

HySupply – Australian update

ACHEMA – World Forum for the Process Industries

15-16 June 2021



Australian Government

Department of Foreign Affairs and Trade



Australian Government

Department of Industry, Science,
Energy and Resources



Baringa
Brighter together



UNSW
SYDNEY

HySupply Partnership



BDI

Bundesverband der
Deutschen Industrie e.V.



acatech

DEUTSCHE AKADEMIE DER
TECHNIKWISSENSCHAFTEN

Key Partners



UNSW
SYDNEY



Baringa
Brighter together

Lead and
Administrating
Organization

Joint Feasibility Study of Renewable Hydrogen

German-Australian Hydrogen Supply Chain

Module 1: Production

Renewable energy



Hydrogen



Module 4: End use

Steel industry



Refineries



Chemical industry



Business cases



AUSTRALIA

Technology export

GERMANY



Module 2: Transport

Export



Hydrogen based energy carriers

Import



Module 3: Recovery



Recovery and distribution

Source: BDI/acatech

Australian stakeholders

Key Partners



Australian Academy of
Technology & Engineering



+



MAN Energy Solutions

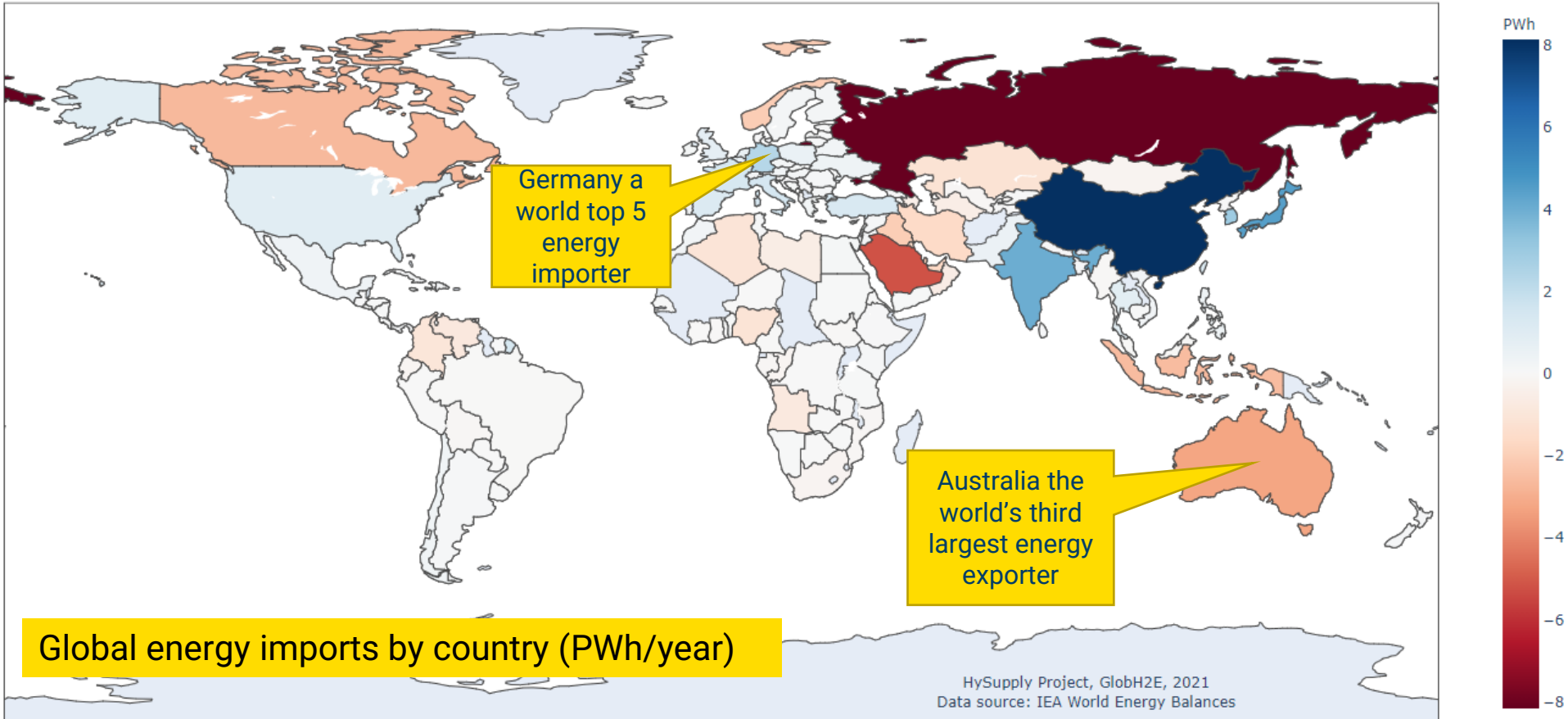


Australian
National
University



Current global energy trade

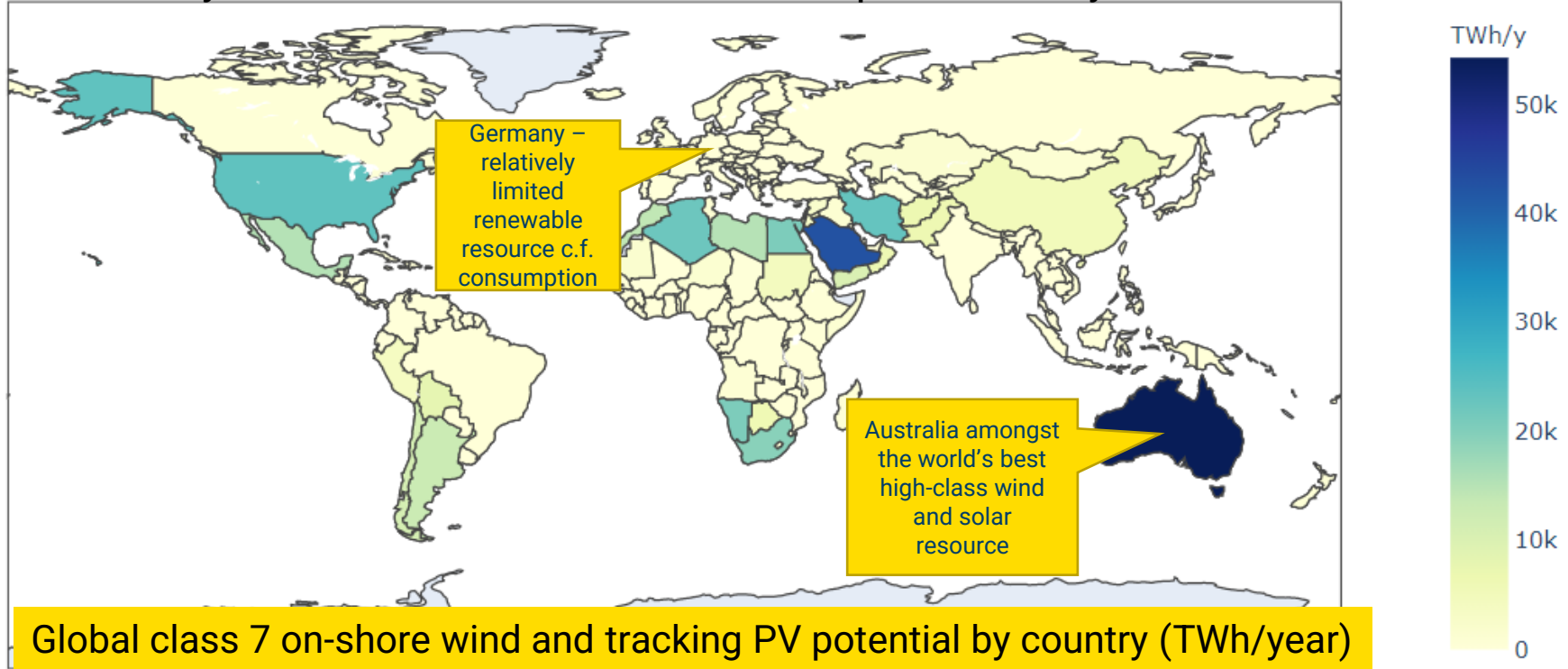
Largely an outcome of the availability of easily extracted low-cost fossil fuels



A mostly renewable world more self reliant

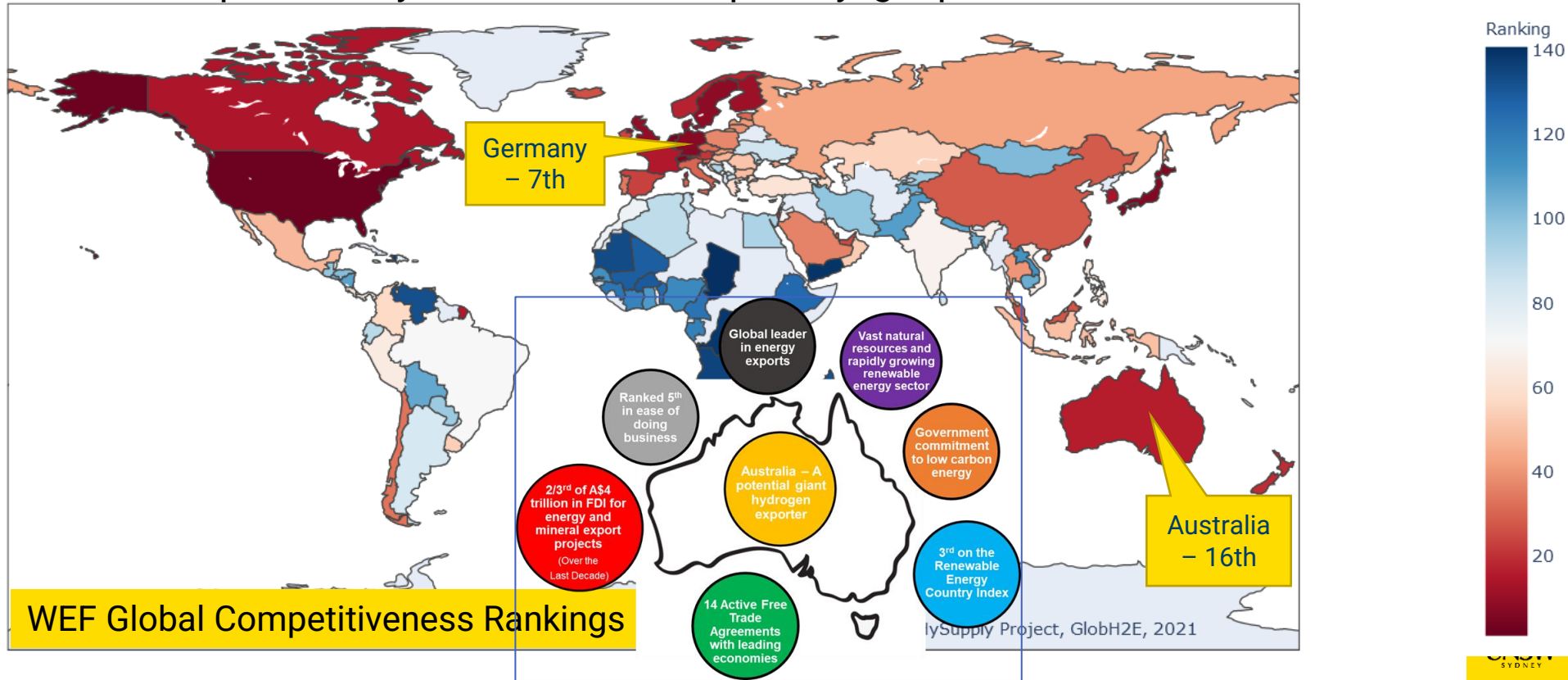
However, various countries still seem certain to require energy imports
... including Germany and some others in Europe, Japan, Korea

Potentially new renewables 'electrostate' exporters, likely some old ones

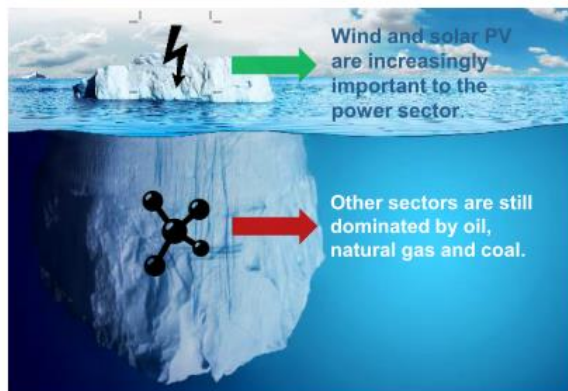


Trade relationships generally multi-faceted

Delivered price is key, but not the only consideration - existing trade relationships, stability, demonstrated capability, geopolitical considerations....

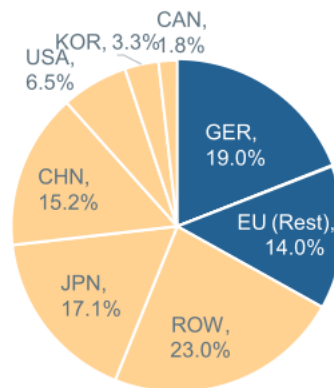


Germany a significant hydrogen market.... and equipment and services provider

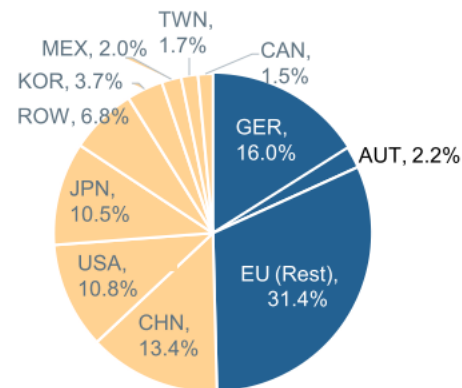


- Until recently the German *Energiewende* has mostly focused on the deployment of renewable energy in the **power sector**.
- However, renewable energy only made up **15 %** of Germany's final energy consumption in 2020.
- Green molecules are needed to defossilize the remaining **85 %** of the energy system.

Market shares of electrolysis technology



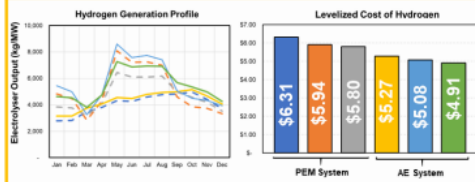
Market shares of other PtX-technologies



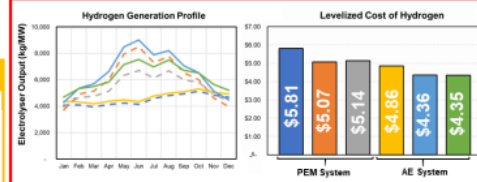
Source: UN (2018), Frontier Economics 2018

Forthcoming – *State of Play* report and open-source value-chain models

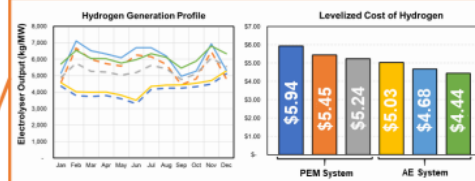
Baines, NT



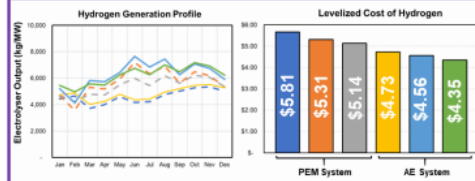
McArthur, NT



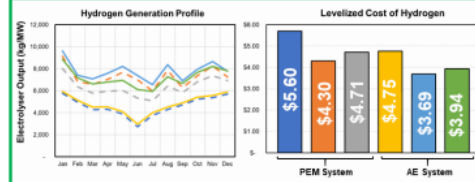
New England, NSW



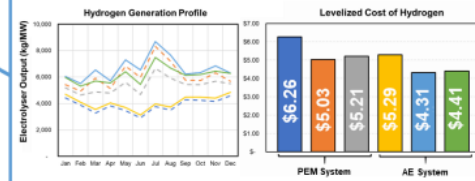
Ashburton, WA



Geraldton, WA



Southern NSW Tablelands



Key

- Electrolyser Facility
- Solar PV H₂ Profile (Fixed Effic.)
- Wind H₂ Profile (Fixed Effic.)
- Hybrid H₂ Profile (Fixed Effic.)
- Solar PV H₂ Profile (Vab. Effic.)
- Wind H₂ Profile (Vab. Effic.)
- Hybrid H₂ Profile (Vab. Effic.)
- Solar PV - AE LCH₂
- Wind - AE LCH₂
- Hybrid - AE LCH₂
- Solar PV - PEM LCH₂
- Wind - PEM LCH₂
- Hybrid - PEM LCH₂

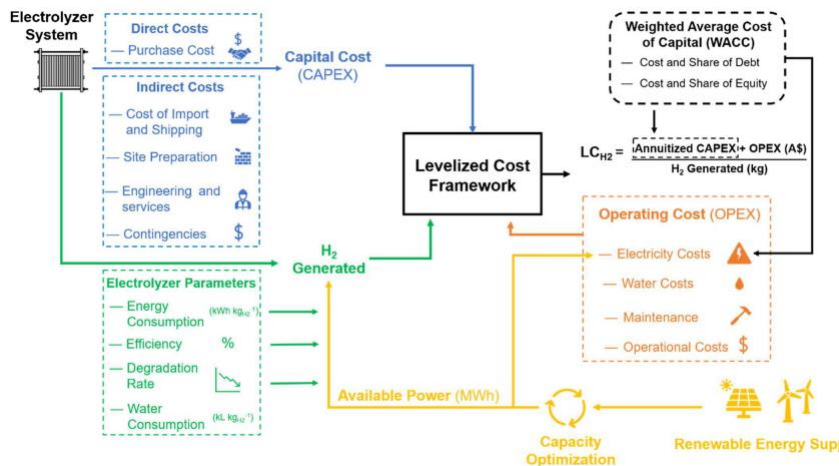
*Hourly resolution
renewables + electrolyser
modelling required to
properly assess processes,
conversion systems, buffer
storage needs and firmed
energy requirements*

Green H₂ production costs

Location matters

Cost reductions needed

- Renewables costs down, CF up
- Electrolysers costs down, efficiency up
- Improved integration (CF optimisation) for both off-grid and NEM / SWIS / DKIS projects
- Low cost (de-risked) finance



Designing Optimal Integrated Electricity Supply Configurations for Renewable Hydrogen Generation in Australia

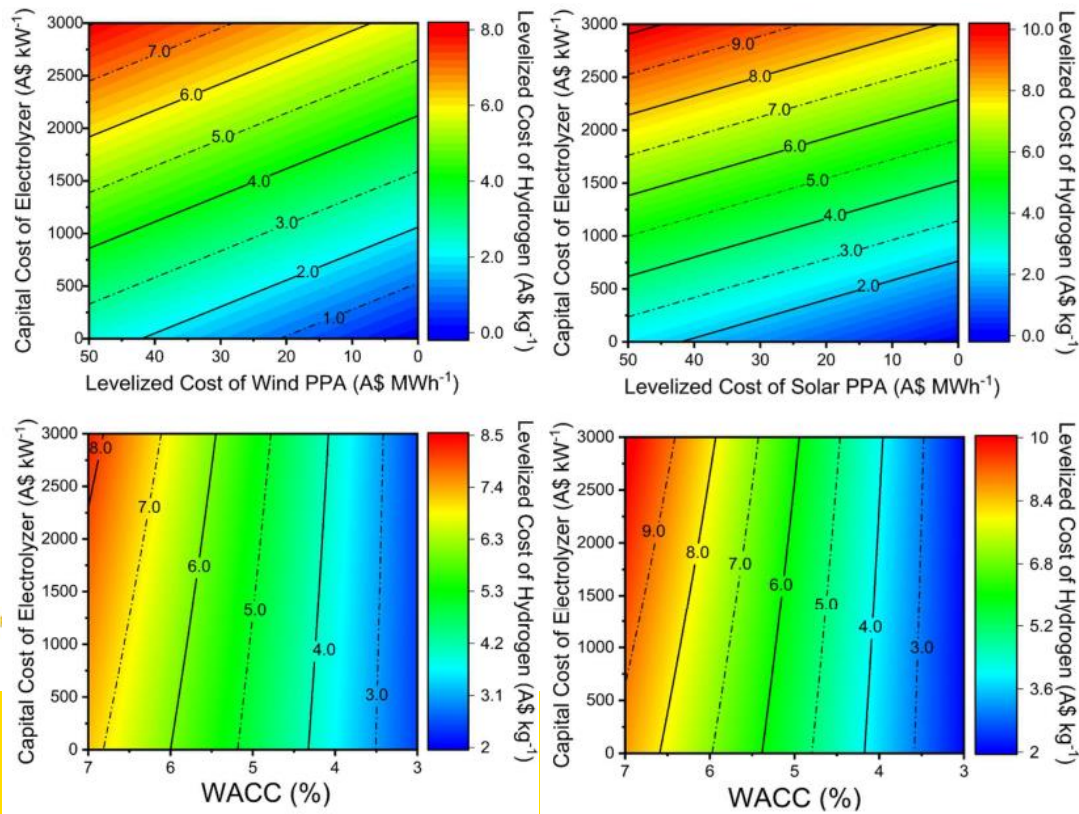
Muhammad Haider Ali Khan^a, Rahman Daiyan^{a*}, Zhaojun Han^a, Martin Hablutzel^b, Nawshad Haque^c, Rose Amal^a, Iain MacGill^{a,d}

^a Particles and Catalysis Research Laboratory, School of Chemical Engineering, The University of New South Wales, Sydney, NSW 2052, Australia

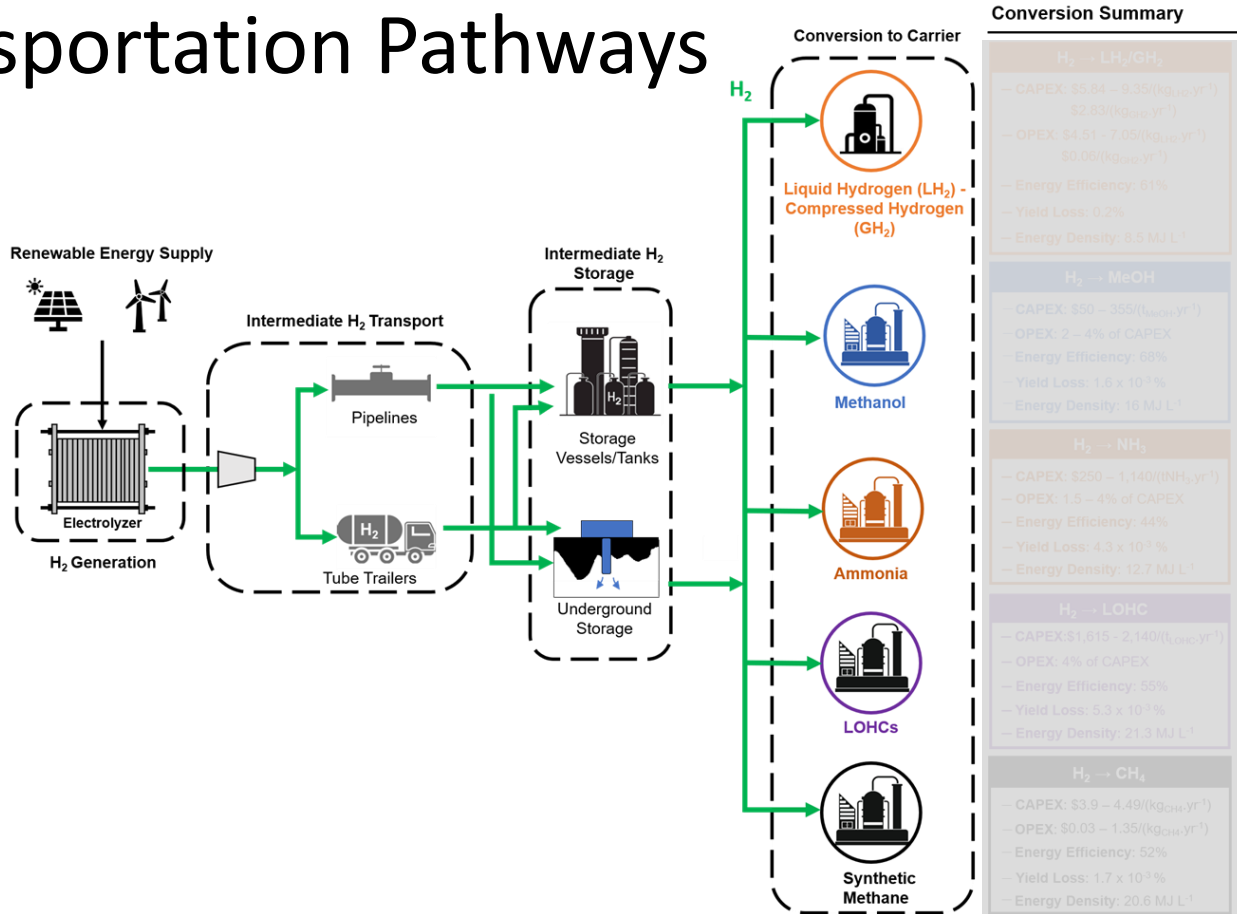
^b Siemens Limited, Melbourne, VIC 3153, Australia

^c CSIRO Energy, Private Bag 10, Clayton Victoria 3169, Australia

^d Collaboration on Energy and Environmental Markets, The University of New South Wales, Sydney, NSW 2052,

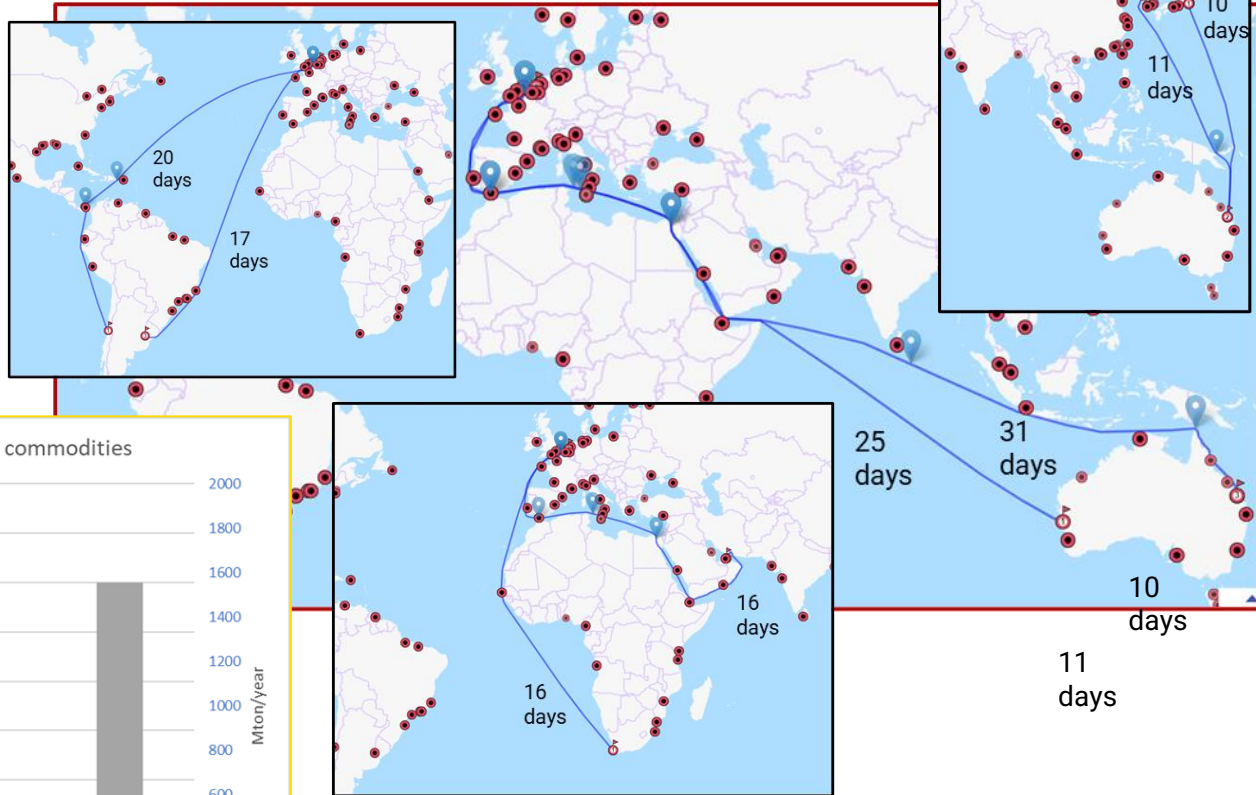


Also modelling Storage, Conversion and Transportation Pathways

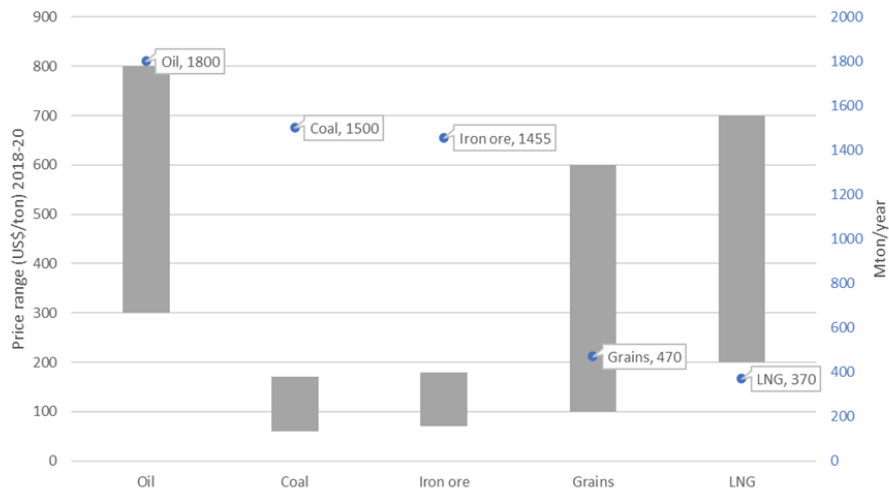


Shipping hydrogen

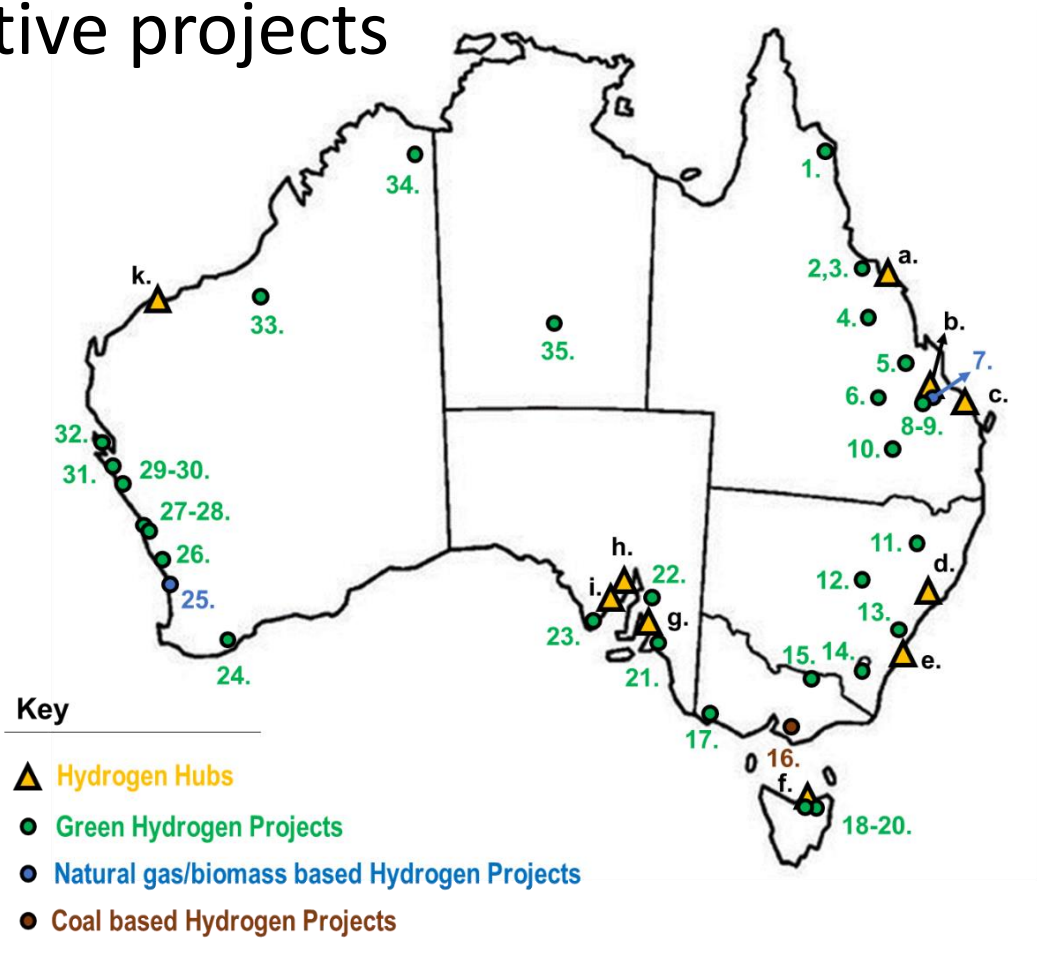
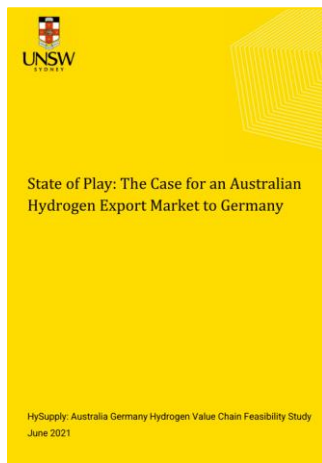
- Advantages for hydrogen production near point of use
- Pipelines the lowest cost, albeit less flexible, option for distances up to thousands of km, subject to route constraints
- **However**, shipping delivers 80% of global trade, flexible, low cost.... *and needs clean fuels*



Shipped tonnages and price ranges for some key commodities



A growing number of export oriented / hydrogen and hydrogen derivative projects



Progress... on numerous fronts


Sustainable Business

June 14, 2021
10:12 AM AEST

Germany, Australia sign hydrogen accord to boost lower-emissions technology

3 minutes read

Reuters



Altmaier

German Economy Minister Peter Altmaier addresses a news conference in Berlin, Germany, April 27, 2021. John MacDougall/Pool via REUTERS/Phil Photo

Germany and Australia on Sunday signed a bilateral alliance on hydrogen production and trade to try to facilitate a renewable energy-based hydrogen supply chain between the two countries.

Economy Minister Peter Altmaier and Education and Research Minister Anja Karliczek signed a letter of intent to set up a "Germany Australia Hydrogen Accord" with Australian Energy and Emissions Reduction Minister Angus Taylor, the German Economy Ministry said in a statement.

It said the cooperation was about enabling "the import of sustainably produced hydrogen in relevant volumes, which is an important factor to reach our tighter climate targets."

Handelsblatt

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KLIMANEUTRALITÄT

„Champagner der Energiewende“: Australien könnte schon 2023 große Mengen grünen Wasserstoff liefern

Der australische Industrielle Andrew Forrest will Milliarden in die Produktion von grünem Wasserstoff investieren. Namhafte deutsche Unternehmen könnten zu den ersten Abnehmern gehören.


Klaus Stratmann

31.05.2021 - 04:00 Uhr • 4 Kommentare • 9 x geteilt



Autonomer Bohrer in Christmas Creek, Australien

Das Unternehmen Fortescue ist Eigentümer von mehreren Zehntausend Quadratkilometer Land in Australien. (Foto: Fortescue Metals Group Ltd.)



Australia, Singapore to accelerate hydrogen deployment in maritime sector


By George Haynes on Jun 10, 2021 | [Translate](#) NEWS

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Australia and Singapore will establish a A\$30m (\$23m) partnership to accelerate the deployment of hydrogen to reduce emissions in maritime and port operations, it has been revealed today (June 10).

The initiative will trial the use of clean hydrogen, clean ammonia and other hydrogen derivatives in shipping and port operations and explore the potential for hydrogen demand from the maritime sector.

RECHARGE
Global news and intelligence for the Energy Transition



German steelmaker gets government backing for green hydrogen pilot in Saudi Arabia future city

Big 20MW electrolyser from ThyssenKrupp to be 'stepping-stone' towards construction in 'Neom' of one of world's largest renewables-powered hydrogen plants

18 December 2020 11:36 GMT | UPDATED: 18 December 2020 18:18 GMT
By David Radcliffe

Germany has handed over a grant to steelmaker ThyssenKrupp's Ude Chlorine Engineers' unit for the development of a prototype of a 20MW alkaline electrolyser for the production of green hydrogen and ammonia in Saudi Arabia.

The grant is part of Germany's national hydrogen strategy that seeks to source green hydrogen from abroad given Germany's limited space for domestic hydrogen production from renewables.

Out of a total of €9bn (\$11bn) earmarked by Berlin for

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Germany covers almost half of its 2020 power needs with renewables
Transition
15 December 2020 14:51 GMT

Germany and Denmark to cooperate on North and Baltic Sea energy islands
Wind
14 December 2020 24:45 GMT

RWE on course to become leading green hydrogen developer globally as it joins North2

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Much to be optimistic about... but much much more to be done



GlobH2E

Questions, comments, suggestions all welcome

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With particular thanks to co-leads Profs Rose Amal, Kondo-Francois Aguey-Zinsou and Sami Kara and the research, modelling and data analytics team of Muhammad Haider Ali Khan, Charles Johnston, Phoebe Heywood and Aaron Kuswara