



# Hydrogen Opportunities and Challenges in Australian Context

**Dr. Tara Hosseini**

**Team Leader & Senior Research Scientist  
CSIRO Energy, Australia**

Email: [Tara.Hosseini@csiro.au](mailto:Tara.Hosseini@csiro.au)

**RD20 Conference**  
December 2024

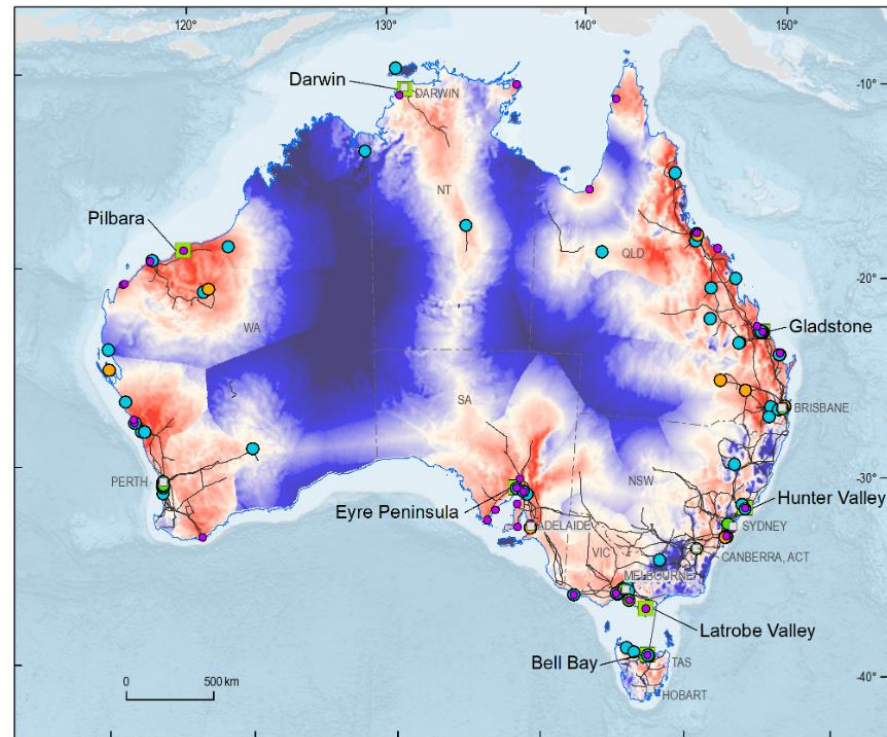




# Hydrogen Opportunities in Australia

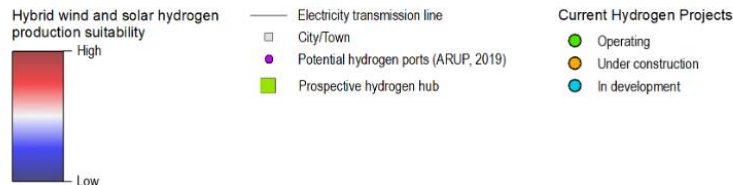
- Australia's vast resources to support large-scale hydrogen production.
- Renewable and CCS hydrogen can be produced.
- There is also a prospect for natural hydrogen in some locations.
- Abundant water, land, renewable Energy, and fossil fuels enable diverse production options.
- Underground storage offers flexibility and seasonal storage.
- Australia's geography provides unique opportunities for hydrogen production and grid support.

Geoscience Australia 2023, Australia's hydrogen production potential. [www.ga.gov.au/](http://www.ga.gov.au/)



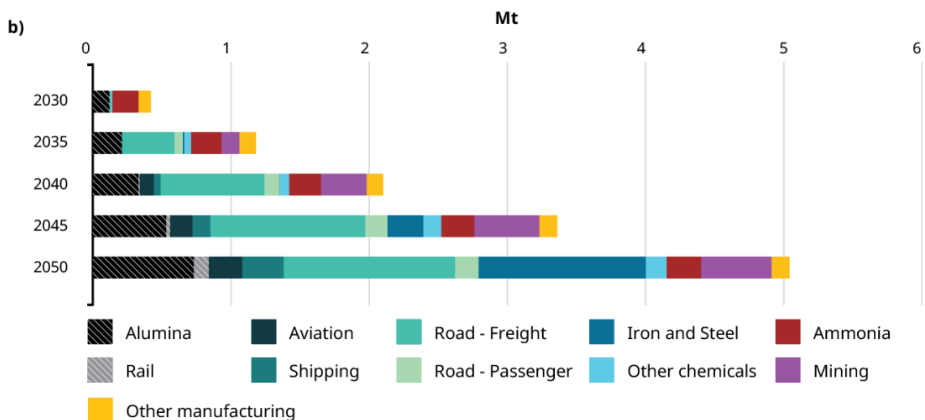
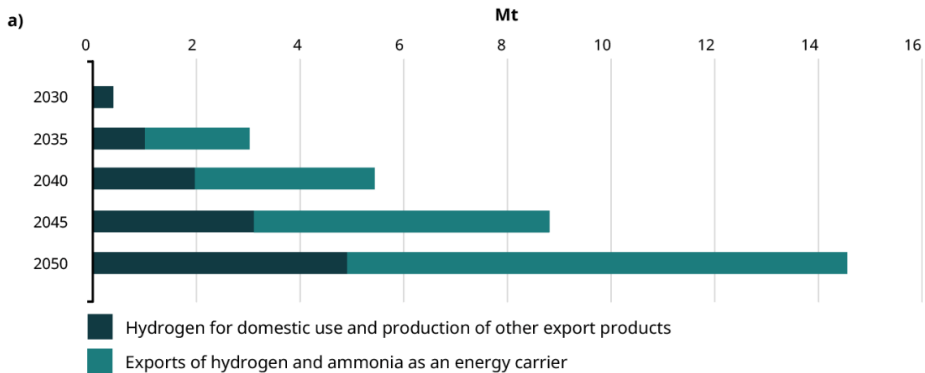
Source: compiled by Geoscience Australia, March 2022. Please note this scenario may not reflect future market and technology developments.

MEGIS 21014-35





# Australian Hydrogen Market



- Australia is well-placed for renewable energy export and manufacturing
- Australian hydrogen can be exported as energy carrier.
- Hydrogen can be used as a chemical or heat input to the production of green metals, ammonia and low-carbon liquid fuels.
- Hydrogen will play a role in decarbonising existing hard-to-abate sectors such as long-haul transport and aviation.
- It could also potentially support power generation.



# Challenges to deploying a clean hydrogen economy

- Producing low-cost hydrogen at scale
- Large gap between projected demand and supply growth rates.
- Diverse sources of hydrogen needed to help countries achieve their net zero ambitions at least cost.
- Large-scale hydrogen projects require substantial upfront investments in new infrastructure.
- bulk storage of hydrogen, distribution systems for hydrogen into both the domestic and export markets.
- Strong safety systems and regulations are essential.
- Growing hydrogen industry needs skilled workers.

*Srinivasan, V., Temminghoff, M., Charnock, S., Hartley, P. (2019). Hydrogen Research, Development and Demonstration: Priorities and Opportunities for Australia, CSIRO.  
[LETA Submission: Hydrogen Strategy Review Consultation Paper July 2023](#)*



# Australia's 2024 National Hydrogen Strategy

## Supply

- Renewable hydrogen production is currently expensive
- The Australian Government will support this industry through incentives and programs like the Hydrogen Production Tax Incentive and Hydrogen Headstart.

## Demand and decarbonisation

- Key Hydrogen use cases:
  - Green metals (iron and alumina)
  - Ammonia
  - Long-haul transport
  - Power generation and grid support
- Safeguard Mechanism:
  - Australian government policy that sets limits on greenhouse gas emissions from large industrial facilities







# Australia's 2024 National Hydrogen Strategy (continued)

## Community Benefit

- Expand First Nations Renewable Hydrogen Engagement Fund pilot.
- Establish a national Net-Zero economy authority.
- Plan for water demands, including for hydrogen, in a new National Water Initiative.

## Trade, investment and partnership

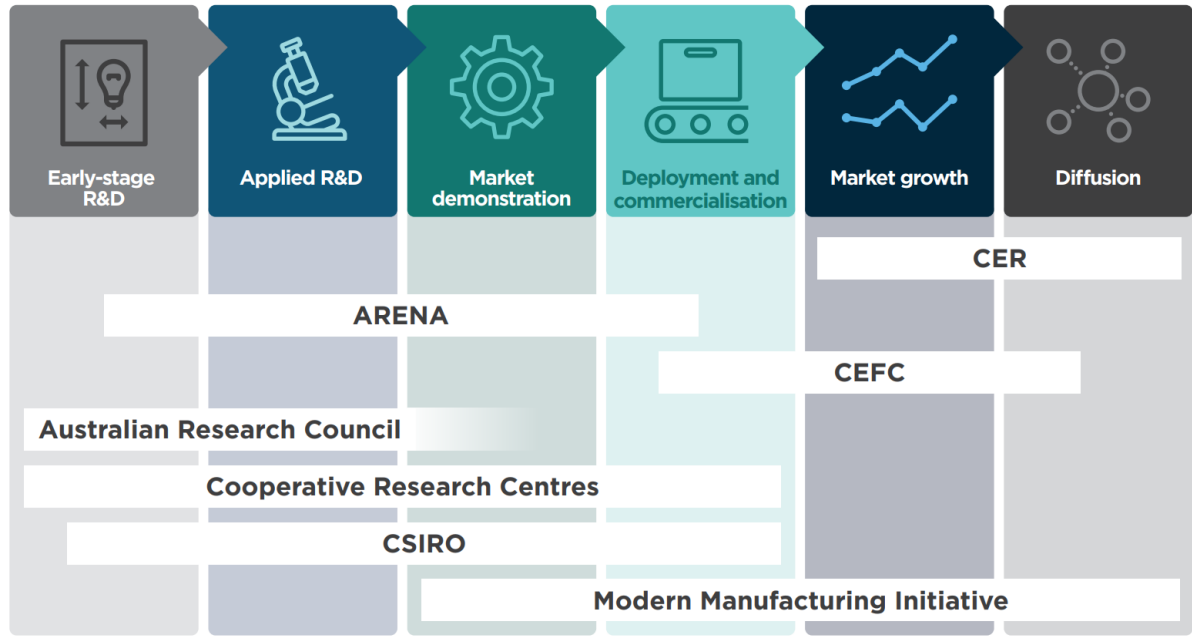
- Base export target: 0.2 million tonnes/year, potential: 1.2 million tonnes/year.
- Austrade and NZEA will attract international investment.
- Guarantee of Origin (GO) scheme will verify hydrogen emissions intensity.
- International partnerships will foster knowledge sharing, RD&D, and supply chain development.





# Australian government's Invest in the research to commercialisation pipeline

- Support research, development, and early-stage commercialisation through co-investment.
- CSIRO collaborates with universities, research institutes and industry to develop technologies and support commercial uptake.
- CSIRO's focus areas include clean hydrogen, energy storage, industrial decarbonisation, and agricultural emission reduction.



- CSIRO has also established a mission-driven multidisciplinary science and research program.



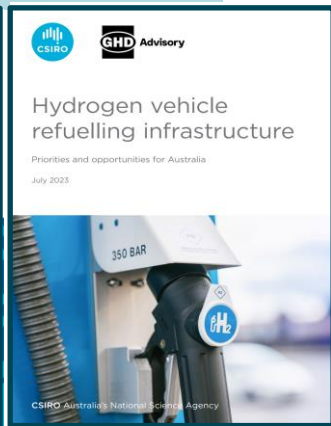
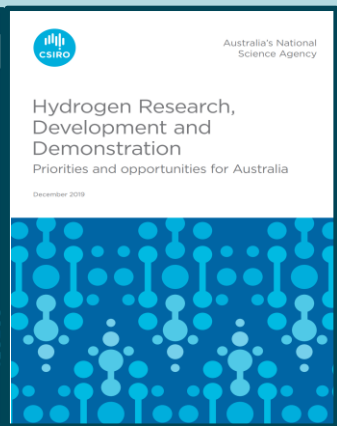
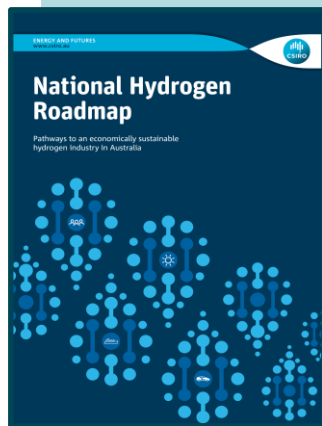
# CSIRO's Hydrogen initiatives

HyResource

HyResearch: Australian Hydrogen R&D Portal

HyLearning: Data visualisation tools –

- Facilitate connections and collaborations, domestically and internationally
- Enable efficient retrieval of information on Australian hydrogen-related activities
- Demonstrate collaborative knowledge sharing efforts and Australian leadership
- Assist in identifying knowledge gaps, thereby supporting future R&D program development actions







# CSIRO Hydrogen / Ammonia Research Portfolio

## Hydrogen Production

### Novel hydrogen production

- Natural Hydrogen
- Photocatalysis
- Electrolysis

### Ammonia production

- LP Synthesis
- E-Chem. Systems
- Biological Synthesis

## Hydrogen Storage and Distribution

### Novel hydrogen storage options

- Geological Storage
- Hydrogen Liquefaction
- Ammonia & LOHC Conversion

### Hydrogen handling

- MH Hydride Compression
- Hydrogen Embrittlement
- Handling Materials

## Hydrogen / Ammonia Utilisation

### Hydrogen use

- Fuel cells
- H<sub>2</sub> use in industry
- Hydrogen Burners

### Ammonia use

- Ammonia SOFC
- Ammonia cracking
- Ammonia Engines

## Cross-Cutting Value Chain Projects: Supporting hydrogen industry development

Environmental impacts

Social license to operate

Techno-economic evaluation

Regulatory requirements



# Thank you

## **CSIRO Energy – Clayton**

Dr Tara Hosseini

Team Leader & Senior Research Scientist

E: [Tara.Hosseini@csiro.au](mailto:Tara.Hosseini@csiro.au)