



29 March 2023

House Standing Committee on Industry, Science and Resources
Parliament House
Canberra ACT 2600

Dear Committee,

Developing Advanced Manufacturing in Australia

Hysata is grateful for the opportunity to provide a response on the inquiry into developing an advanced manufacturing industry in Australia, with a particular focus on low-emission technology.

Executive Summary

Hysata is a Wollongong-based green hydrogen company which is developing the world's most efficient electrolyser and is preparing to bring automation and advanced manufacturing to our pilot manufacturing and assembly line in Port Kembla, NSW.

There is an estimated US\$1.7 trillion dollars of cumulative demand for electrolysers between now and 2050, to produce the large volumes of green hydrogen required to achieve net zero emissions. The US and the EU have made major commitments to capture that value through the Inflation Reduction Act and The Green Deal Industrial Plan by providing significant resources to advanced, low-carbon manufacturing. These commitments are now threatening Australia's market share of advanced low emissions technologies like electrolysers.

Australian Government investment in advanced manufacturing in high-potential manufacturing companies like Hysata is critical to the success of Australian manufacturing, achieving the Government's emissions targets, and capturing the hundreds of billions of dollars of value that technologies like green hydrogen can deliver.

Based on Hysata's experience in developing breakthrough technology and an advanced manufacturing pilot line, funding should be prioritised towards:

- Direct financial support for capital intensive manufacturing equipment via grants (preferably) or concessional debt.
- Expansion of tertiary education courses related to field automation and system engineering. Currently these courses are limited to only a few universities, and they are heavily focused on the defence industry as opposed to general manufacturing. This is creating a shortage of appropriately specialised talent.
- Attracting international integrators that can set up advanced manufacturing lines while domestic talent is trained. High quality manufacturing line integrators will be crucial for equipping existing companies with the advanced equipment required. These companies can also provide valuable industry training and cooperative research partners for universities.

Hysata recommends the committee consider using tested funding mechanisms like grants to ensure that small and medium businesses can quickly find support. Other mechanisms such as concessional debt, with start-up favourable financing terms, may also prove to be valuable in providing access to cheap capital while also reducing the cost of accessing future, private capital.



Hysata

Hysata is a Wollongong-based green hydrogen company that is developing the world's most efficient electrolyser. Our ultra-high efficiency electrolyser already exceeds the efficiency target of the International Renewable Energy Agency (IRENA) for the year 2050. It also transforms green hydrogen production economics to well under the federal target of \$2/kg. Our technology is based on leading-edge research undertaken by scientists at the University of Wollongong.

Our patented technology was validated by Nature Communications journal in March 2022¹ and was in the top 1% of articles read across all journals tracked by Nature Communications in 2023. Our high efficiency design has also been verified by a major EU electrochemistry lab².

Hysata is preparing to bring automation and advanced manufacturing to our designed and planned pilot manufacturing and assembly line in Port Kembla, New South Wales (Figure 1), by 2025. This automation will allow Hysata to rapidly scale manufacturing to meet the multi-billions of dollars' worth of pre-orders we have signed and in our pipeline with high profile customers for 2025+ delivery.



Figure 1 Hysata's new Port Kembla hydrogen electrolyser manufacturing facility

Australia is lagging in our advanced manufacturing capabilities

The world today is being shaped by mega trends of technological advancements, taking off at unprecedented speeds. This innovation is in large part driven by the adoption of advanced manufacturing.

The value of advanced manufacturing stems from three main factors:

1. Efficiencies and competitiveness

Efficiency improvements foremost lead to cost reductions, but also vitally the speed at which we can scale innovations. Analysis from the World Economic Forum identified that industrial facilities that are leading advanced manufacturing see an improvement in:

- **Productivity** by 3 - 400%

¹ Hodges, A., Hoang, A.L., Tsekouras, G. et al. A high-performance capillary-fed electrolysis cell promises more cost-competitive renewable hydrogen. Nat Commun 13, 1304 (2022). <https://doi.org/10.1038/s41467-022-28953-x>

² Publication pending



- **Factory output** by 4 - 140%
- **Greenhouse gas emissions reduction** by 8 – 100%
- **Speed to market reduction** by 10 – 90%

Of the 132 leading facilities identified by The World Economic Forum³, **zero** are in Australia (Figure 2).

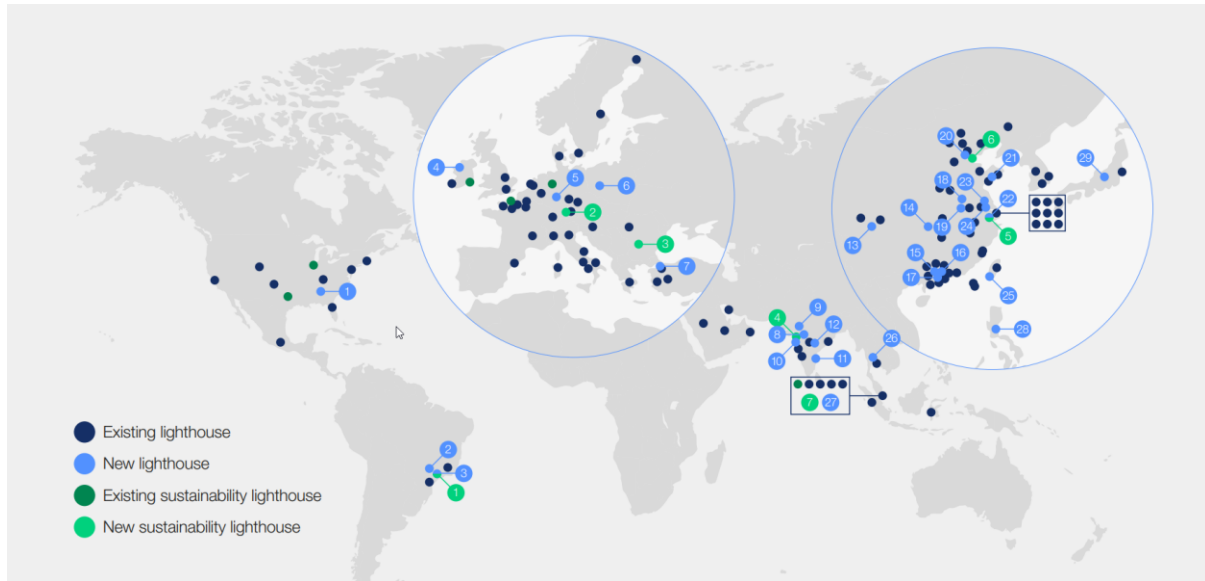


Figure 2 Map of the World Economic Forum’s Global Lighthouse Network. Lighthouses represent the 132 industrial facilities that are leading the Fourth Industrial Revolution, including in sustainability.

2. New business models that deliver greater value

Advanced manufacturing optimises manufacturing operations and operating models, promotes seamless connection and leverage of data across the production ecosystem, and allows for an agile workforce and supply chain that unlocks new products and services, new customers, new demand, and untapped economic value and emission reductions.

3. Fostering valuable partnerships

The impact of improved efficiencies and new business models provides the opportunity for traditional manufacturers to foster relationships with new industries and sectors that were previously separated. Australian green manufacturers move from a siloed value chain, to unlocking an entire system built on collaboration and benefit sharing (Figure 3).

³ World Economic Forum. Global Lighthouse Network: Shaping the Next Chapter of the Fourth Industrial Revolution. Accessible at: https://www3.weforum.org/docs/WEF_Global_Lighthouse_Network_2023.pdf

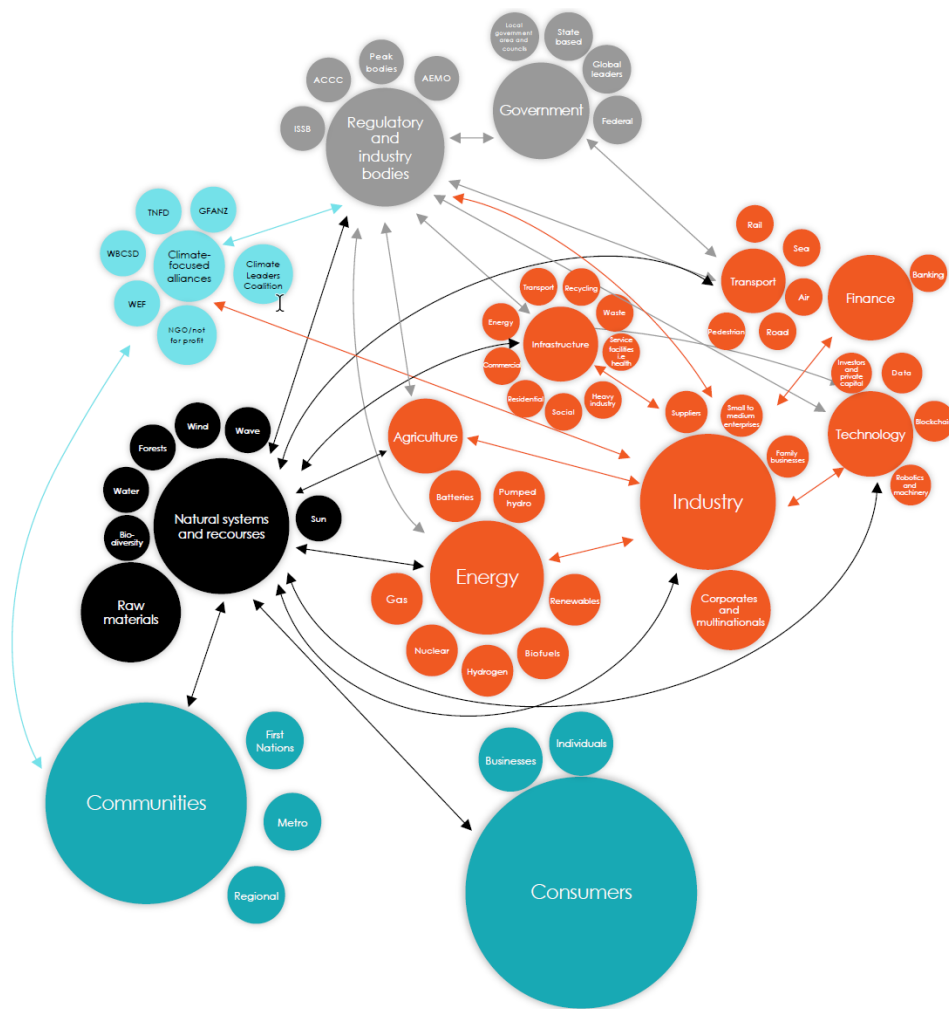


Figure 3 The systems principle (in the context of climate change). This collaboration provides opportunities for new business models, collaboration, and partnerships that will be unlocked by, and in turn support, advanced manufacturing⁴

Australia holds a massive competitive advantage in the development and manufacture of many of the technologies needed in the next century, such as green hydrogen and electrolyzers, solar, green steel and aluminium, and critical minerals. Currently we are at risk of losing this competitive edge by providing our competitors with the time they need to equip themselves with the most advanced manufacturing facilities on the planet.

Advanced manufacturing coupled with low-emissions technology like hydrogen electrolyzers leads to a prosperous, low-emission, and future-proofed Australian industry.

As manufacturing advances, simultaneously, the world is moving towards a green economy. Estimates from McKinsey suggest that next-generation climate technologies could attract US\$1.5

⁴ Australian Climate Leaders Coalition. Scope 3 Roadmap. Practical Steps to Address Scope 3 Emissions – Written by CEOs for CEOs. Accessible at <https://www.climateleaders.org.au/publications/scope-3-roadmap/>



trillion to \$2 trillion of capital investment per year by 2025⁵. Hydrogen is one of the five priority areas identified.

The speed and innovation advanced manufacturing delivers, combined with the urgency of climate change, and monumental demand for climate technologies like electrolyzers, creates a perfect storm that will transform the Australian economy, and our sovereign capabilities forever. Goldman Sachs estimates that there will be US\$1.7 trillion dollars of cumulative demand for electrolyzers between now and 2050, to produce the large volumes of green hydrogen required to achieve net zero emissions. Australia has the natural advantages, and breakthrough technology, to take a large share of that market but needs considerable support to equip companies like Hysata with advanced manufacturing capabilities to make sure we aren't late to the opportunity.

In the context of electrolyser manufacturing, the winning companies will need ultra-high efficiency products, to be able to rapidly scale and to manage costs. From the very beginning, Hysata's engineering focus has been on achieving an ultra-high 95% efficiency system while also ensuring that every design choice prioritises mass manufacturability in order to enable rapid scaling.

However, to become the world leading electrolyser company, Hysata needs access to advanced manufacturing equipment, and world class talent who are capable of using that equipment to its full extent. As an indication of the potential jobs created through advanced manufacturing, Hysata's new pilot production line in Port Kembla is expected to create an additional 150 FTE jobs. With greater investment into more advanced equipment, this figure will increase. Hydrogen and the energy transition has the potential to be a case study for Australian innovation and job creation, or alternatively, be another example like the automotive industry, which resulted in the offshoring of 40,000 jobs.

Climate change is one of the most pressing challenges we face. Cheaper green hydrogen means faster uptake of green hydrogen, since the energy transition is still very much driven by economics. The faster green hydrogen can outcompete oil, gas, and coal, the faster we can reach net zero and the less cumulative emissions we have in getting there. Just as the fall in the cost of renewable electricity has resulted in renewables outcompeting fossil generation, so too will low-cost green hydrogen outcompete oil and gas. This will require higher efficiency, and cheaper electrolyzers at a massive scale.

[Australia is lacking advanced, green manufacturing support, leading to promising talent and companies investigating support from overseas](#)

Automation of assembly lines in Australia is costly - roughly in the hundreds of millions of dollars for a smaller facility. In the next year, Hysata is looking to equip our new Port Kembla facility with the following advanced manufacturing capabilities to allow us to rapidly scale to gigawatt capacity and capitalise on the 500-800 million tonnes of hydrogen needed by 2050.

- additive manufacturing (3D printing)
- Internet of Things (IoT)

⁵ McKinsey & Company. Innovating to net zero: An executive's guide to climate technology. Accessible at <https://www.mckinsey.com/capabilities/sustainability/our-insights/innovating-to-net-zero-an-executives-guide-to-climate-technology>



- AI guided factory optimisation
- AI-powered process control
- collaborative robotics and automation
- cycle time optimisation through big-data analytics on manufacturing lines
- product lifecycle management systems
- digital twin for flexible production
- flexible manufacturing
- digitally enabled variable takt time
- light-guided assembly sequences
- mixed reality to enable digital training
- real-time locating system for key manufacturing components
- repair process automation
- automated line balancing

Government investment into advanced manufacturing capabilities in high-potential manufacturing companies like Hysata, is critical to the success of Australian manufacturing, achieving the Federal Government's emissions targets, and capturing the hundreds of billions of dollars of value that technologies like green hydrogen can deliver.

The United States has made major commitments to capture that value through the Inflation Reduction Act (IRA) by providing significant resources to advanced, low-carbon manufacturing. These commitments are now threatening Australia's market share of these technologies.

The IRA provides US\$369 billion in direct support (largely through investment and production tax credits) for advanced manufacturing, climate, and energy related provisions. These tax credits have on average reduced the cost to manufacture and produce climate technologies by 40% (Figure 4). This is in addition to the US\$9.5 billion in grants for hydrogen hubs and electrolyser R&D through the Bipartisan Infrastructure Law and numerous other grant programs delivered through the Department of Energy.



IRA credits decrease climate technology costs by 40% on average

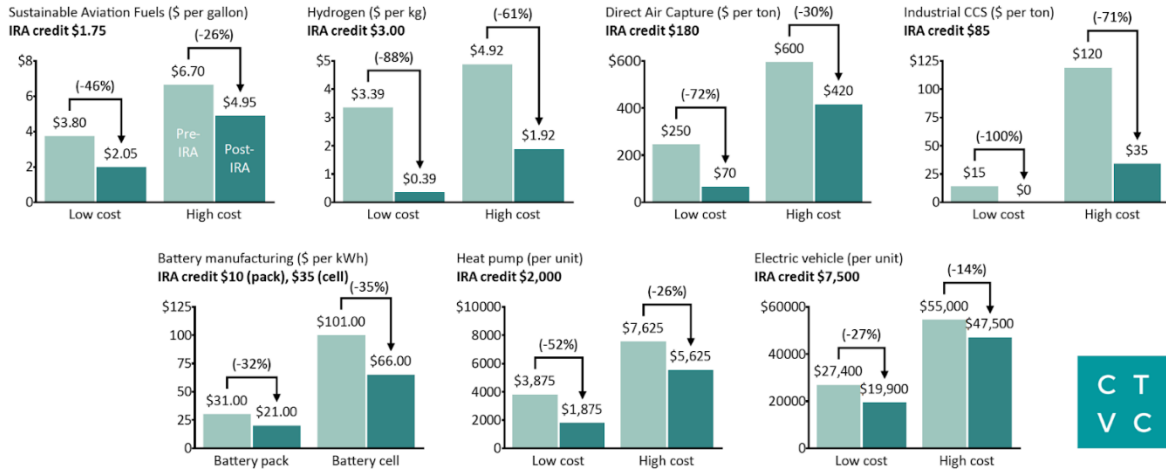


Figure 4 Inflation Reduction Act credits on critical climate technologies.⁶

Australia’s competitiveness in climate technology manufacturing is also being tested by the European Union’s “Fit for 55” reform, which includes the Carbon Border Adjustment Mechanism, as well as their own response to the US IRA via the Green Deal Industrial Plan. This plan sets a target for 40% of the EU’s manufacturing demand for solar, wind, heat pumps, batteries, and electrolyzers to be met through domestic manufacturing. This target is expected to be complemented with a generous investment package to attract global talent and technology, with €3 billion earmarked to guarantee hydrogen demand.

The impact that the IRA is projected to have on Australia’s market share of hydrogen is extreme, with analysis from Deloitte Access Economics predicting a 65% reduction in export volume by 2050 (Figure 5) - a loss of \$55 billion per year (Figure 6). This level of support is attracting the attention of Australia’s top talent, technology, and private investment to the US as a potential manufacturing base.

⁶ CTVC. IRA and the new capital cost of climate #114. Accessible at: <https://www.ctvc.co/ira-and-the-new-capital-cost/>

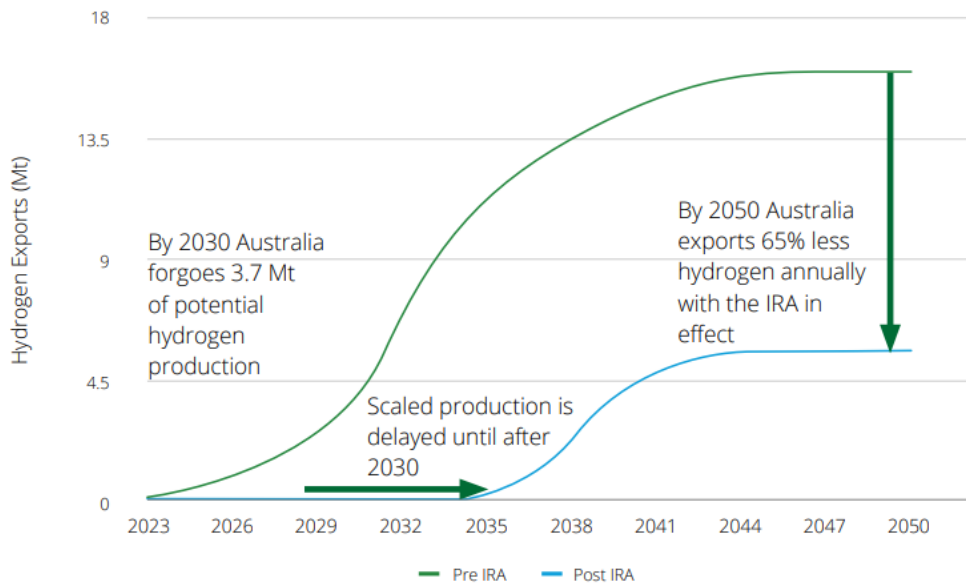


Figure 5 Impact of US' IRA on Australian hydrogen exports by 2050.⁷

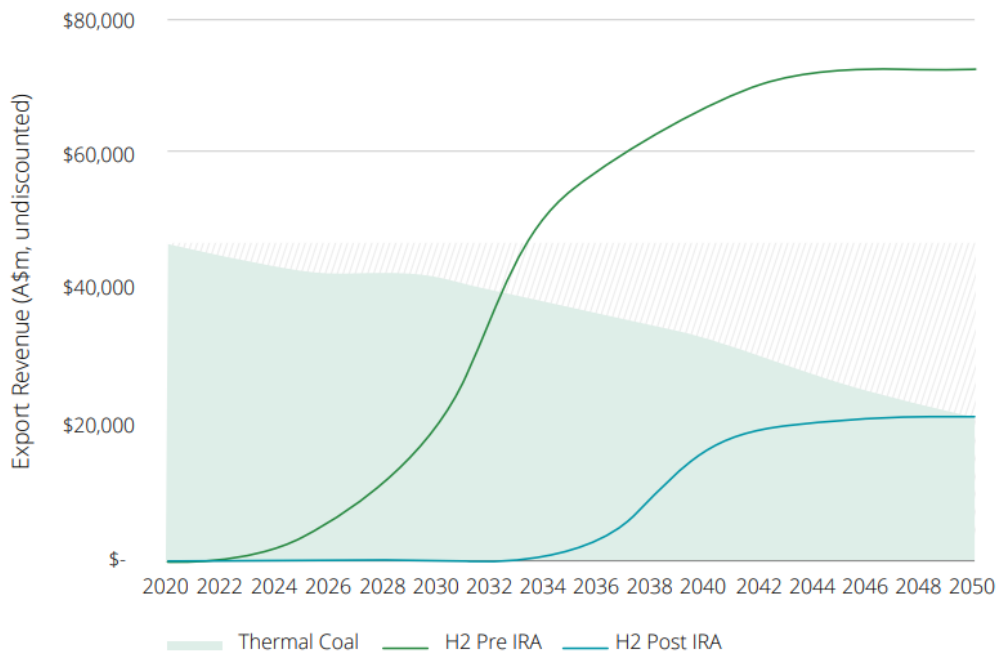


Figure 6 Impact of US IRA on Australian hydrogen export value, compared to thermal coal exports.⁸

⁷ Deloitte Access Economics. Australia's hydrogen tipping point: the urgent case to support renewable hydrogen production. Accessible at: <https://www2.deloitte.com/au/en/pages/about-deloitte/articles/australia-hydrogen-tipping-point.html>

⁸ Deloitte Access Economics. Australia's hydrogen tipping point: the urgent case to support renewable hydrogen production. Accessible at: <https://www2.deloitte.com/au/en/pages/about-deloitte/articles/australia-hydrogen-tipping-point.html>



The Federal Government's recently passed National Reconstruction Fund provides much needed financial support into Australian manufacturing, and the \$3 billion focus on low emissions technologies is welcomed. A review of Australia's National Hydrogen Strategy to focus on retaining Australian talent and technology, and promoting advanced, scalable manufacturing of electrolysers post-IRA and the Green Deal Industrial Plan, is also critically important.

Based on Hysata's experience in developing breakthrough technology and the establishment of an advanced manufacturing pilot line, funding should be prioritised towards:

- Direct financial support for capital intensive manufacturing equipment via grants (preferably) or concessional debt.
- Expansion of tertiary education courses related to field automation and system engineering. Currently these courses are limited to only a few universities, and they are heavily focused on the defence industry as opposed to general manufacturing. This is creating a bottleneck of talent that are not appropriately specialised.
- Attract international integrators that can set up advanced manufacturing lines while domestic talent is trained. High quality manufacturing line integrators will be crucial for equipping existing companies with the advanced equipment required. These companies can also provide valuable industry training and cooperative research partners for universities.

Public investment needs to be accessible

While the EU and US support packages for climate and manufacturing both provide highly significant sizes of investment, the US tax credits and grants are distinctive due to their accessibility, as opposed to the more complicated, and highly bureaucratic systems that the EU packages are known for. Hysata urges the Committee to favour tested funding mechanisms like grants to ensure that small and medium, time-poor businesses can access support quickly. Concessional debt with terms appropriate to the delayed revenue timeframes of startups have also been successful in supporting more mature startups as this form of financing is non-dilutive and can reduce the company's future cost of capital.

Hysata is a high-potential company aiming to be the number one electrolyser company in the world. This will require a blend of private capital and government support. Our Series A investment round was one of the biggest in Australia in 2022, and we are making tremendous progress technically and commercially. Government support will amplify that private capital and help us achieve more in the same amount of time. Government support for the advanced manufacturing industry at this stage is vital to help increase the technology readiness level of climate technologies, achieve global manufacturing scale, and help gain access to the bigger pools of private capital needed.

Conclusion

Hysata has developed an ultra-high efficiency, mass manufacturable electrolyser and is launching an automated manufacturing and assembly pilot line in Port Kembla by 2025, with the ultimate goal of becoming the largest electrolyser company in the world.

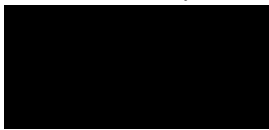
Advanced manufacturing unlocks major efficiencies, new business models, and partnership opportunities for Australia but requires significant government support through grants or concessional debt and a more available field automation and systems engineering workforce,



specialised for general manufacturing. The urgency of this support is compounded by the fact that the United States' Inflation Reduction Act, and the European Union's Green Deal Industrial Plan have threatened the market share of Australia's hydrogen and climate technology manufacturing industries until 2050.

We appreciate the Committee in considering our submission, and for taking the time to consider the role advanced manufacturing has in Australian development and emissions reduction.

Yours sincerely,



Paul Barrett

CEO – Hysata