Hydrogen on the International Stage

APGA Hydrogen Symposium – November 2022

Today's presenter

David Norman
CEO
Future Fuels Cooperative Research Centre

About Future Fuels Cooperative Research Centre

Long term, industry-led collaboration between 100 industry, all State governments and six academic organisations, co-funded by the National Government

FUTURE FUELS CRC

Action orientated, industry led, applied research

Trusted voice of evidenced-based knowledge

100 projects and over 50 PhD and Masters scholarships covering:

- **Future Fuel Technologies, Systems and Markets**
- **Social Acceptance, Public Safety, Security of Supply and Policy & Regulatory Changes**
- **Network Lifecycle Management**

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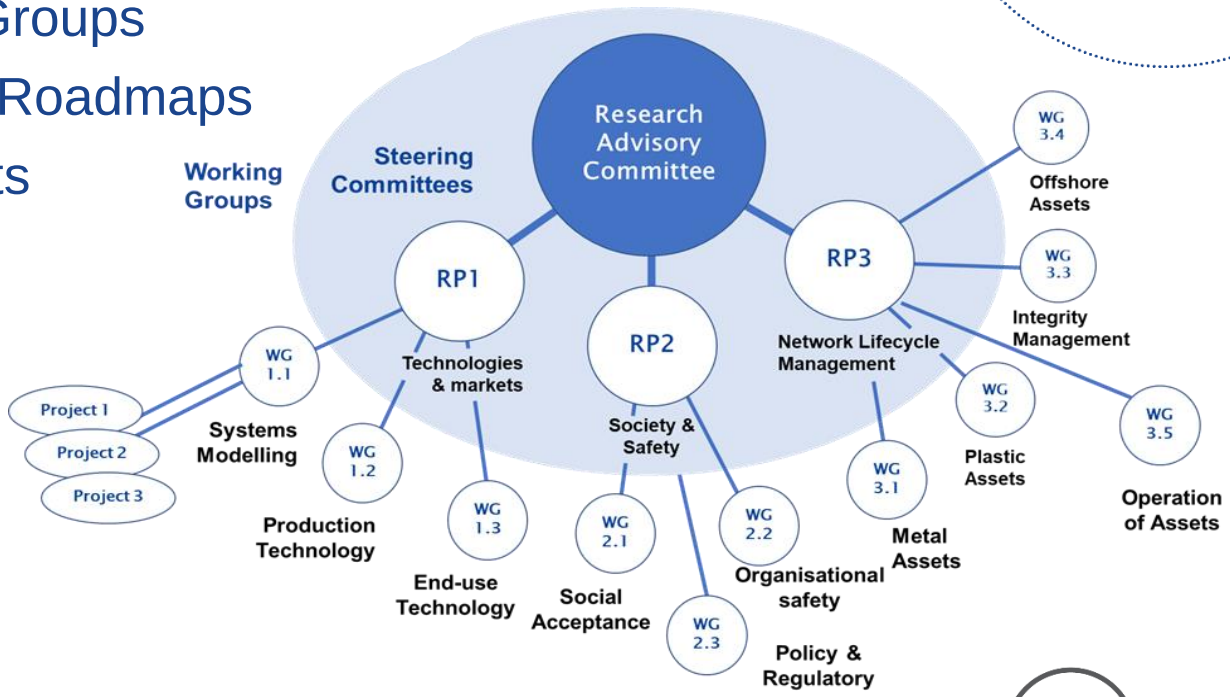
Research Management Structure

10 Focused Working Groups

10 Detailed Research Roadmaps

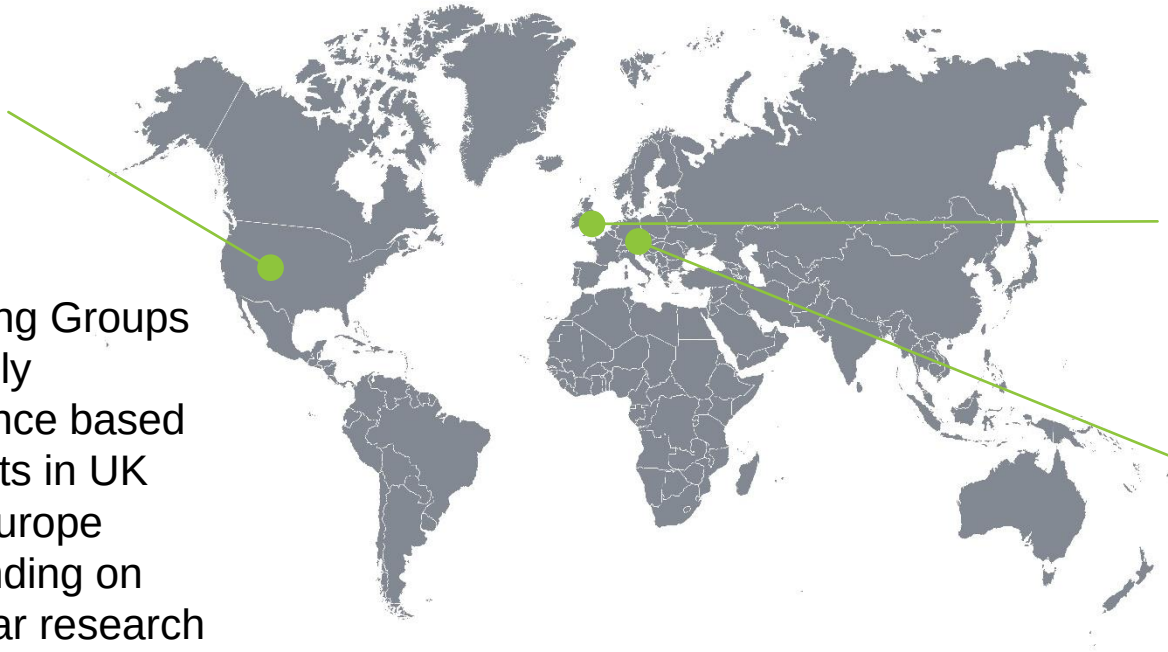
210 Industry Specialists

150 Researchers



Our regular international linkages

with other infrastructure related research organisations



- Working Groups monthly
- Evidence based projects in UK and Europe
- Expanding on 20-year research relationships

PRCI

IGEM
Institution of Gas Engineers & Managers

nationalgrid Northern Gas Networks

EPRG

GERG
THE EUROPEAN GAS RESEARCH GROUP

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Europe

- Previous H_2 target: 'Fit for 55', H_2 less than 5 MTpa by 2030.
- New 'REPowerEU' H_2 target: 10MTpa production and 10MTpa imports of renewable H_2 by 2030.
- Sustainable biomethane production: from current 3bcm to 35 bcm by 2030.
- €3bn Innovation Fund including Hydrogen technology
- Renewable Energy Directive (RED) - including green hydrogen
- Important Projects of Common European Interest – €10bn
- European Hydrogen Bank creation – September 2022 - €3bn

Europe - Shell Netherlands

200MW electrolyser in the port of Rotterdam

60 tonnes of renewable hydrogen per day

Photo: Shell Global (10MW Shell Germany)

Europe - Manufacturing

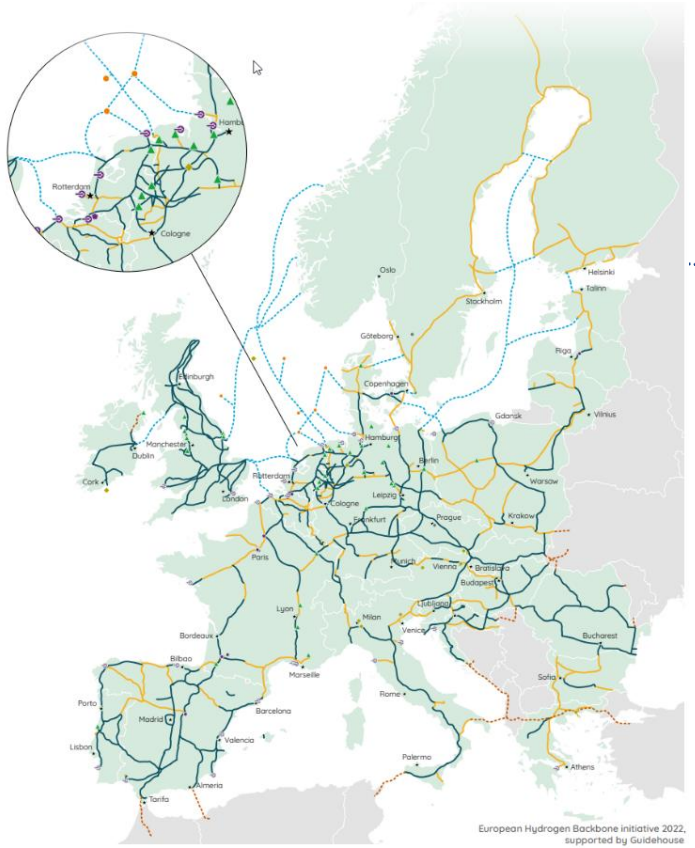
In addition to ITM Power, NEL, Siemens and Thyssenkrupp, now Topsoe has taken FID on new manufacturing facility in Denmark with a total capacity of 500 megawatt per year by 2023, with the option to expand to 5 gigawatt per year.

Efficiencies above 90% using proprietary solid oxide electrolysers

Photo: Topsoe

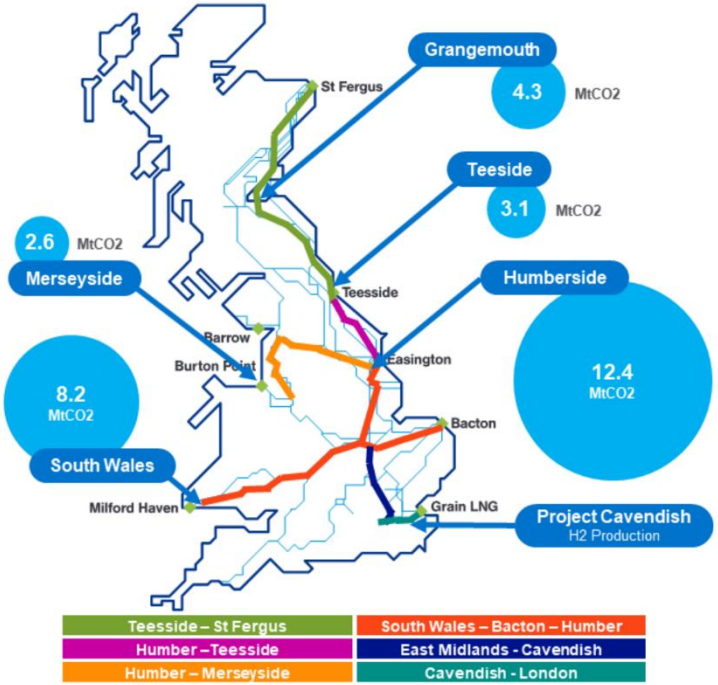
Europe - Hydrogen Backbone transmission

- 31 gas infrastructure companies
- 53,000 km of hydrogen transmission by 2040
- Sep 2022 – accelerated plan with advanced planning focussed on developing infrastructure in Spain, Belgium, Slovakia, Czechia and Hungary



Source https://ehb.eu/

UK - HyNTS FutureGrid



Source https://www.nationalgrid.com/gas-transmission/insight-and-innovation/transmission-innovation/futuregrid

UK - FutureGrid

HyNTS FutureGrid
Phase 1 Overview

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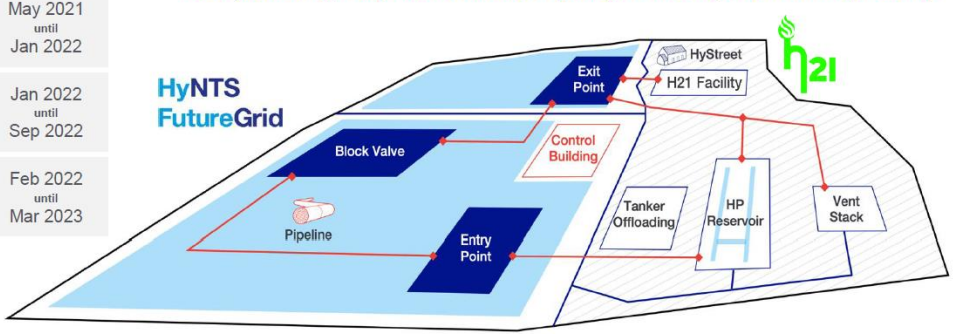
This ambitious programme seeks to build a hydrogen test facility from decommissioned assets at DNV GL Spadeadam to demonstrate the National Transmission System (NTS) can transport hydrogen.

The project will be delivered in three phases:

Phase 1a	Offline Facility Build	May 2021 until Jan 2022
Phase 1b	NTS Asset Testing	Jan 2022 until Sep 2022
Phase 1c	Safety & Risk Impact	Feb 2022 until Mar 2023

The FutureGrid test facility will connect to the existing H21 distribution facility creating a representative UK Hydrogen Testing and Training Facility:



FutureGrid Project Partners: DNV·GL, HSE, Northern Gas Networks, fluxys, Durham University, The University of Edinburgh

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UK - FutureGrid

HyNTS FutureGrid
1b: NTS Asset Testing

Phase 1a: Offline Test Facility Build | **Phase 1b: NTS Asset Testing** | Phase 1c: Safety & Risk Assessment

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Three concentrations of hydrogen will be tested:

- **2%** hydrogen in natural gas
- **20%** hydrogen in natural gas
- **100%** hydrogen

The main steps for Phase 1b are:

Operate the FutureGrid test facility for 6-12 months across 2% 20% and 100% hydrogen, following the detailed Master Test Plan developed under the FutureGrid NIA project.

Review and evaluate the test results utilising the research from Fluxys with the Fast Screening Methodology allowing for the extrapolation of results across the NTS.

Validate flow parameters such as gas velocities, pressures, energy delivery and other operating parameters for the 3 concentrations of hydrogen.

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UK – other demonstration programs

US – Inflation Reduction Act

Earthshots Initiative – US$1 per kg in one decade

Infrastructure Investment and Jobs Act - hubs, supply chain support, electrolyser hydrogen production cost reduction programs

Inflation Reduction Act

- Four regional clean hydrogen hubs (US$8bn in FY22-26)

- Demonstration, commercialisation and deployment program (US$1 billion in FY22-26)

- Tax credit for production of “qualified clean hydrogen” set at US$0.60 per kg but increases to $3.00 per kg when the hydrogen’s lifecycle carbon intensity measures less than 0.45 kg of CO_2e per kg of H_2

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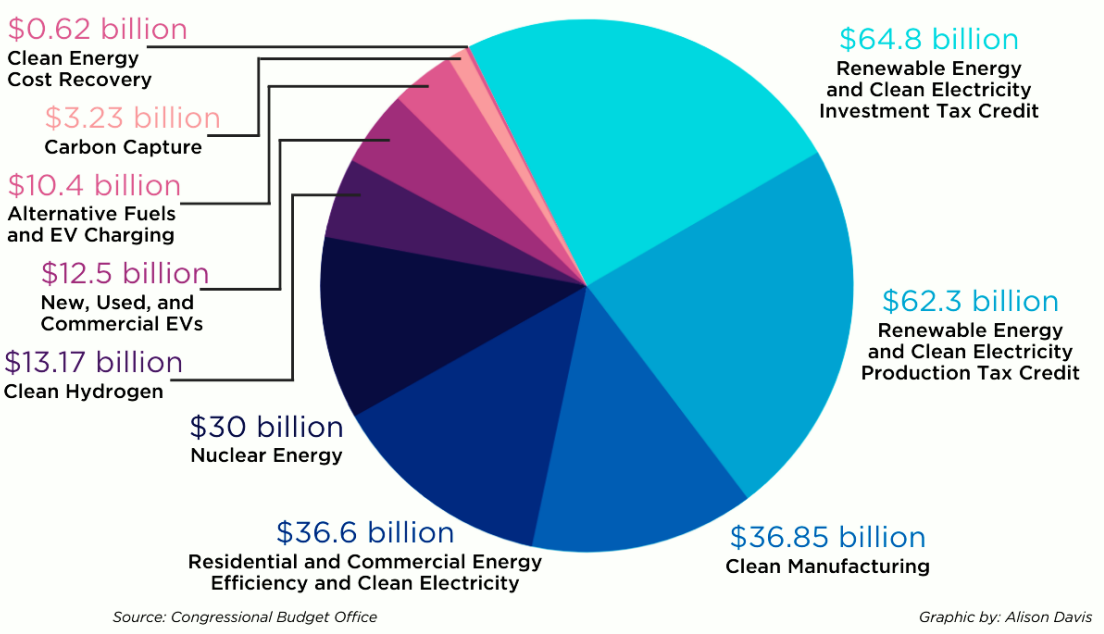
US - Inflation Reduction Act



China

Medium and Long-Term Plan for the Development of Hydrogen Energy Industry (2021-2035) now targets 100 - 200 thousand tonnes of green hydrogen by 2025

Ningxia Baofeng Energy Group in Ningxia has commissioned a 150MW alkaline electrolyser powered by a 200MW solar array

Sinopec has begun construction of a 260MW alkaline electrolyser facility in Xinjiang by 2023.

Japan and South Korea

Japan

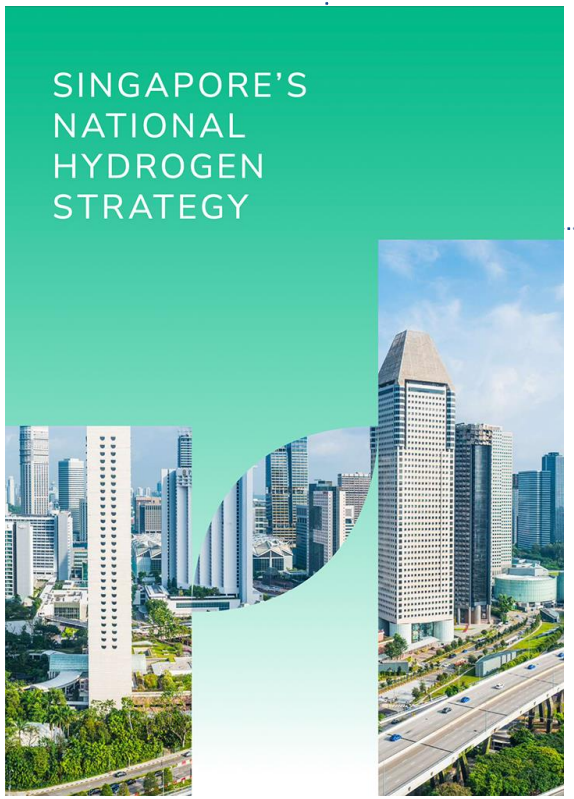
- Hydrogen supply chain fund allocation 270 billion Yen (US$2.4bn)
- Generation of green hydrogen projects fund allocation 70 billion yen (US$640bn)

South Korea

- Government funding at around US$700 million (40% higher than FY 2020) with reports of other support for mobility applications
- Korea H2 Business Summit announces a 500 billion Won fund (US$383 million) to promote hydrogen infrastructure across the value chain

Singapore – new entrant

- Small scale commercial projects
- Research and development work to advance hydrogen technologies through collaborations between academia and industry
- Guarantee of Origin certification methodologies
- Develop the land and infrastructure plans
- Workforce training



Interim findings from a groundbreaking study

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NET ZERO AUSTRALIA

THE UNIVERSITY OF MELBOURNE

THE UNIVERSITY OF QUEENSLAND AUSTRALIA CREATE CHANGE

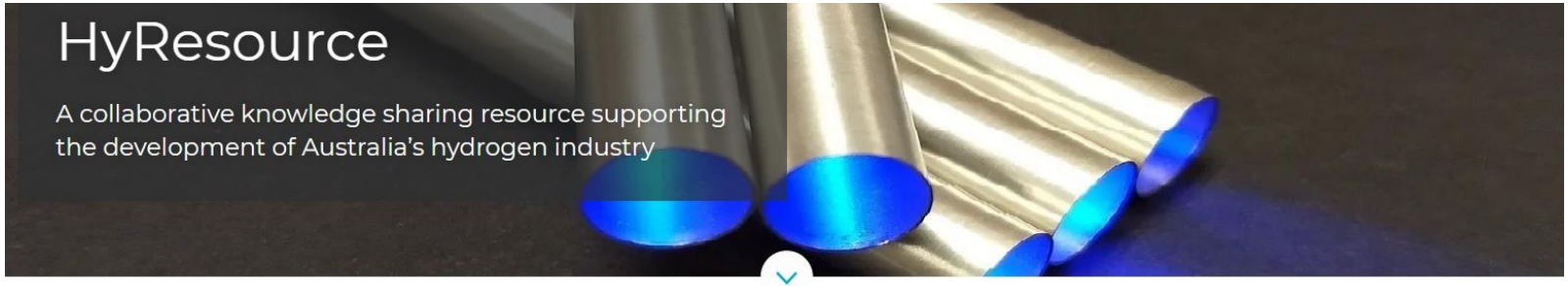
PRINCETON UNIVERSITY

nous

https://www.netzeroaustralia.net.au/

Silver Sponsor

HyResource is following hydrogen projects and R&D



Find out more at https://research.csiro.au/hyresource

FUTURE FUELS CRC

Enabling the decarbonisation of Australia's energy networks

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