social licence planning, careful consideration of site and infrastructure selection, and a strong focus on early regulatory engagement and approval pathways.

While these lessons are grounded in the specific experience of the Project, they are intended to support broader knowledge sharing across industry, government, and the investment community. By highlighting potential key enablers and surfacing potential barriers to the development of a robust domestic SAF sector, this work aims to support a more collaborative, de-risked and scalable approach to future LCLF projects in Australia.

Ultimately, the development of a viable LCLF and SAF industry will require more than successful individual projects. It will require alignment across policy, planning, infrastructure, investment, and community expectations - as well as a willingness to share learnings that accelerate collective progress.

Glossary

Bagasse— Bagasse, sometimes known as sugarcane pulp or megass, is the fibre remaining after the juice is extracted from sugarcane.

Biocrude— The liquid bio-intermediate produced from Licella's core hydrothermal liquefaction (HTL) process. It is a renewable oil that can be refined to a range of biofuels and biochemicals, including sustainable aviation fuel (SAF).

Biomass— Biomass is biogenic material that comes from plants and animals. The term is usually used to refer to solid plant and organic material. In the case of Licella's Cat-HTR™ process, biomass is a feedstock that is converted to a liquid bio-intermediate (see *biocrude*).

Cat-HTR™— Cat-HTR™ is the abbreviation of Catalytic Hydrothermal Reactor, Licella's patented Hydrothermal Liquefaction technology platform.

CI— CI stands for carbon intensity and refers to the amount of greenhouse gas emissions (measured in carbon dioxide equivalents or CO_2e) produced per unit of activity or output, like generating electricity or producing a product.

CORSIA— CORSIA, or the Carbon Offsetting and Reduction Scheme for International Aviation, is a global scheme, developed by the International Civil Aviation Organization (ICAO), designed to address CO_2 emissions from international flights by requiring airlines to offset any growth in emissions above a certain baseline.

FEED— Front End Engineering Design (FEED) is an engineering design approach used to identify technical requirements and main costs for a proposed project, used by design/build engineering organisations.

Feedstock— Feedstock refers to the raw material to supply or fuel an industrial process. In the case of the Cat-HTR™ process, it is the material fed into the front-end of the process that gets converted into the bio-intermediate.

FEL— Front End Loading (FEL) is the conceptual development process of projects into processing industries and is commonly divided into 3 stages: FEL-1, FEL-2, and FEL-3 (also called FEED). In FEL-1 the deliverable is an engineering study conducted to a +/-50% cost level based upon a given scope and answers the question 'What are my options to achieve my project goals?'

FID— Final Investment Decision (FID)

FOAK— First-of-a-kind (FOAK) is a term usually used to describe a project that is a first to implement a new technology or process at commercial scale. A project may not be a FOAK globally, but it may be a FOAK deployment in the local market.

GHG— Greenhouse gas are gases that trap heat in the atmosphere and contribute to climate change

HTL— Hydrothermal Liquefaction (HTL) is a depolymerisation process that utilises water under moderate temperatures (200-400°C) and high pressures to convert large carbon-based molecules, like biomass, into high energy density and smaller molecules. It is referred to as a 'next-generation' biomass to biofuel conversion technology and is the governing process for Licella's Cat-HTR™ platform.

ICSM— Isis Central Sugar Mill (ICSM)

LCLF— low carbon liquid fuels (LCLF) can be produced sustainably from waste materials, biomass, or by combining hydrogen from low carbon feedstocks. Some examples include sustainable aviation fuels (SAF) and renewable diesel. They can be produced in different ways with different resulting fuel properties.

Levelised cost of production— The average cost of producing a unit of fuel over the lifetime of a production process. This includes considering costs associated with producing the product, such as capital, raw materials, labour, energy, and other production inputs.

NOAK— Nth-of-a-kind (NOAK). In the context of biorefineries, the term "nth plant" refers to a commercial-scale facility that utilises established and well-understood technologies, contrasting with a "pioneer plant" which uses newer, less proven technologies. The "nth" plant is typically a later plant of its kind, benefiting from the experience and reduced risk associated with scaling up a proven technology.

SAF— Sustainable aviation fuel (SAF) is an alternative to traditional fossil-based jet fuel derived from renewable or waste sources, aiming to reduce carbon emissions from air travel.

SIA— Social Impact Assessment (SIA) is a systematic process for evaluating the potential social consequences of a project, both positive and negative, on individuals, communities, and their way of life.