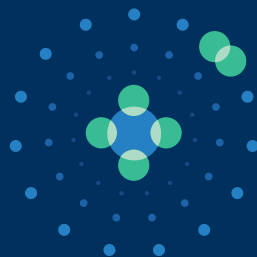
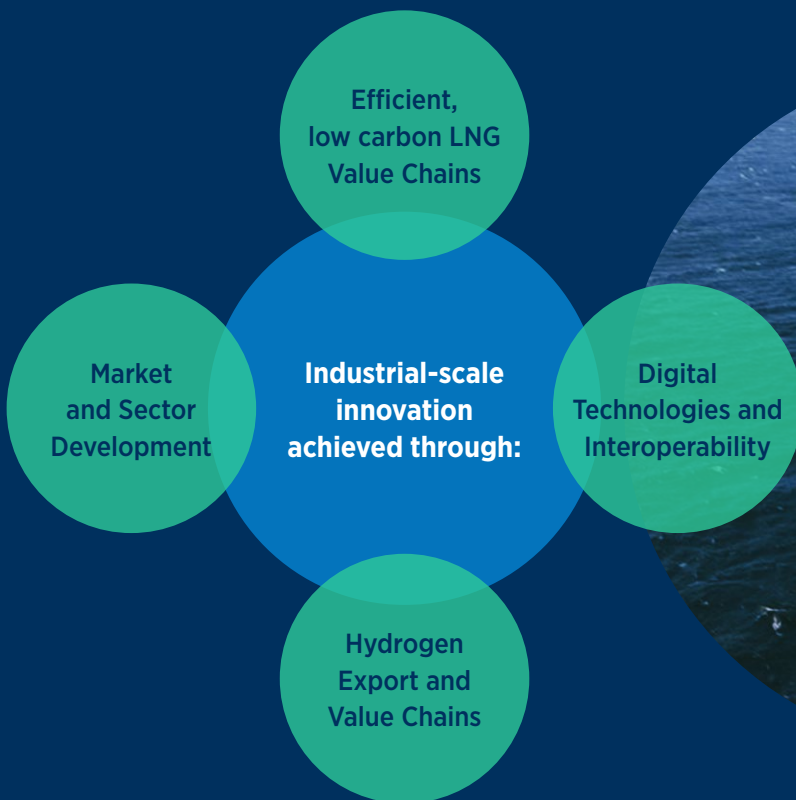


FEnEx CRC PARTICIPANT BENEFITS

Future-proofing Australia's
low carbon energy exports



**FUTURE
ENERGY
EXPORTS**

Cooperative Research Centre

WHO WE ARE

The Future Energy Exports Cooperative Research Centre (FEnEx CRC) is an Australian not-for-profit organisation striving to future-proof energy exports through industrial-scale research and innovation. Established in 2020 as a research-driven charity, the organisation also delivers education and training, evidence-based advice to inform the development of government policies, testing facilities and PhD scholarship opportunities.

Through research and innovation in LNG and Hydrogen, the FEnEx CRC will help Australia remain at the forefront of energy provision internationally.

WHAT WE DO

FEnEx CRC brings together industry partners spanning the entire supply chain, innovative research universities and international participants to collaborate on the development of a sustainable energy export industry. It works to bridge the gap between industry and academia to facilitate and fund cutting-edge industry-led research. The CRC aims to navigate the demands of the industry to maintain growth and affordability while also addressing the desire for substantial emissions reduction.

The CRC's network shares knowledge, exchanges ideas and challenges at monthly colloquiums, offers micro-credentials and professional development, and participates in public forums, webinars and panels.

PARTICIPANTS DIRECTLY BENEFIT FROM:



Priority access to research findings, models and methodologies



License to use FEnEx CRC intellectual property



Opportunities to undertake collaborative research, feasibility studies or consultancy agreements to meet specific industrial needs



Influence the direction of research and access outcomes



Access to specialised, worldwide technical and research expertise



Participate on the Research Advisory Committee, supporting FEnEx CRC's technical leadership



Engage and collaborate in projects across the supply chain



Opportunity to leverage government funding



Participate in the annual technology conference and monthly colloquiums

Vision

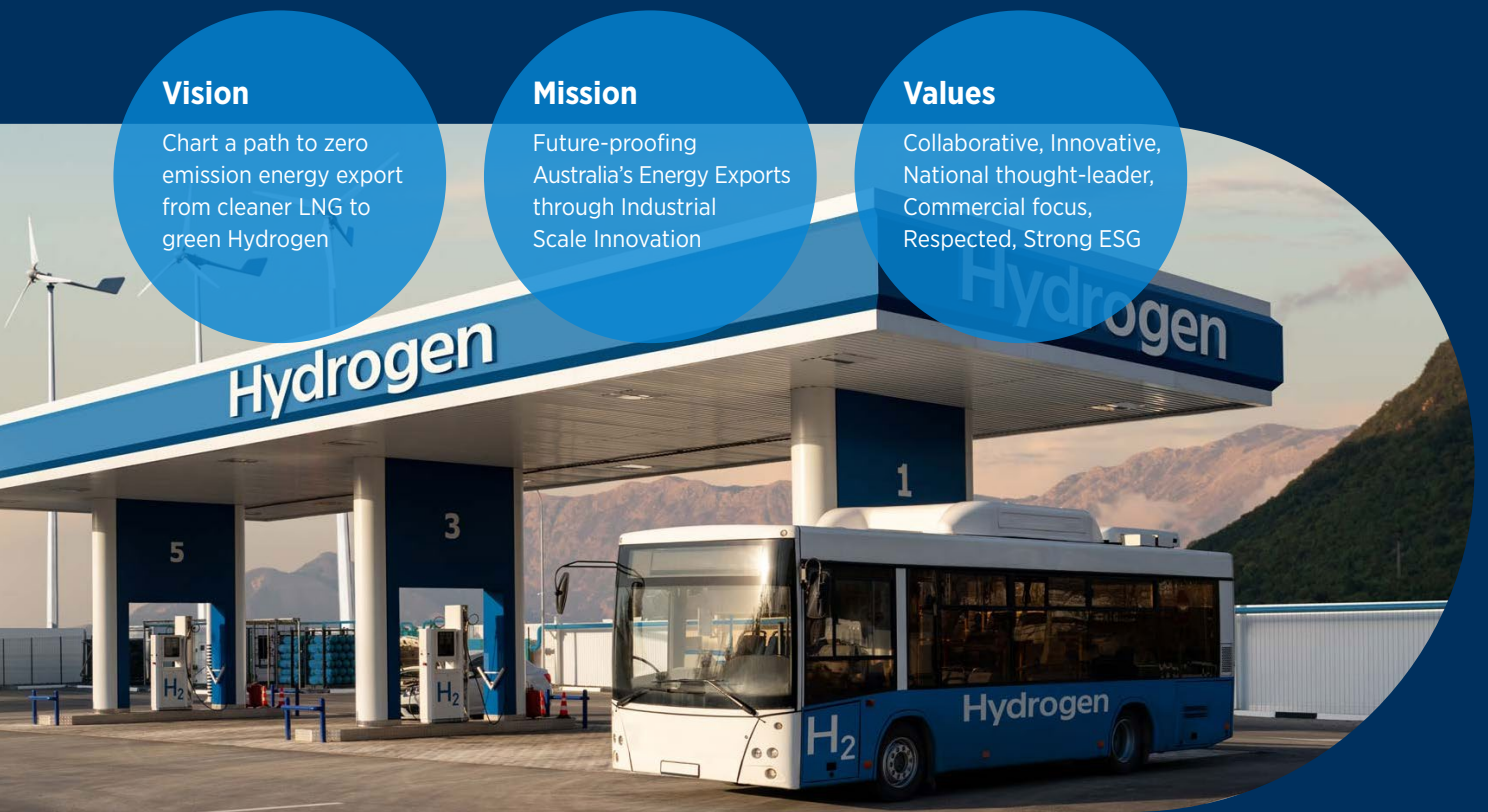
Chart a path to zero emission energy export from cleaner LNG to green Hydrogen

Mission

Future-proofing Australia's Energy Exports through Industrial Scale Innovation

Values

Collaborative, Innovative, National thought-leader, Commercial focus, Respected, Strong ESG



BENEFITS OF BEING IN THE FEnEx CRC NETWORK

- Access to leading edge solutions to commercial challenges and opportunities. It is estimated that addressing the challenges confronting the LNG energy sector could be worth \$12.2 billion per annum, when extrapolated across the 10 mega-LNG projects in Australia.
- Access to infrastructure to develop and pilot new technologies.
- Access to world leading researchers and capabilities, and to a post-graduate and post-doctoral community with a culture of industry engagement and innovation.
- Potential eligibility for R&D tax credits.
- Access to low cost upgrading and replacement of major process automation and control infrastructure.
- Improved maintenance and reduced inventory costs.
- Identification of new business opportunities including an emerging hydrogen export industry which could be worth A\$1.7 billion by 2030.
- Leading the development of the nascent Hydrogen Export industry.
- Collaboratively work to set the standard for Export-Class infrastructure.
- Access to pilot infrastructure to develop new technologies for hydrogen production and integration of renewable energy.
- Access to training and future leaders and technologies, and a community of researchers with world-leading capabilities, and a culture of industry engagement and innovation.



Membership categories and fee structure

Membership types	Annual Cash Contribution	Option to be Member
Core Participant	≥ \$150,000	Yes
Supporting Participant	≥ \$50,000	No

- Core Participants can elect to be Members (it is not mandatory).
- Members will vote on Board nominees. All Members have an equal vote.
- Board ultimately approves Project Agreements and expenditure of CRC funds.
- Board also decides on the admission of New Core Participants into the CRC.
- All Participants can participate in, propose and/or lead Projects.
- Larger cash contributions enable larger ability to leverage Commonwealth funds for Projects.

Current participants

FEnEx CRC acknowledges and appreciates the integral relationships it has with universities as well as industry and government organisations in Australia and around the world.

Industry

Asset Institute
Ansteel
Australian Petroleum Production and Exploration Association (APPEA)
Beach Energy
Carbon 280

Chevron Australia
Enterprise Transformation Partners
Environmental Clean Technologies
Horizon Power (Regional Power Corporation)

INPEX
MIMOSA
Mineral Resources Limited
Origin Energy Limited
Shanxi Keteng Environmental Protection Technology Co.
Wood

Government

QLD: Department of State Development, Infrastructure, Local Government & Planning (DSDILGP)

VIC: Department of Environment, Land, Water and Planning (DELWP)
VIC: Department of Jobs, Precincts and Regions (DJPR)

WA: Government Department of Jobs, Tourism, Science and Innovation (DJTSI)

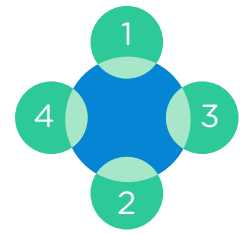
Universities

University of Western Australia
Curtin University
Queensland University of Technology

University of South Australia
Swinburne University
University of Melbourne
Charles Darwin University

University of Tokyo
Seoul National University
University of Science and Technology Liaoning

FEnEx CRC'S FOUR RESEARCH PROGRAMS



1 Efficient LNG Value Chains

The Australian LNG export industry is dominated by large-scale processing plants and continuous production from a variety of natural gas reservoirs located both on- and off-shore. Their business model is based on the amount and reliability of LNG production over decadal time frames. The technical challenges affecting this export industry's competitiveness may be classed as follows:

- Need to reduce their carbon footprint while keeping production costs viable.
- Amount of LNG that can be made per day (throughput limitations).
- Energy required to make, store and transport the LNG (efficiency limitations).
- Unplanned shutdowns interfering with contractual supply requirements (reliability limitations).
- Compositional changes in the natural gas source feeding the plant (gas quality limitations).
- Inability to extract & monetise high-value components in the gas (value-add limitations).

3 Digital Technologies and Interoperability

Australia's entire resources sector relies upon automated processes controlled by a wide-variety of hardware and software tools, many of which are legacy solutions. New digital technologies offer tremendous opportunities to increase the productivity, reliability and security of these processes particularly in the technically demanding LNG and hydrogen export sectors.

However, these digital technologies are typically not interoperable: products from one vendor cannot communicate or work with products from another. This constraint applies to interactions between new and legacy digital systems, as well as between modern Industry 4.0 technologies.

This program will work to develop the industry-wide standards necessary to ensure new digital technologies for use in both LNG and hydrogen export are interoperable and provide a platform for demonstrating that interoperability. In parallel, emerging Industry 4.0 technologies for advanced process automation and control (e.g. digital twins, predictive maintenance sensing) will be benchmarked rigorously to demonstrate their fidelity and value.

The successful deployment of interoperable Industry 4.0 technologies in LNG and hydrogen export plants will enable:

- increased throughput and energy efficiency through the improved understanding of the process delivered via advanced digital sensors and models, and
- reduced maintenance and inventory costs through the ability to reliably predict equipment failure rates and thereby avoid excessive expenditure on contingent spares.

2 Hydrogen Export and Value Chains

Decarbonisation by energy importers presents an opportunity for Australia to leverage the know-how, capability, infrastructure and supply chains of our existing LNG industry, and build on our world-class renewable energy resources to establish a globally leading position in the nascent Hydrogen Export industry.

Much like the efforts that supported the LNG Export industry four decades ago, development of the Hydrogen export industry will require Export-class infrastructure systems, operations and procedures to be defined over the next decade.

This is the core mission of Program 2, which will focus on addressing the following challenges:

- Processing and delivery methods for cost-effective large-scale Hydrogen Export
- Target Export markets, including key applications and requirements
- Supply chain architecture, design and operations
- Export-class systems and technologies for hydrogen production, storage and delivery
- Mapping future world-scale hydrogen export regions

4 Market and Sector Development

To increase the resilience of Australia's current LNG industry and to deliver market-readiness for a future hydrogen export industry, this research program will focus on the factors that drive market growth as well as the barriers that can stifle the development of supply chains and inhibit technology adoption. Market development opportunities exist for increased use of LNG as a transport fuel or diesel replacement both domestically (mining sector) and internationally (shipping).

These same markets could also be serviced by hydrogen fuel if appropriate cost-effective storage technologies can be demonstrated. Best-practice hydrogen custody transfer standards and reporting networks must also be developed to satisfy the demand for *verifiable* green hydrogen. Policy frameworks for value chain market formation must be developed systematically, with appropriate emphasis on the business capabilities that allow new technologies to be adopted and distributed through the sector.

Finally, it is essential that both the LNG and Hydrogen export industries establish, maintain and nurture the appropriate social licenses; to incorporate the lessons from and replicate the benefits of LNG exports on Australia's domestic energy sector, a critical evaluation of the similarities and differences applicable to hydrogen is essential.