

IChemE Adelaide Roundtable – Growing capability to decarbonise heavy industry

At the GHD Adelaide office in October 2025, IChemE hosted its second Australian Roundtable event focusing on heavy industry decarbonisation. The Roundtable included talks about the latest industry-led research on heavy industry decarbonisation by HILT CRC, GHD’s learnings from a project advisory perspective, and LMS Energy’s case study insights on bioenergy policy and market development. The Roundtable was well attended by thought leaders, innovators, experts, and early career representatives across academia and industry.

Key themes

The key themes that emerged from the Roundtable for IChemE to support were:

- the need for policies that drive industrial decarbonisation to be flexible, including technology-neutral wherever possible, to fully harness the benefits of innovation
- sharing more of the latest positive developments on industrial decarbonisation to help provide a balanced view of progress
- facilitating greater connection between industry and IChemE’s student members to help enhance job readiness and early career navigation

Background

IChemE’s second Australian Roundtable in Adelaide discussed the challenges and opportunities for heavy industry decarbonisation, a potential industry growth area that draws significantly on chemical engineering expertise.

There are significant economic opportunities that can be realised through decarbonisation of Australia’s heavy industry over the longer term. Federal Treasury modelling projects in some scenarios that the total value of Australia’s green exports – which includes green ammonia, green iron, alumina, aluminium and critical minerals – is projected to reach \$80–93 billion in 2035 and \$109–178 billion in 2050, supporting an increase in total exports.

The collective viewpoints from the Roundtable session on heavy industry decarbonisation were facilitated by focusing on two key themes: Policy Development and Capability Development.

Technical challenges to overcome

Key technical challenges as chemical engineers were of course front of mind, including:

- How to solve the chicken and egg problem of getting confidence in what energy (eg renewable electricity/hydrogen/bioenergy) can be reliably delivered to heavy industry, and can this be done at a price that large energy users are willing to pay?
- Can we design and operate process plants to take advantage of variable renewable energy being cheaper at certain times in the day and year? Storage of intermediate products then becomes important to allow parts of the production process to shut down at certain times. To prepare our next generation of chemical engineers they will need to be taught more about process dynamics.
- How do we best integrate circular economy approaches?
 - By way of example the option of mineral carbonation using red mud (or its derivatives). Red mud is a waste product of the alumina production process that has a significant remediation cost. Solving the red mud problem by turning it into a resource can mean that money is freed up for more decarbonisation.
 - Also, can we think of smart ways to use the CO₂ in flue gases? This would decrease the need and cost to capture the CO₂ to prevent the release of greenhouse emissions.

There was a strong collective view that embracing a circular economy approach can provide a growing supply of cost effective decarbonised renewable fuels for heavy industry and other applications. It was also acknowledged that chemical engineers will have an important role in designing and implementing the infrastructure and systems needed to embed these new renewable fuels into the Australian market.

Policy development matters

While technical issues in decarbonising energy are often the point of focus for engineers, it was acknowledged that policy and market development, as well as social issues, are just as important.

It was considered important that chemical engineers take steps to re-balance what can be an at times a negativity bias towards the challenges of industry decarbonisation in media and social media. From a talent development perspective, it can lead to young

people thinking “*What’s the point of going into heavy industry for my career, it’s dirty and a dead end*”. Communicating the decarbonisation challenge as a both an opportunity to make a difference and with significant economic benefits for Australia is a helpful way to drive positive engagement.

One of the key challenges also flagged for industrial decarbonisation in Australia is that even when we are dealing with high TRL technologies there is still considerable risk involved with technology integration. Overcoming these integration risks is very costly for pilots and therefore a compelling case was needed to explain to senior management why these types of projects need to be pursued now rather than stopped or delayed. Given this there can be an important role for government to share some of the costs and risks in these situations.

For example, to leverage bioenergy decarbonisation solutions policy incentives will be needed such as targets and market mechanisms, for example a contracts for difference scheme to incentivise scale in renewable fuels uptake as has already occurred in Europe and the US, but not yet Australia.

A representative from Nystar Australia highlighted the important policy role that the SA Government recently played in providing three years of funding to transition their 120 year old operations at Port Pirie to pilot the production of the critical mineral, antimony, used in the renewable energy and electric vehicle industry.

New Zealand has seen some funding provided through the Decarbonising Industry Fund (DIF) which provided \$300M to NZ Steel for electric arc furnace decarbonisation project. This is different to Australian steel-making as it uses iron sands. The DIF was discontinued after the last NZ election, so it does bring up an example of phases of project enablement together with the decarbonisation policy uncertainty that can be created through political change.

There is a need to be better communicating with governments, and equally the opposition parties, to strengthen their understanding of the opportunities, challenges and solutions for decarbonisation as we navigate the pointy end of this transition as engineers. Unfortunately, too often engineers are not as actively involved in the policy discussions so there can be a reality check that is missing from policy design and implementation. It’s important that engineers free up some time and focus for learning about and participating in policy development. This may involve building up communication and collaboration skills in new ways too and particularly focusing on this as a student because it can be easier to start earlier.

Building capability

From a building capability perspective, it was highlighted that the need for chemical engineers, and other professions involved in heavy industry decarbonisation, to be as adaptable and resilient as possible so they can best navigate uncertainties. Of course longer term stable bi-partisan policies are helpful and preferable for delivering better decarbonisation and capability building outcomes too.

Adelaide University hackathon and student participants provided the following valuable insights about challenges to building their capability:

- At the moment it is proving really difficult across the board for students to get out into industry and experience it through plant tours and internships. As soon as students graduate, they are expected to have some background and bit of experience. As a result there is currently a disconnect.
- Students can be too focused on the technical, and then get into industry before realising actually how limited the budgets for projects are and understand the decarbonisation policy incentives that can be accessed.
- It can be frustrating for students to see the disconnect between the government's understanding compared to what engineers/scientists know needs to be done. Students can tend to have a stronger social conscious and hence are thinking a lot about how they can help educate people about climate change and SA's algal bloom.

Students also offered the following thoughts on what helps them build their capability, including:

- The Chemeca hackathon is a highly regarded opportunity to get practical exposure to industry decarbonisation challenges, and a key learning was learning through research and engagement that solutions were not as simple as first thought.
- Targeting to build some basic knowledge in government policies in the curriculum would be helpful for second year students, and the hackathon is already perfectly timed for students when they are developing their ability to cost and size engineering solutions from third year onwards.
- Need to get a broader representation of industries involved in university and IChemE student engagement activities, to develop awareness and connection with a broader range of chemical engineering opportunities. It's the connection and involvement that positively engages students in the solutions rather than being an outsider criticising the perceived lack of action.

From a university academic perspective, it was great to hear that Adelaide University was leading the way by:

- focusing on low and high TRL projects in partnership with industry on hydrogen production, carbon capture utilisation and storage (CCUS) and green metals.
- collaborating to progress towards large industrial decarbonisation pilot projects
- identifying that students are having difficulty connecting and is developing a new course on integrated work learning as a key initiative to address this issue.

Some advice by and for the chemical engineering profession more generally on capability building included:

- Participants who have worked in, and advised, governments noted that the officials are often extremely busy, so the engineering profession needs to network with them directly to tell them what's important and follow up with information sharing to cement the relationship.
- Even experienced chemical engineers will often need some help on how they can link their technical knowledge to advise decarbonisation policy, particularly because they are not often included in the process

IChemE can build up their engagement with government officials and create new networking opportunities.

About IChemE

About IChemE The Institution of Chemical Engineers (IChemE) is the qualifying body and learned society for chemical, biochemical, and process engineers in the UK and worldwide, with over 33,000 members. Our mission is to champion the input of chemical engineers to create a sustainable future. Find out more about IChemE and our strategic vision of engineering a Sustainable World at www.icheme.org