



## Department of Climate Change, Environment, Energy and Water

# Carbon Leakage Review, Consultation Paper 2

3<sup>rd</sup> December 2024

### About HILT CRC

The heavy industrial sector contributes significantly to the Australian economy, with an annual direct economic output of approximately \$180 billion, representing around 9% of the national economy. However, the sector is also carbon intensive, with the iron/steel, alumina and cement/lime sectors alone accounting for approximately 9% of Australia total CO<sub>2</sub> emissions and downstream processing of Australia's resources globally accounting for three times all of Australia's direct emissions. While some progress has been made in the decarbonisation of Australia's heavy industries, innovative technologies and transformative processing pathways are required to meet our 2050 net zero emissions targets while maintaining the international competitiveness of these industries.

The Heavy Industry Low-carbon Transition Cooperative Research Centre (HILT CRC) was created as a catalyst to propel Australia's heavy industries towards a sustainable future. Through industry-led research, HILT CRC endeavours to mitigate risks and pave the way for effective decarbonisation strategies with a focus on the iron/steel, alumina and cement/lime sectors.

Since commencing operations in November 2021, HILT CRC has successfully embarked on groundbreaking research in collaboration with over 60 partners. HILT CRC's vision is to facilitate prosperous and thriving heavy industries in the net-zero economy through de-risking the technical pathways to decarbonise, thereby supporting Australia's heavy industry during the transition to low-carbon products. HILT CRC aims to achieve this vision through the implementation of rigorous, targeted, and industry-led research aimed at resolving technical challenges and addressing sector-wide concerns.

### HILT CRC's contributions to other Government consultations

HILT CRC welcomes the opportunity to respond to the Department of Climate Change, Environment, Energy and Water – DCCEEW's consultation on the findings of the Carbon Leakage Review. Our response is focussed on the opportunities for Australia in new, net-zero heavy industry, in particular the sectors that constitute our Partners: iron/steel, alumina and cement/lime.

HILT CRC has also recently engaged with other Australian Federal Government departments and agencies, as the Australian Federal Government considers its strategy for supporting decarbonisation and economic development, in particular:

- Department for Industry, Science and Resources – Green Metals Consultation
- Department for Industry, Science and Resources – Net Zero Industrial Sector Plan
- Climate Change Authority – 2024 Issues Paper: Targets, Pathways and Progress

Copies of documents provided to these Departments can be provided upon request.

## Leakage under existing policies

### 2.1 The Safeguard Mechanism

#### Summary

HILT is in broad agreement with the findings of the Review with regards to the Safeguard Mechanism.

In addition, we note that the Safeguard Mechanism alone is unlikely to be sufficient to drive the transformation to net-zero of the heavy industry sectors covered by the HILT CRC scope: that is iron and steel making, and the production of cement, lime, and alumina. HILT CRC analysis has shown that realising net-zero in heavy industry by 2050 will require ongoing investment in developing and derisking technologies, beginning in the near-term, i.e. pre-2030. We further highlight that policy risk and uncertainty has been identified by our industry partners as a key challenge holding back investment in decarbonisation technologies that will be needed before 2030, and that **additional long-term (non-partisan) policy commitment and support is required, commensurate with the multi-decadal timescales of heavy industry decarbonisation pathways.**

#### Discussion

Reaching net-zero within heavy industries such as iron and steel production, alumina and aluminium production and cement and lime production will require significant transformation of processes along the supply chain. The scale of investment needed for retrofits and/or new plants will be significant. Heavy industrial processes require assets that generally have long lifetimes meaning that industry decarbonisation plans are multi-decadal, with timing determined by capital renewal cycles as well as ongoing technology development.

HILT CRC has developed anticipated technology pathways to net-zero with indicative timings as shown in [Appendix A](#), based on internal analysis<sup>1</sup> and external sources<sup>2</sup>. Required phased actions can be summarised as follows:

1. Install 'transitional' technologies or low-carbon solutions for retrofits or brownfield installations to manage the risk of new technologies and the high capital cost of new net-zero metals plants.
2. Trial 'transformational' technologies or low-carbon solutions in retrofit/brownfield installations to de-risk various components of a new production process.
3. Install new green metal production facilities, with maximum emissions reduction benefit, once technology is fully de-risked and a robust business case for investment is demonstrated.

Critically, transformational technologies will need to be developed and derisked in parallel to deployment of transitional technologies (i.e. renewable energy, low carbon fuels, CCUS), requiring ongoing investment in pilot and demonstration plants, from before 2030.

HILT held a series of roundtables with stakeholders, including industry partners and government representatives, across Australia in 2023 to discuss non-technical barriers holding back the deployment of decarbonisation technologies (See [Appendix B](#)). Policy risk and uncertainty was identified as a key challenge holding back investment in decarbonisation. Partners also identified the need for long-term (non-partisan)

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<sup>1</sup> HILT RD&D Facility Plan

<sup>2</sup> Deloitte for ARENA, 2022, A Roadmap for Decarbonising Australian Alumina Refining; VDZ for The Cement Industry Federation, Cement Concrete and Aggregates Australia, SmartCrete CRC, and RACE for 2030 CRC, 2021, Decarbonisation Pathways for the Australian Cement and Concrete Sector; Minerals Research Institute of Western Australia, 2023, Western Australia's Green Steel Opportunity, MRIWA Project M10471; Australian Industry Energy Transitions, 2021, Australian Industry ETI - Phase 1 Technical Report.

policy commitment and support, commensurate with the timescales of heavy industry decarbonisation pathways.

Suggestions to support international competitiveness of Australian net-zero products, based on feedback from stakeholders provided during the roundtables and subsequent discussions at HILT CRC conferences include:

- Co-ordinated trade and industry policy to assist Australian industry in attracting capital investment, in accessing technology and remaining internationally competitive with their products
- Engage with local industry during the 2026-27 review of Safeguard Mechanism to ensure that ‘top-down’ policy objectives are aligned with ‘bottoms up’ pathways of what is achievable.
- Ensuring regulations and approval processes are efficient, consistent and co-ordinated and across state and federal government (i.e. do not overlap, clash and/or cause unreasonable regulatory burden).
- Developing internationally recognised and interoperable net-zero product certification and verification.

We further highlight the need to ensure that domestic climate policies such as Safeguard Mechanism are developed in consideration of wider green industrial policy goals such as the Future Made in Australia initiative.

The HILT Facilitating Transformation (P3) program aims to provide evidence-based information to support such measures. More information on the program can be provided on request.

## *2.2 Public investment*

### Summary

HILT CRC is in broad agreement with the findings of the review with regards to the role of public investment as they align with HILTs own analysis of what is required, as detailed in the discussion below.

We provide further insights into the role that public investment can play in supporting innovation, deployment of enabling infrastructure, and unlocking private investment:

- Public investment has an important role in supporting capital-intensive RD&D facilities to derisk new technologies at all scales spanning laboratory research to commercial demonstration.
- Access to renewable electricity and net-zero fuels (e.g. hydrogen) at sufficient cost and scale is a critical enabler for to achieve net zero by 2050. HILT research aims to greatly improve our understanding of the required energy infrastructure and the potential government co-investment that may be required.
- Australian projects must compete globally to attract investment, and more work is needed to identify effective and efficient use of public investment to unlock private capital.

## Discussion

### *RD&D facilities for derisking transformational technologies*

Capital-intensive Research Development and Demonstration (RD&D) facilities are needed to support the development and de-risking of low carbon technologies for heavy industry. HILT proposes that the fastest, least cost and least risk way to develop these facilities is if they are co-ordinated nationally (and internationally) and involve industry, research and government working collaboratively, particularly on knowledge sharing. Public investment has an important role in de-risking RD&D facilities. across all three scales of facility, from research to pilot to demonstration (see [Appendix C](#)).

HILT has developed an RD&D Facilities Plan based on extensive consultation with our Partners, which can be supplied on request.

### *Investment in enabling energy infrastructure*

Roundtables held by HILT in 2023 (see [Appendix B](#)), and subsequent HILT conferences in 2023 and 2024 highlighted that access to energy and net-zero feedstocks and fuels (e.g. hydrogen) at sufficient cost and scale and within necessary timeframes is a critical enabler for heavy industry decarbonisation.

Flagship HILT project *PR3.007 Unlocking investment in energy infrastructure for net zero industrial hubs* aims to identify the place-specific energy infrastructure required for heavy industry transition to net-zero in Australia. This project kicked-off in August 2024 and will greatly improve our understanding of the public investment in energy infrastructure required to achieve net zero by 2050 under a series of scenarios that the industry considers to be plausible. Specific aims include:

1. developing plausible scenarios both for the transition of existing processes and the establishment of new processes needed to reach net zero emissions by 2050 for major industrial hubs in Australia.
2. developing energy system modelling tools to estimate demand for electricity and fuels for these processes, and the capital cost-optimised infrastructure needed to meet these demands.
3. estimating the potential government co-investment that may be required and justified based on future economic benefits, such as employment, royalties/revenues, social/regional benefits and private co-investments.

More information on the objectives and outcomes of this project can be supplied on request.

### *Unlocking private investment*

Outcomes of the HILT 2023 Roundtables and subsequent HILT conferences in 2023 and 2024 highlighted that government support significantly influences the investment thinking of our industry partners with respect to projects targeting decarbonisation (See [Appendix B](#)). Australian projects must compete globally to attract capital investment and market share for their products. Australia has competitive advantages for new net-zero commodities including access to abundant renewable energy, low sovereign risk, skilled labour force, a high quality of life which is attractive to labour. However, it also faces challenges in attracting investment compared to some other places with access to abundant renewable energy, including relatively high capital costs and regulatory risk.

Current green industrial policy in Australia has focused on public investment in supply side incentives, i.e. R&D (e.g. through ARENA), investment support (e.g. Powering the Regions Fund), and production incentives (e.g. hydrogen production credits). Future policy mechanisms could also include investment in demand side incentives such as government purchasing agreements or procurement contracts to create domestic demand for net-zero products. More work is needed to identify the most effective and efficient public investment strategies to unlock private investment for primarily export focused net-zero industries.

## 2.6 Findings of leakage by commodity

### Summary

HILT applauds the Review's nuanced approach to quantifying sector specific carbon leakage risk based on rigorous analysis. We are in broad agreement with the approach, methodology and findings.

We acknowledge that consideration of broader investment risks for future net-zero export commodities was not within the scope of the review. However, we highlight the need for **changes in domestic climate policy (i.e. through the 2026-27 review of the Safeguard Mechanism) to consider the competitiveness of potential net-zero export focused industries and products in the future**, such as intermediate iron ore or iron pellets, alumina and aluminium. In particular, **quantifying carbon leakage investment risks for net-zero iron making** may be particularly important, as this will lead to additional scope one domestic emissions which could be significant during the transition phase (i.e. due to natural gas use) and could lead to material carbon leakage risk.

### Discussion

The opportunity for Australian industry in future net-zero steel supply chains will likely vary depending on location and ore type. Generally, there is opportunity for exports of value-added intermediate products such as green iron pellets, green iron as hot briquetted iron (HBI), and green steel, produced by on shore processing of Australian ores. Conversely, failure to upgrade ores so that they are suitable for low-carbon processing techniques could result in reduced demand as global climate goals become more ambitious and the steel industry moves to decarbonise in response.

Preliminary results from HILT research project RP3.005 *Analysis of market, cost and locational factors for green iron and steel in Australia* suggest that Australia's key future opportunity to supply net-zero, value-added products into international markets is likely in the form of green iron, supplied as an intermediate input to traditional steel making in trade partner countries. Processing iron ore to iron is the most emission intensive step in making steel and is currently carried out offshore, meaning that Australia could play a role in significantly reducing the emissions from steel processing<sup>3</sup>, particularly as Australia is the largest iron ore producer. However, development of net-zero iron production in Australia will increase domestic (scope 1) emissions, especially during the transition phase when natural gas may be used as a feedstock and fuel. For this reason, any changes in domestic climate policy (i.e. through the 2026/27 review of the Safeguard Mechanism) should consider potential impacts on new low carbon iron making industry.

HILT research project RP3.005 has identified lack of government support, high capital costs, and competition from producers in iron ore producing and iron ore exporting countries as major obstacles for green iron and steel making in Australia, based on expert elicitation of stakeholders. Competitiveness concerns may be exacerbated by material or perceived investment leakage risks, particularly for iron making, which was not considered in the Carbon Leakage Review. Once again, this highlights the need for domestic climate policy settings to consider the competitiveness of net-zero export focused industries and products.

HILT research project RP3.008: *A Policy Roadmap for Australia's Heavy Industry Low-carbon Transition* aims to enhance the understanding of the relevant climate and green industrial policy landscape among heavy industry decision-makers, thus instilling a higher degree of confidence in their investments in the transition.

HILT Research Project RP3.006 *Certification and verification to enable a successful LCT for heavy industry* aims to enable Australian heavy industry to be able to successfully engage with emerging certification and verification schemes relying on embedded emissions accounting. In doing so, it will help ensure that Australian industries remain competitive while aligning with the future trajectory of global climate policies.

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<sup>3</sup> Minerals Research Institute of Western Australia, 2023, Western Australia's Green Steel Opportunity, MRIWA Project M10471

Additional information on these HILT projects can be provided on request.

## Border Carbon Adjustment

### *3.1 Principles and objectives*

HILT agrees with the Review that any BCA would need to uphold Australia’s reputation as a trusted trading partner and be consistent with its open, rules-based trading system and international trade law, based on review by key HILT Program 3 Research Leaders. This will be particularly important if Australia is to leverage opportunities in new global net-zero supply chains and decarbonise heavy industry.

Preliminary results from an expert elicitation study carried out under HILT research project RP3.005 indicates that the majority of experts interviewed view ***CBAM and carbon pricing as the most critical enabling policies*** to address the challenges faced by the green iron and steel industry in Australia.

### *3.4 Sectoral Application*

HILT supports the Review’s findings that a BCA could ‘level the playing field’ in domestic markets for specific sectors. We are in broad agreement with the approach, methodology and findings.

We note the finding that steel is a “Potential future candidate for a BCA based on carbon leakage risk” (Table 5 of the Review under consultation), and that alumina and aluminium were not considered, based on an analysis of current technology supply chains. We further note that iron and potential future value-added iron ore products such as pellets were not included.

We highlight that the ***timing of future policy development for steel making should take into account the long lead-times of investment and development*** in assets and technology used in heavy industry.

We also highlight that application of BCAs and associated review of relevant domestic policy (such as the Safeguard Mechanism) should also ***consider the impact on potential net-zero, export focused industries and products such as value-added iron ore, iron, alumina and aluminium.***

We note that industry decarbonisation plans are multi-decadal, with timing determined by capital renewal cycles as well as ongoing technology development, and that investment decisions need to be made in the short term (pre-2030) to enable net-zero by 2050. As mentioned above, policy risk and uncertainty was identified as a key challenge holding back investment by our industry stakeholders.

### 3.5 Design considerations

#### Summary

HILT broadly agrees with the findings of the Review regarding design considerations, as it aligns with HILT analysis that Australia could seize significant opportunities in developing a net-zero heavy industry, enhancing consistency, reducing trade barriers, and positioning itself as a leader in sustainable industrial practices, by ensuring alignment and interoperability of any BCA

Research within the HILT Facilitating Transformation program (P3) will provide evidence-based information for the development of internationally recognised and interoperable product certification and verification. We further highlight that **a BCA policy should consider alignment with existing and potential trading partners**, considering opportunities for Australia in new net-zero export industries. For example, we note that there is currently misalignment between the emissions covered by the Safeguard Mechanism (scope 1) and the EU ETS (scope 1 and 2) and significant discrepancy in the pricing of carbon.

#### Discussion

HILT Research Project RP3.006 *Certification and verification to enable a successful LCT for heavy industry* aims to provide our partners with evidence-based information to enable them to engage in processes around the development of embedded emissions accounting regimes in Australia. This includes options for as-yet unresolved questions around accounting complexity for circularity and co-products. The project kicked-off in June 2024. Preliminary results highlight that misalignment in proposed certification schemes (i.e. in the EU and in Australia) can occur for both the type or ‘scope’ of emissions included, and the emissions accounting frameworks used to quantify emissions leading to significant discrepancy.

Research is also underway to quantify the cost, emissions, and certification of grid connected hydrogen production in Australia. This project develops energy system modelling tools to compare emissions calculated under the proposed settings of the hydrogen Product Guarantee of Origin scheme with actual emissions, and to investigate optimal temporal correlation settings for least-cost low emission hydrogen.

HILT research project RP3.005 *Analysis of market, cost and locational factors for green iron and steel in Australia* highlighted that Australia will likely participate in global net-zero steel supply chains by exporting green iron. Further, it identified potential mid to near-term uses for green steel in the automotive and domestic appliance sectors. Germany has been flagged as a potential near-term partner to develop net-zero steel supply chains<sup>4</sup>. However, the emissions scopes covered in the proposed BCA (scope 1 under the Safeguard Mechanism) are not aligned with the scopes covered in the EU CBAM (scope 1 and 2). We also note that the EU ETS prices carbon significantly higher than Australian Safeguard Mechanism<sup>5</sup>.

More information on the objectives and outcomes of these projects can be supplied on request.

<sup>4</sup> <https://www.globh2e.org.au/susteelag>

<sup>5</sup> <https://www.motive-power.com/visualized-the-price-of-carbon-around-the-world/>

## Multilateral and plurilateral initiatives

### Summary

HILT strongly supports the finding that Australia should encourage enhanced global climate ambition through ongoing climate diplomacy. HILT analysis finds that international policies aimed at promoting decarbonisation will be critical to drive demand for Australian exports of net-zero products and commodities and support green premiums.

It is possible that deployment of an Australian BCA would encourage proliferation of BCAs within the region and among our trading partners. ***Aligned and interoperable BCAs will support the development of new green supply chains and drive demand for new net-zero Australian exports.*** We suggest that Australia engage closely with existing and potential trading partners, particularly with the EU and our largest trading partner China, to ensure alignment of any BCA policies.

### Discussion

Preliminary findings from HILT research project RP 3.006 highlight that ensuring alignment and interoperability will enable Australia could seize significant opportunities in developing a net-zero heavy industry, enhancing consistency, reducing trade barriers, and positioning itself as a leader in sustainable industrial practices.

HILT research project RP 3.008 aims to assist heavy industry decision-makers to understand, manage and mitigate risks associated with the current and future domestic and international policy developments, thus instilling a higher degree of confidence in their investments in the transition.

It is possible that deployment of an Australian BCA would encourage proliferation of BCAs within the region and among our trading partners. Aligned and interoperable BCAs would enable the development of new green supply chains and drive demand for new net-zero Australian exports. However, we note that badly designed BCAs may increase the complexity in international trade and could result in protectionism, damping investment confidence in net-zero industries within Australia. Even without protectionist intent, BCAs could lead to complex arrangements with excessive administrative costs and unintended incentives to adjust production, investment and trade patterns to optimise around the vagaries of differing bilateral BCAs. We suggest that Australia engage closely with existing and potential trading partners, particularly our largest trading partner China, to ensure alignment of any BCA policies.

Here we note that China will likely focus on an alignment with the EU's CBAM in the first instance, given the importance of the European market to China and the fact that the EU CBAM is the most advanced globally. This suggests that alignment of any Australian BCA with the EU CBAM should be a priority, noting the potential misalignments mentioned above.



## Appendix

A. Indicative pathways to decarbonise heavy industry developed by the HILT CRC in conjunction with academic and industry partners

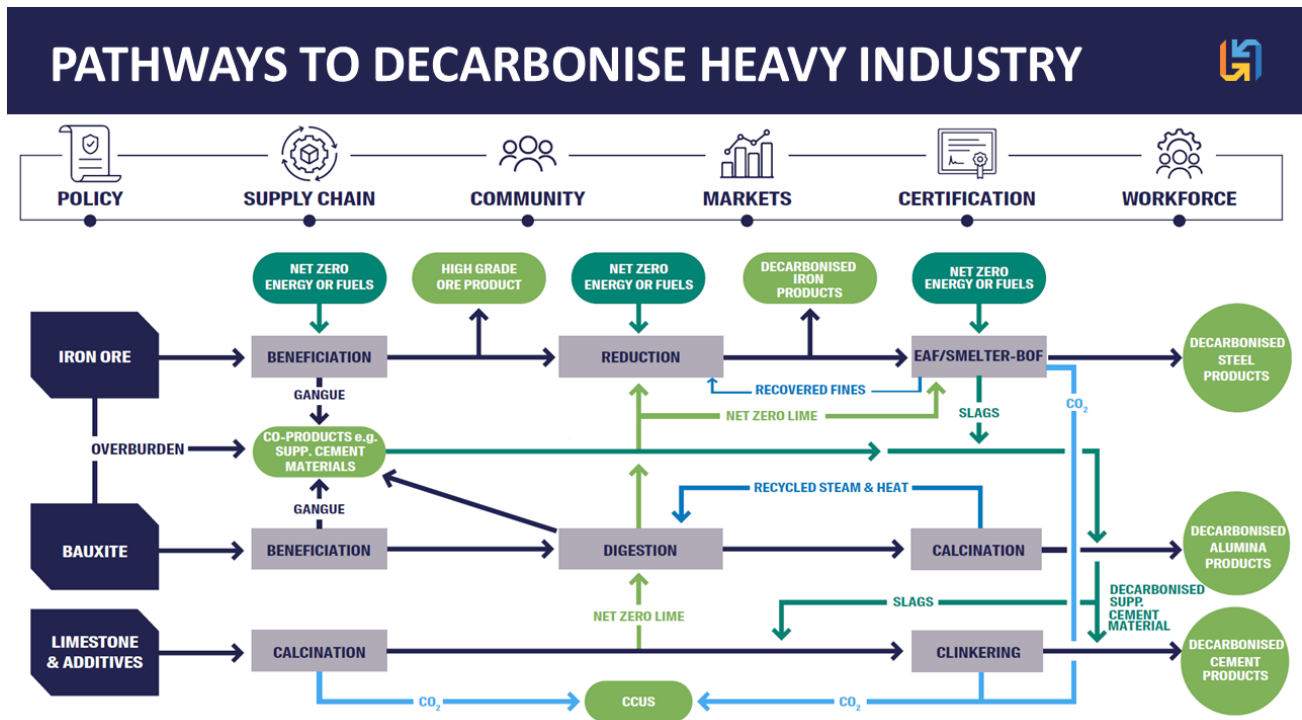


Figure A1: HILT CRC's vision of the interrelated pathways to decarbonise heavy industry, showing options for circularity

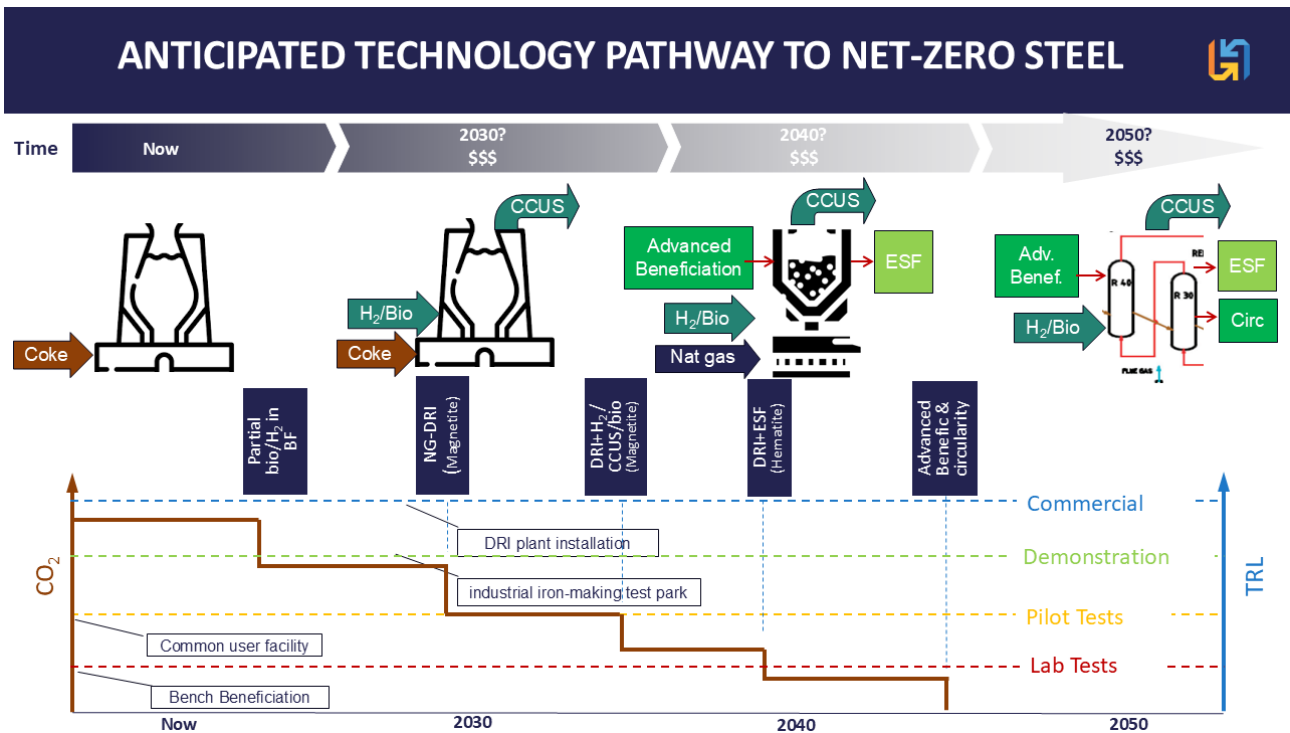


Figure A2: HILTCRC's vision of the technology pathways to decarbonise steel making

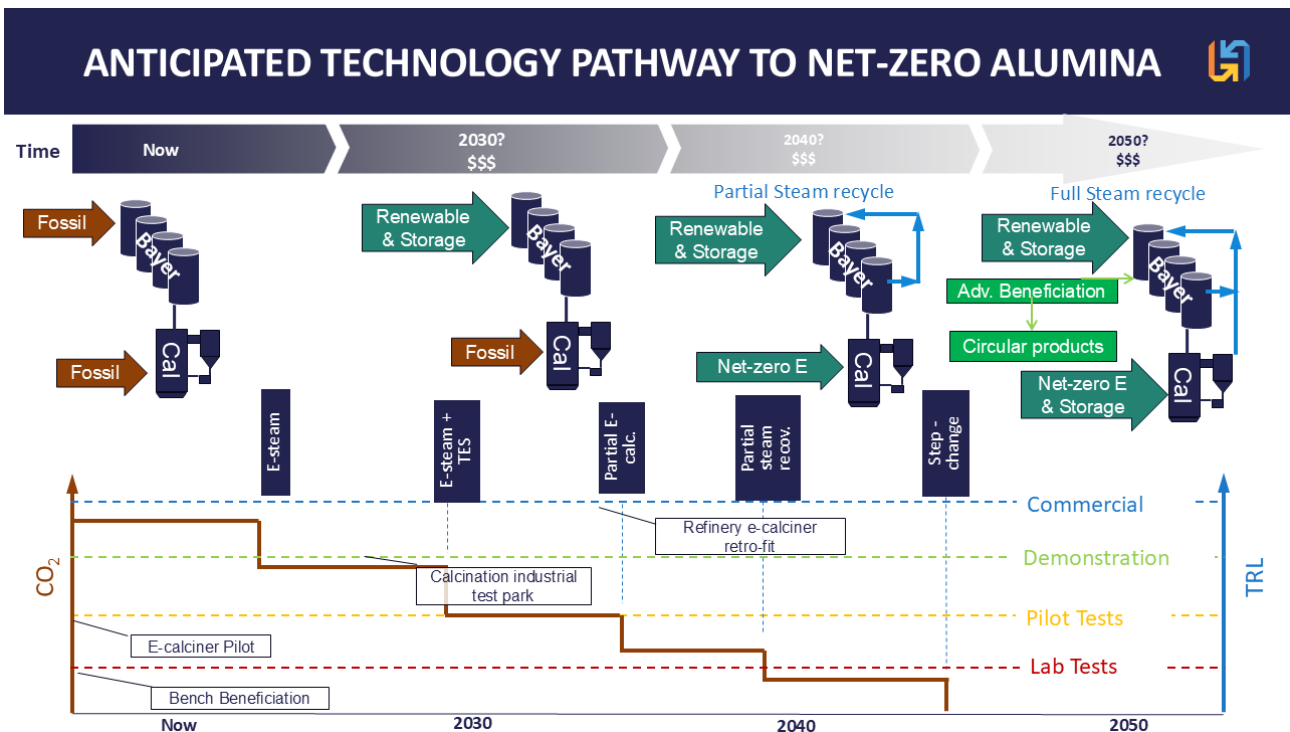


Figure A3: HILTCRC's vision of the technology pathways to decarbonise alumina making

### *B. HILT CRC Stakeholder Roundtables 2023*

HILT hosted a series of Roundtables with stakeholders, including industry partners and government representatives, across Australia in 2023 to discuss non-technical barriers holding back the deployment of decarbonisation technologies. Identified issues are listed below:

- The significant amount of capital investment required
- Time, cost and risk in securing development regulatory approvals
- Access to energy and net-zero fuels (eg Hydrogen) at sufficient cost, scale and within necessary timeframes
- Enabling infrastructure such as roads, rail, water, housing
- Access to workforce with sufficient skills and experience to implement new technologies
- Green product value – need for a premium to offset the high cost of investment which, in turn, required processes for regulation and certification
- Policy risk and uncertainty
- Supply chain risks
- Community Engagement

In particular, it is important to note that Australian projects must compete globally to attract capital investment market share for their products. Outside of Australia, environments with significantly lower capital costs, lower regulatory risk and greater access to green energy exist, which provide additional significant barriers for projects in Australia.

### *C. RD&D Facilities*

Capital-intensive Research Development and Demonstration (RD&D) facilities are needed to support the development and de-risking of low carbon technologies for green metals production. HILT has identified the need for the following three types of RD&D facilities:

- Research (bench to sub-pilot) scale facilities – typically owned and operated by research partners, moderate in cost and required to support technology development and de-risking projects. Order of magnitude cost: <\$10M
- Trials/Pilot scale facilities – typically owned and operated by a technology company or government research laboratory and used to demonstrate the variability of an integrated process or a specific technology pathway. Order of magnitude cost: \$10M - \$50M
- Industrial-scale demonstration and de-risking facilities – typically owned and operated by end user/producer companies. Order of magnitude cost: >\$100M

We believe that funding is needed across all three scales of facility, from research to pilot to demonstration scale, to provide complementary information and support each other. Different sized facilities provide complementary information and support each other: smaller scale facilities de-risk transitional technologies and develop transformational technologies and hence support large-scale deployments at commercial scale, since they are more flexible, cheaper to run and provide more data. Larger-scale pilots and demonstrations are also needed to de-risk commercial projects and test integration of high technology readiness level solutions at industry sites.

Education and training are other important considerations: Research/lab-scale facilities are important to provide the training and building of the workforce of the future.

HILT proposes that the fastest, least cost and least risk way to develop these RD&D facilities is if it is co-ordinated nationally (and internationally) and involves industry, research and government working collaboratively, particularly on knowledge sharing.

HILT has worked closely with our industry and research partners to develop an Australian RD&D Facility Plan, as illustrated in Figure C1.

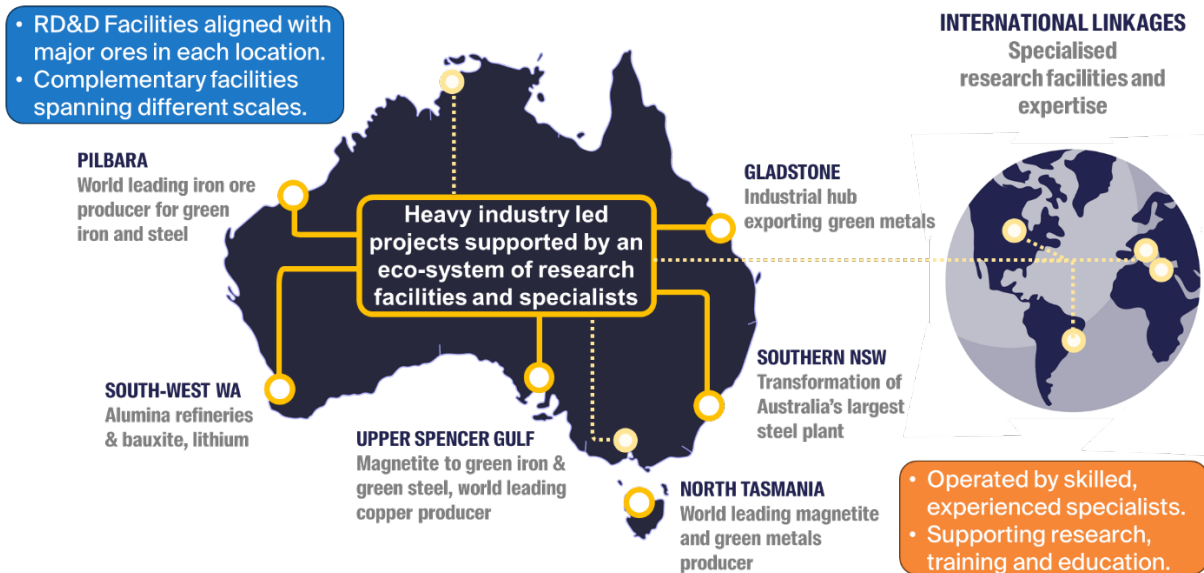


Figure C1: HILT CRC's vision of national and international co-ordination of RD&D facilities to support decarbonisation of heavy industry.

HILT's RD&D Facility Plan has identified technology priorities for heavy industry decarbonisation and priority facilities or development.

Key priorities for large-scale pilot and demonstration facilities, that will generally be industry led include:

- A Direct Reduced Iron pilot plant coupled with an Electric Smelting Furnace
- Green ironmaking demonstration plant using novel reduction technology
- Thermal energy storage demonstration
- A cascaded high temperature heat pump/MVR trial at a common refinery

Key priorities for research scale facilities, that will be led by HILT CRC and research organisations include:

- A multi-user Iron Ore Centre of Excellence for metallurgical testing of ores
- Novel iron ore reduction technology development and testing facility
- A next generation calciner test facility
- High temperature material testing facility

HILT's RD&D Facility Plan can be provided upon request.