2023 Consultation: Department of Industry, Science and Resources (DISR), Australia

Industry Growth Program – Consultation paper

Consultation response from the Institution of Chemical Engineers (IChemE)

The Institution of Chemical Engineers (IChemE) is pleased to make this submission on Australia's Industry Growth Program: discussion paper consultation. As a Learned Society of chemical and process engineering professionals worldwide, IChemE shares and creates knowledge, providing evidence to inform policy. Chemical and process engineers are trained in the scale-up of processes from the laboratory bench to commercial scale, and optimisation of processes for efficiency and sustainability. The responses in this consultation will also help in addressing the current and future economic and environmental challenges, such as those outlined in the Government's *2021 Intergenerational Report - Australia over the next 40 years* [1].

Eligibility of projects

- **Are there barriers beyond pre-profit stage that the program should consider supporting?**

  Small and medium enterprises (SMEs) seeking to expand their businesses often report that they go overseas for funding and that competing for funding is challenging and time consuming– well-known examples include solar PV technologies. To address the funding barriers, the program should consider alignment to other policies and programs, so that key technologies can be retained and scaled up, the industries can develop in Australia and organisations and skilled professionals can remain in Australia.

  The requirement for matched funding is a barrier. Many early-stage SMEs lack funding. This requirement results in them giving away significant intellectual property value in their companies at low cost to raise initial funding.

  A critical barrier is often the lack of ecosystem / supply chain to support the business. For a new company / start-up, especially for a new product, it's crucial to understand market readiness, customer base and demands (or otherwise being able to create the demand from gap in market). It's also important to ensure available supply chain as otherwise the cost will skyrocket.

- **Should Technology Readiness Levels (TRLs) be used to determine eligibility of a project? If so, what are appropriate TRLs for commercialisation and/or early-stage growth phases?**

  TRLs are a useful guide for eligibility. The program needs to focus on lower TRL 2-5, which is where the risks are higher, and the organisations cannot readily get other sources of commercial support and funding.

In addition, in a world where knowledge is global, and engineering, science and technology ecosystems are increasingly globalised, international collaborations are beneficial, and Australia is part of international agreements and conventions that also impact trade. Funding goals must balance public interest that only supports funding areas that provide Australia with the means to grow industries in ways that retain in Australia some ownership, tax revenue, income, and jobs.

Eligible projects should fund organisations that meet:

A. Economic criteria:

(1) organisation based in Australia, and

(2) more than 50% of workers to be within Australia, and

B. Social and sustainability criteria

(3) support progress towards one or more of the United Nations Sustainable Development Goals (UN SDGs), and

(4) just transition for climate action, that respects diversity, is inclusive, and supports transition in a way that people are not left behind.

(5) Australia's commitment to international conventions including climate, nature based, biodiversity, desertification.

- **How should we determine which projects have the most potential for future growth and market impact?**

A. Selection of projects should use **a range of recognised methods** which could include addressable market, cost-benefit analysis, social cost-benefit analysis, life cycle analysis and circular economy solutions. It's important that selection of projects uses a holistic approach to evaluation that takes a broader range of factors into account than just simple linear models of production.

B. Projects should be aligned to

1. **Areas where Australia has a competitive advantage**, including:
    a. **A wealth of natural resources**, such as land, minerals, sun, and wind.
    b. **Skilled personnel**. Australia has a world class education system and a highly skilled workforce. Other areas of strength in Australia include a world class bio-medical research capability for the healthcare sector and significant opportunities for renewable energy generation.

       Australia participates in international qualification schemes. IChemE with its strong member base in Australia can provide high quality professional training and micro credentials to chemical and process engineers working in new and emerging industries.
    c. **Quality institutions**. Australia has renowned institutes for education and research and regulations for managing hazardous industries that can inform safety requirements for future industries such as hydrogen.
    d. **a growing innovation ecosystem** - to develop ecosystems and upskill and retain talent.

e. **Safety and robust institutions for major hazards management**. For example, IChemE Safety Centre (ISC) offers an extensive training programme and improves safety standards throughout the industry [2].

2. **Areas of strength or 'adjacent to' existing areas of strength** – to provide more 'value add' within Australia and increase economic complexity. Examples would include:

    a. Technologies that enhance and grow the processing of critical minerals, green hydrogen, added value agricultural products, biotech and synthetic biology.
    b. enablers such as applications of digitalisation such as artificial intelligence, control and automation, internet of things, cyber security, and quantum.
    c. key societal issues such as climate adaptation and resilience (such as technologies for more robust operations, improving efficiencies and management of scarce water resources) [3], [4]

3. **providing skills and new areas for employment**. In the area of chemical and process engineering, we are seeing our members move from traditional industries (e.g. coal, oil and gas) to alternative industries that can use their skill sets – such as

    a. clean energy (green hydrogen, electrolysis, carbon capture utilisation and storage)

    b. sustainability and professional services (climate change measurement and reporting, efficiency improvement, nature rehabilitation and circular economy)

    c. added value processing (such as critical minerals and added value agricultural products)

    d. translation of research across the full spectrum of technologies (process design and scale-up)

Program governance and grant assessment

- **Are there other skills and expertise that should be represented on the committee?**

The committee should have the capacity to recognise the potential for new innovations and technologies and also to assess the capacity of the SME founding team to advance these from research levels to the commercialisation stage.

The process needs to be open, transparent, independent, with conflicts declared and managed.

There is a risk that program advisors act as gatekeepers and bring inappropriate bias.

The committee should have expertise represented for chemical and process engineering, including scale-up, circular economy/life cycle analysis, sustainability, efficiency, digitalisation, and process safety.

The grant assessment should include risk assessment of the commercial and technical aspects of the technology and business models.

IChemE's technical roadmap, ***Chemical Engineering Matters*** (2022) outlines how chemical engineers will help address the major global challenges of water, energy, food and wellbeing, whilst dealing with challenges and risks of sustainability, safety and digitalisation. [5]

Program design to meet intended outcomes

• What other design elements could be considered to ensure a quality, positive business experience and outcomes?

The program should build on Australia's strengths, grow businesses, and create revenue streams and employment from commercialising science, engineering and research:

- the program should be supported by robust data.
    - To support economic and sustainability criteria in a range of formats, including robust approaches to life cycle analysis and carbon/GHG. Noting that chemical engineers bring experience in this area.
- The program should incorporate safety procedures and robust approaches to risk.
- Building on our educational sector strengths to create efficiencies by:
    - Steering away from defending sunk costs where research and investment is not meeting the KPIs nor creating tangible outcomes.
- Encouraging our entrepreneurs and highly skilled workforce to adapt, commercialise and scale up:
    - Adapt, integrate, and implement globally recognised innovative technologies and best practice (i.e. not all innovation is new, it may just be new to Australia).
    - Encourage tech-ready to commercial products and incentivise collaboration of researchers with industry to create innovative products and solutions.
- Encouraging our policy makers to:
    - Develop effective policies to support innovative research and development through recognising innovation risks and project failure.
    - Develop entrepreneurship and leadership skills, alongside technical and STEM skills
    - Acknowledge members of reputable institutes with qualifications / registration.
    - Support industry ecosystem development e.g. through hubs and clusters.
    - Take a long-term view to supporting start-ups.
    - Ensure that Australian Intellectual property is protected.

• How should we measure the success of the Industry Growth Program, for the economy and for participating businesses?

The program should measure that:

- Businesses reach profitable growth (scale-up), provide employment and (in some cases) exports.
- An allowance for failure, as some of these will not create sustainable businesses.
- There is robust support and gateways. Be fair: sometimes a failure is still a good learning, but don't need to keep funding it. Lessons learnt from failures. Lessons learnt data bases built up.
- The program is aligned to goals for Sustainability, Diversity and Inclusion, Climate action and UN SDGs.

Alignment with other initiatives

- **How can the program complement other university, industry and government initiatives?**

The program should align with other initiatives by the Department, including the CRC-P program.

The program complements other government programs including productivity, innovation, science and research, low emissions technologies, and critical minerals. For optimal results, policies should align.

Noting also that IChemE has provided policy responses to government consultations on related topics in the past year including The Productivity Commission Consultation in October 2022, Australia's Science and Research Priorities Consultation in April 2023, and Australia's Critical Minerals Strategy Consultation in January 2023. [6],[7],[8]

- **How could the program support better connections from industry to universities and entrepreneurial students?**

The program could support a lessons-learned platform. At each gateway, there should be lessons shared, and captured in a platform where they can be shared.

The program connects with others in productivity, innovation/research, LETS and Critical Minerals.

A global hydrogen alliance: IChemE and the American Institute of Chemical Engineers (AIChE) signed a letter of intent to collaborate for building a global alliance. The alliance will give the organisations a shared platform from which to support industry in the adoption of hydrogen as an energy carrier that will form a vital part of the road to net zero.

The Institution of Chemical Engineers (IChemE)

The Institution of Chemical Engineers (IChemE) is a professional association with 30,000 members. IChemE is a not-for-profit, member-led qualifying body and learned society that advances chemical engineering's contribution worldwide for the benefit of society. We support the development of chemical, biochemical and process engineering professionals and provide connections to a powerful network of over 30,000 members in more than 100 countries. The Institution of Chemical Engineers in Australia has a board and staff in Australia.

As a Learned Society of professionals worldwide, IChemE shares and creates knowledge, providing evidence to inform policy.

This response has been produced by IChemE members in Australia and draws on the Institution's position on climate change published in November 2020 [9]. In 2020-22, IChemE also produced sectoral plans to support climate change action in multiple industries and jurisdictions, including energy transition, clean energy, water, food and pharmaceuticals. IChemE has submitted a detailed formal submission on the Low Emissions Technology Statement 2022 consultation: Department of Industry, Science, Energy and Resources, Australian Government.[10]

We support our members in applying their expertise and experience to make an influential contribution to solving major global challenges, including achieving the UN Sustainable Development goals.

IChemE would welcome the opportunity to provide more detailed information if required.

References

[1] Australian Government (2021). 2021 Intergenerational Report, Australian Government, The Treasury, 28 June 2021, ISBN: 978-1-925832-37-2 https://treasury.gov.au/publication/2021-intergenerational-report

[2]. IChemE (2023a). IChemE Safety Centre, https://www.icheme.org/knowledge/safety-centre/

[3]. Australian Government (2022). A roadmap to a more productive and resilient future, Retrieved from Infrastructure Australia:, 21 March 2022, https://www.infrastructureaustralia.gov.au/publications/delivering-outcomes

[4]. UK Water Partnership, (2017). Linking Innovation to Societal Needs (LITSoN). Retrieved from UK Water Partnership: https://www.theukwaterpartnership.org/news/is-the-uk-water-industry-prepared-to-tackle-the-challenges-of-the-future

[5]. IChemE (2022a) *Chemical Engineering Matters*, 4th Edition, Published by IChemE December 2022. Retrieved from IChemE: https://www.icheme.org/knowledge/policy/chemical-engineering-matters/

[6] IChemE(2022b). Response to The Productivity Commission (TPC), Consultation in October 2022, Retrieved from IChemE: https://www.icheme.org/media/19104/2022-icheme-response-to-australian-tpc-consultation_19102022.pdf

[7] IChemE (2023b), Response to Consultation on Australia's Science and Research Priorities in April 2023, Retrieved from IChemE: https://www.icheme.org/media/20086/2023-icheme-response-to-australias-science-and-research-priorities-consulation-06april2023.pdf

[8] IChemE (2022c) Response to Consultation on Australia's Critical Minerals Strategy, Consultation in January 2023. Retrieved from IChemE: https://www.icheme.org/media/19580/icheme-response-australian-cms-consultation-2023.pdf

[9]. IChemE (2022d). IChemE Climate Change Statement, Retrieved from Climate Change Statement: Retrieved from IChemE: https://www.icheme.org/media/14873/icheme-climate-change-statement.pdf

[10]. IChemE (2022e). IChemE Low Emissions Technology Statement 2022 consultation: Department of Industry, Science, Energy and Resources, Australian Government, Retrieved from IChemE: https://www.icheme.org/media/18004/icheme-response-australian-lets-consultation.pdf