



Australia's global opportunities and navigating the pathways to achieve them

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ANU Crawford School of Public Policy | The Superpower Institute

2025 AARES Pre-conference Workshop



Australian
National
University

Crawford School
of Public Policy

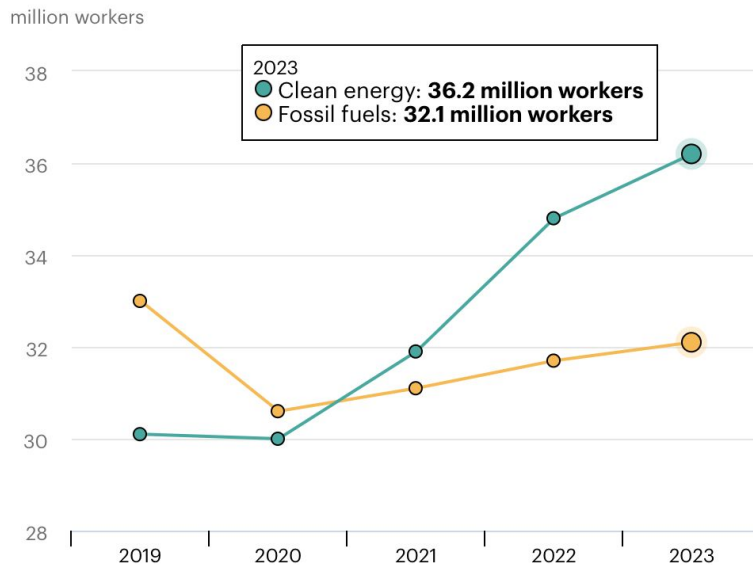


“Overcome barriers for Australia
to become a global leader in a low
or zero carbon economy”

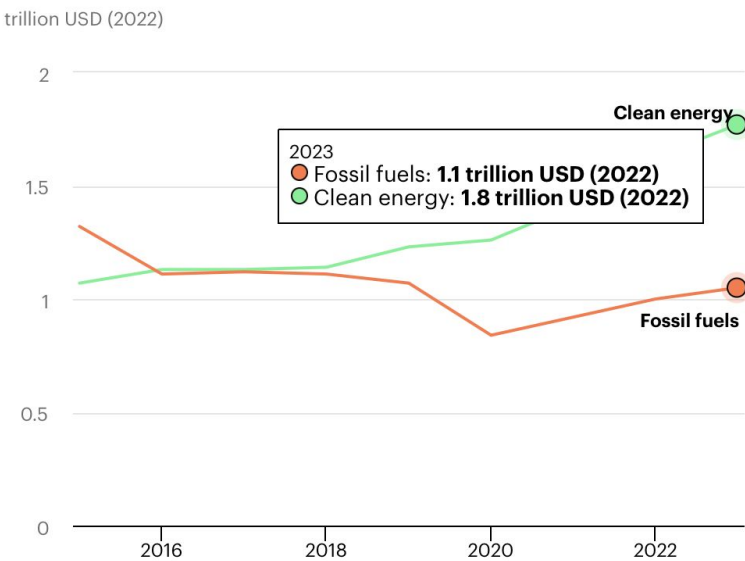
- Baethan Mullen, CEO

A changing landscape

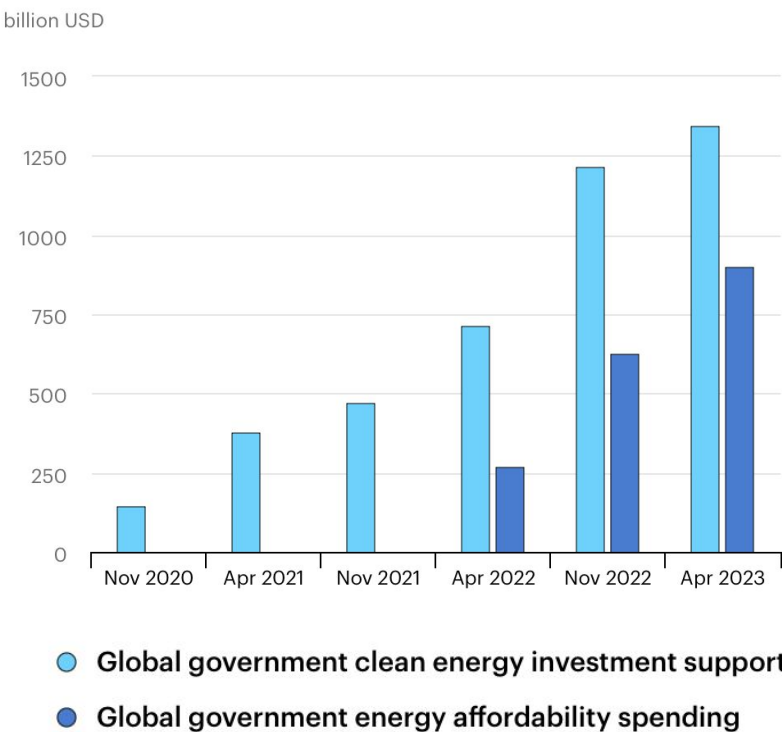
There are now **more people working** in clean energy than in fossil fuels



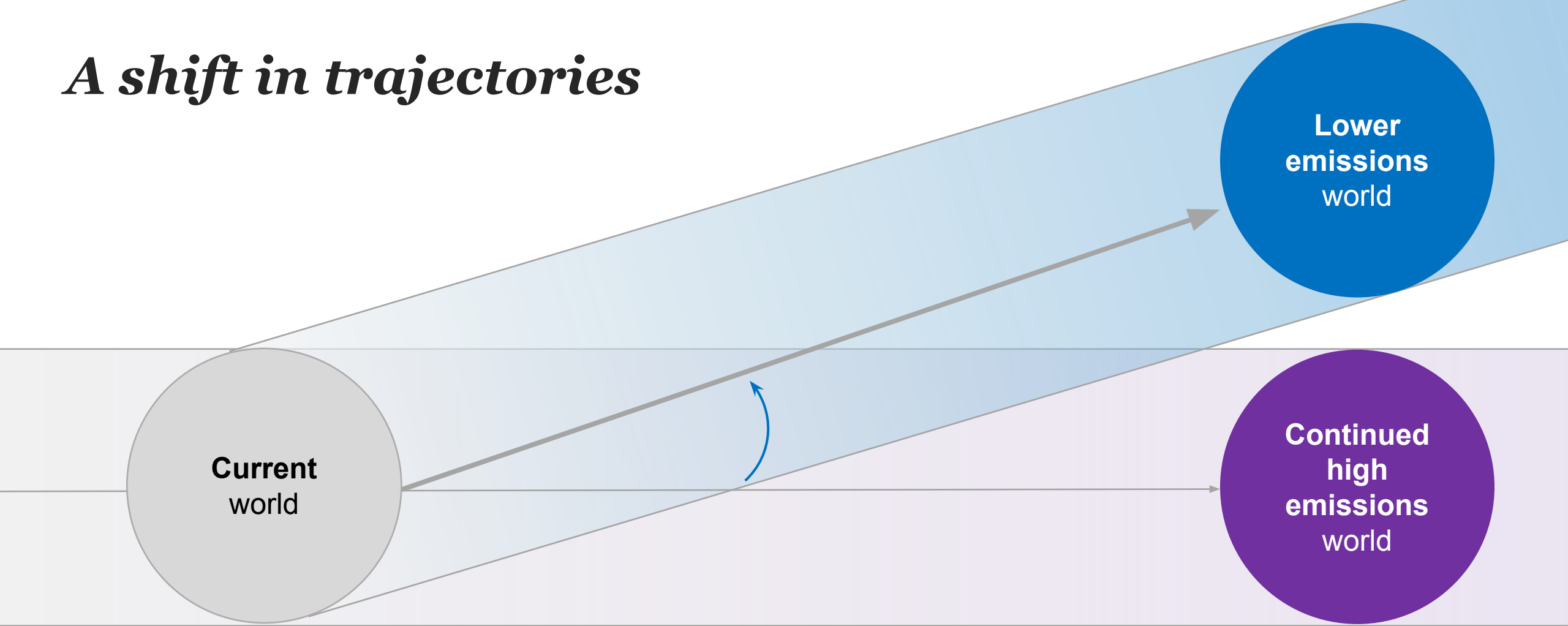
Annual investment in clean energy is now greater than in fossil fuels



Governments have allocated **USD 1.34 trillion to clean energy** since the pandemic



A shift in trajectories



*Is the **design of Australia's social, technological, economic system** compatible with succeeding in a low emissions world?*

*“The alternative to achieving the
superpower is **unimaginable**”*

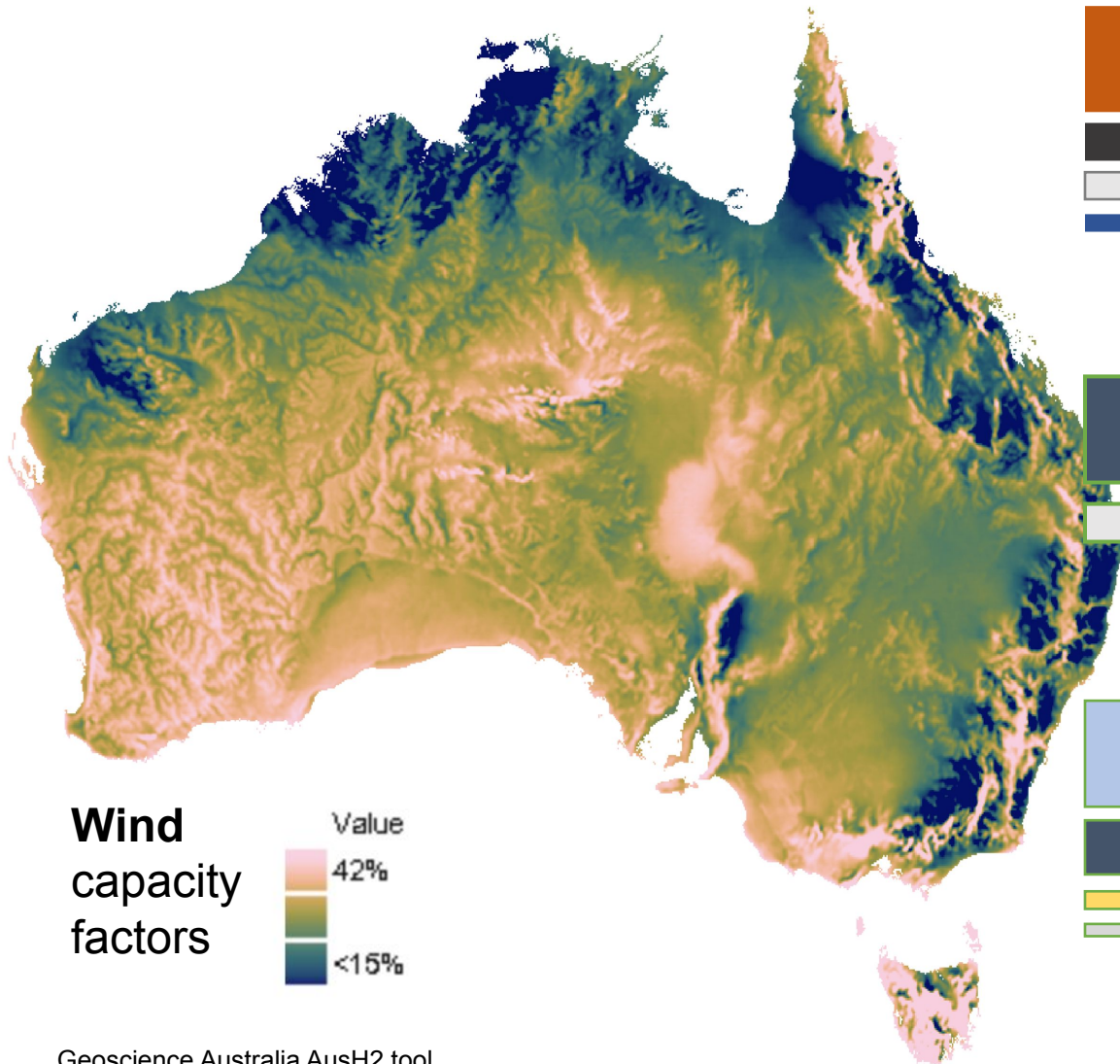
- Ross Garnaut

The opportunity

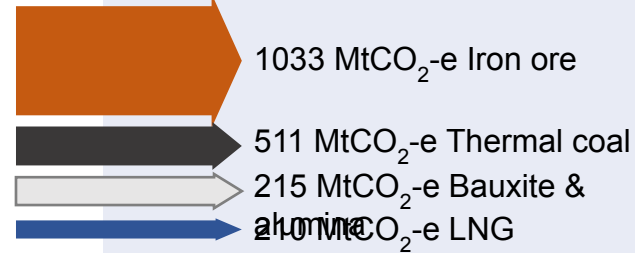
- Most major economies will lack enough cheap clean energy to meet their future needs.
- Australia's renewable energy resources vastly exceeds its domestic needs
- Australia can export renewable energy to countries that have a shortfall
- Do this by embedding renewable energy in value added products, such as green iron/steel, ammonia and aluminium.



Implications



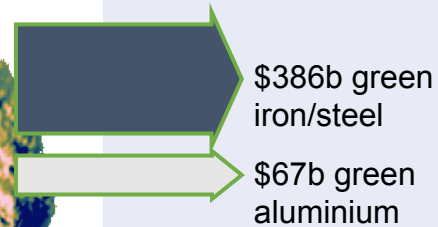
Emissions



5% of global emissions
(Burke et al, 2022)

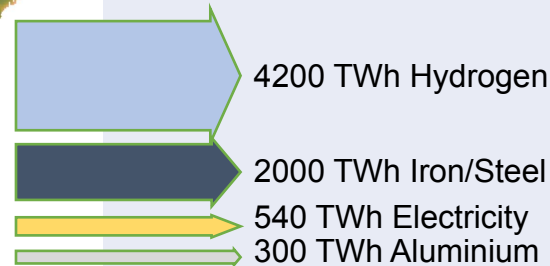
6.7-9.6% of global emissions
*includes other commodities
(Finighan, 2024)

Export revenue



\$700 billion per year from all heavy green commodities combined

Renewables generation



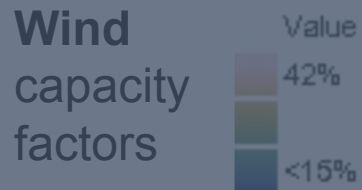
7000 TWh per year (about 50x current renewables capacity)

Sources:

Burke, Beck, Aisbett, Baldwin, Stocks, Pye, 2022, Energy, vol 248.
Ruben Finighan – The Superpower Institute 2024

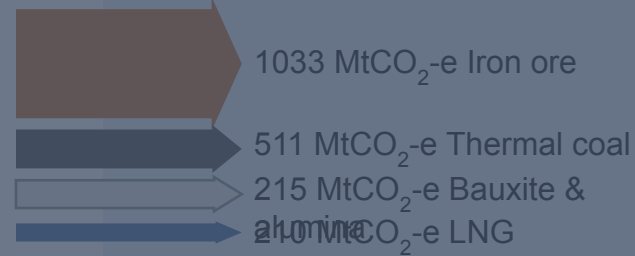
Implications

Is the design of Australia's social, technological, economic system compatible with succeeding in a low emissions world?



Geoscience Australia AusH2 tool

Emissions



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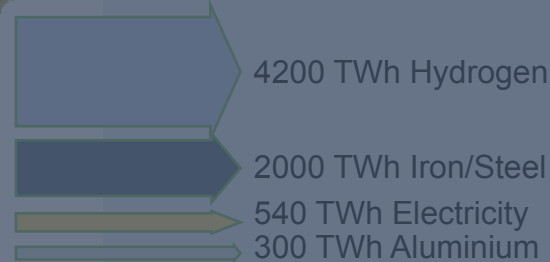
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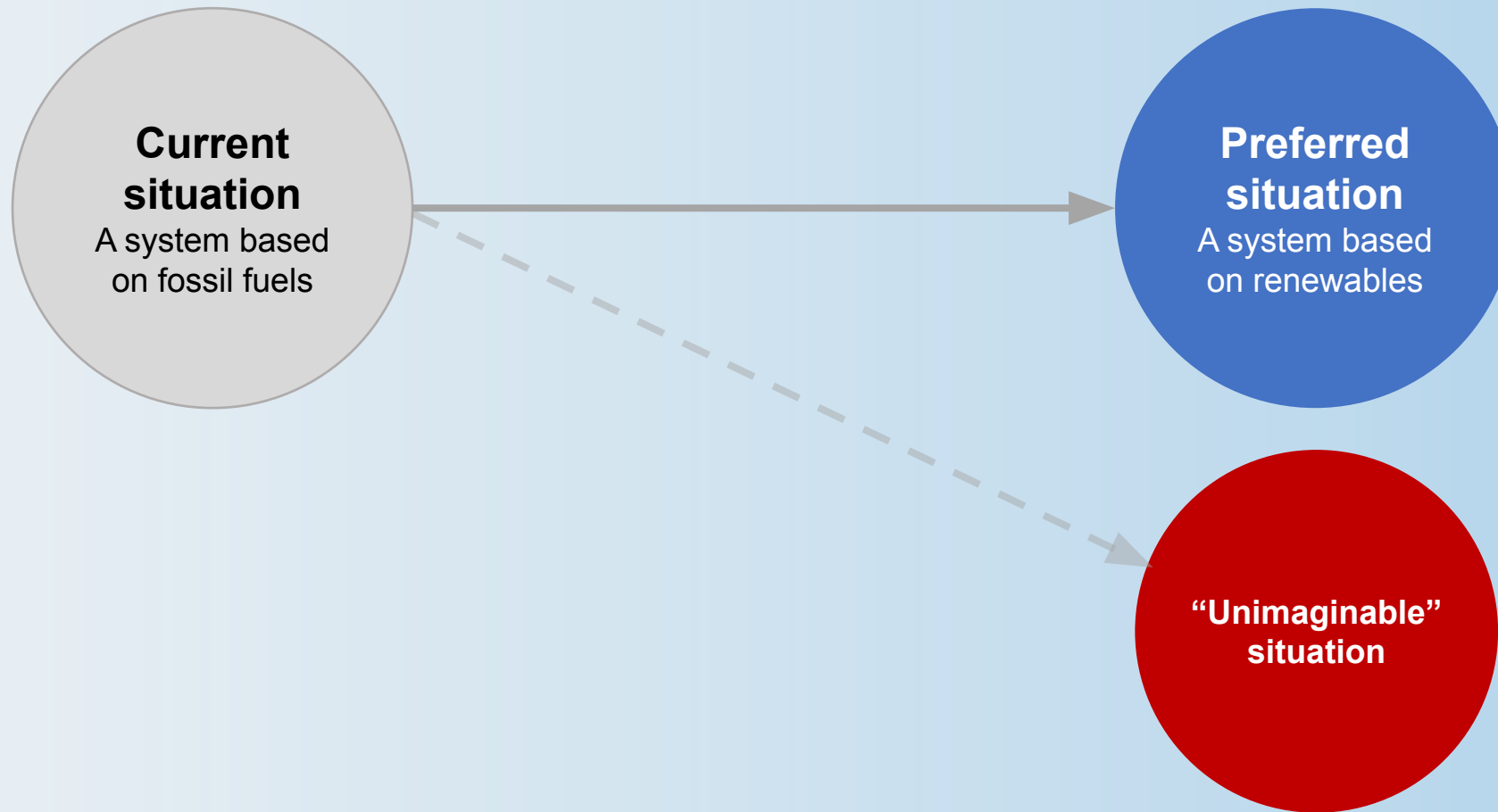
Ruben Finighan – The Superpower Institute 2024

*“Everyone designs who devises courses of action aimed at **changing existing situations into preferred ones.**”*

- Herbert Simon

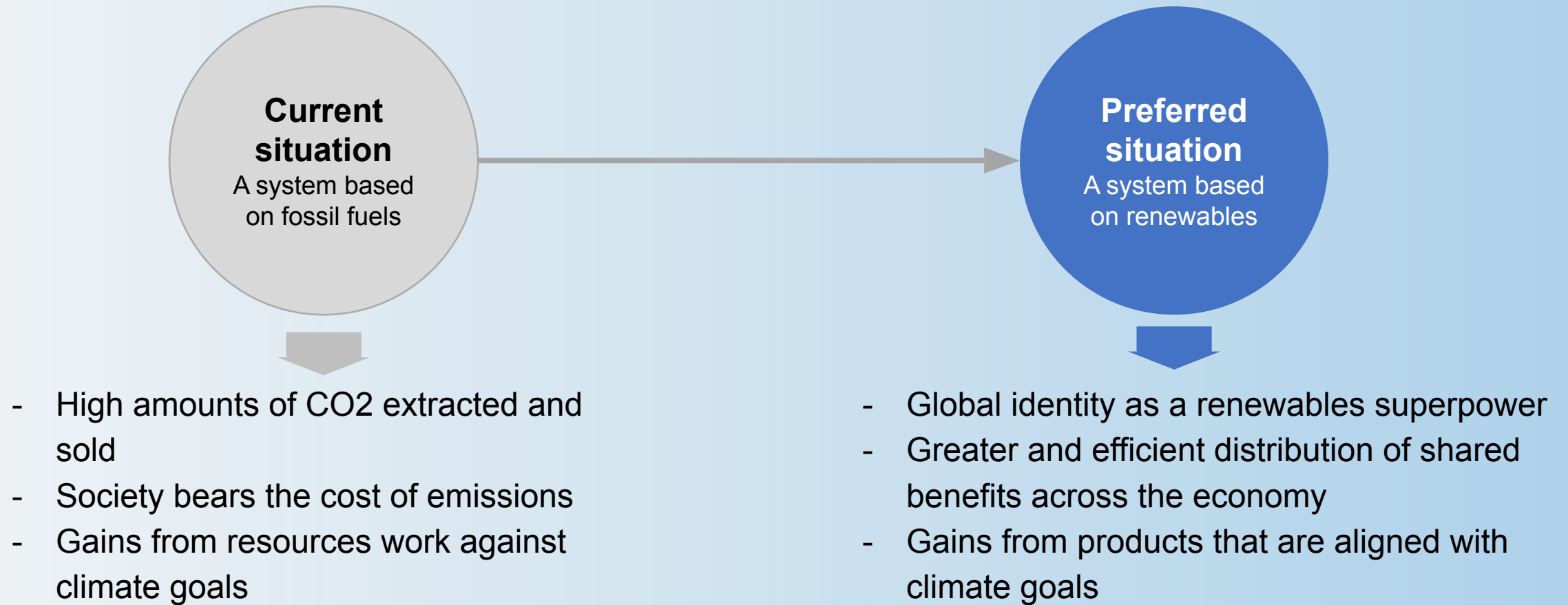
The design task

In the context of the global transition



The design task

In the context of the global transition



Hurdle 1

Australia's iron and steel production is so small – how do we make a difference in the market and influence the big players?

Total production of crude steel

World total 2024

Last updated on 24 January 2025

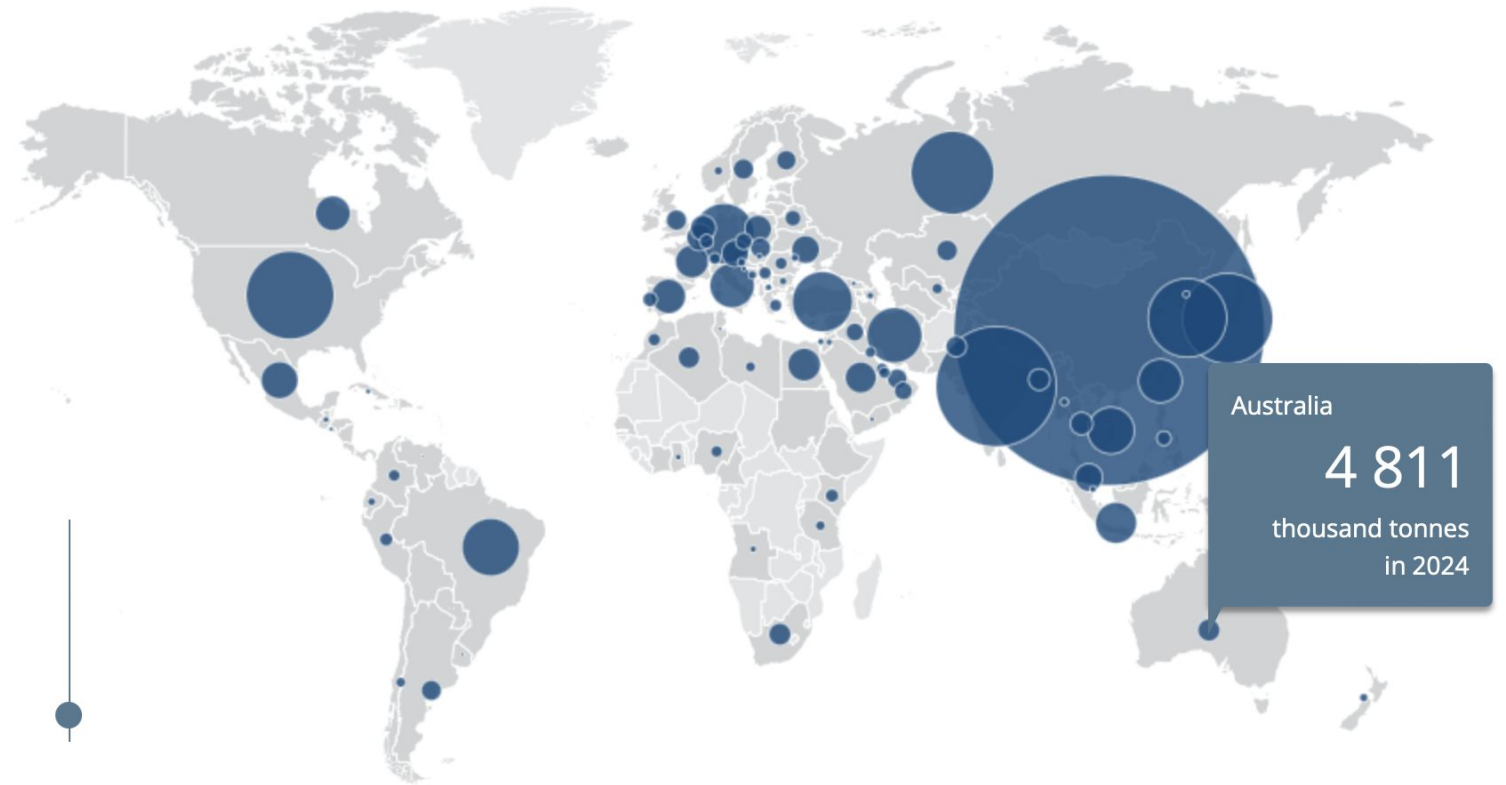
1 881 394

thousand tonnes

2024 MAP

Total production of crude steel (thousand tonnes)

Circle size is proportional to the country value

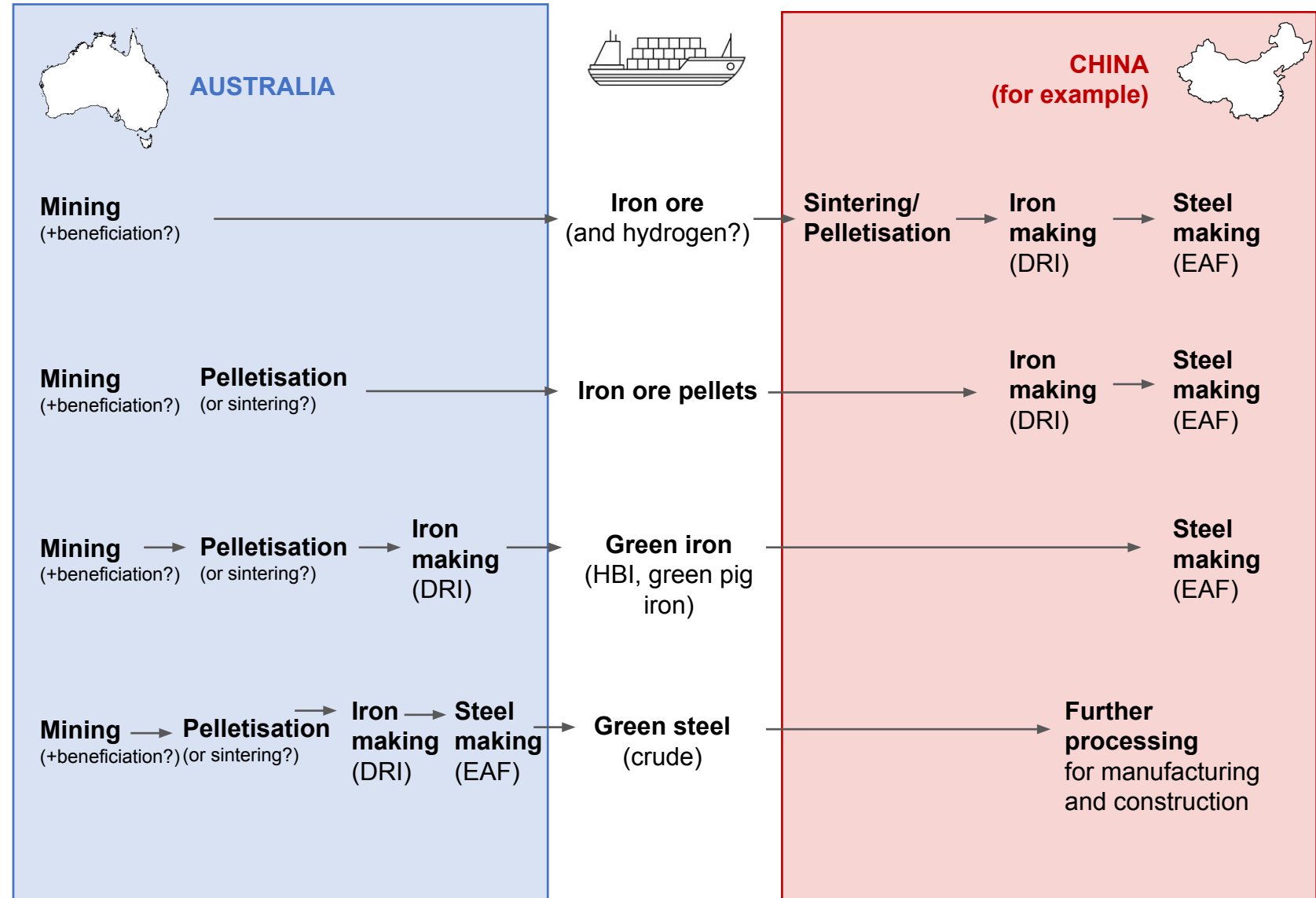


World Steel Association

Hurdle 1

Australia's iron and steel production is so small – how do we make a difference in the market and influence the big players?

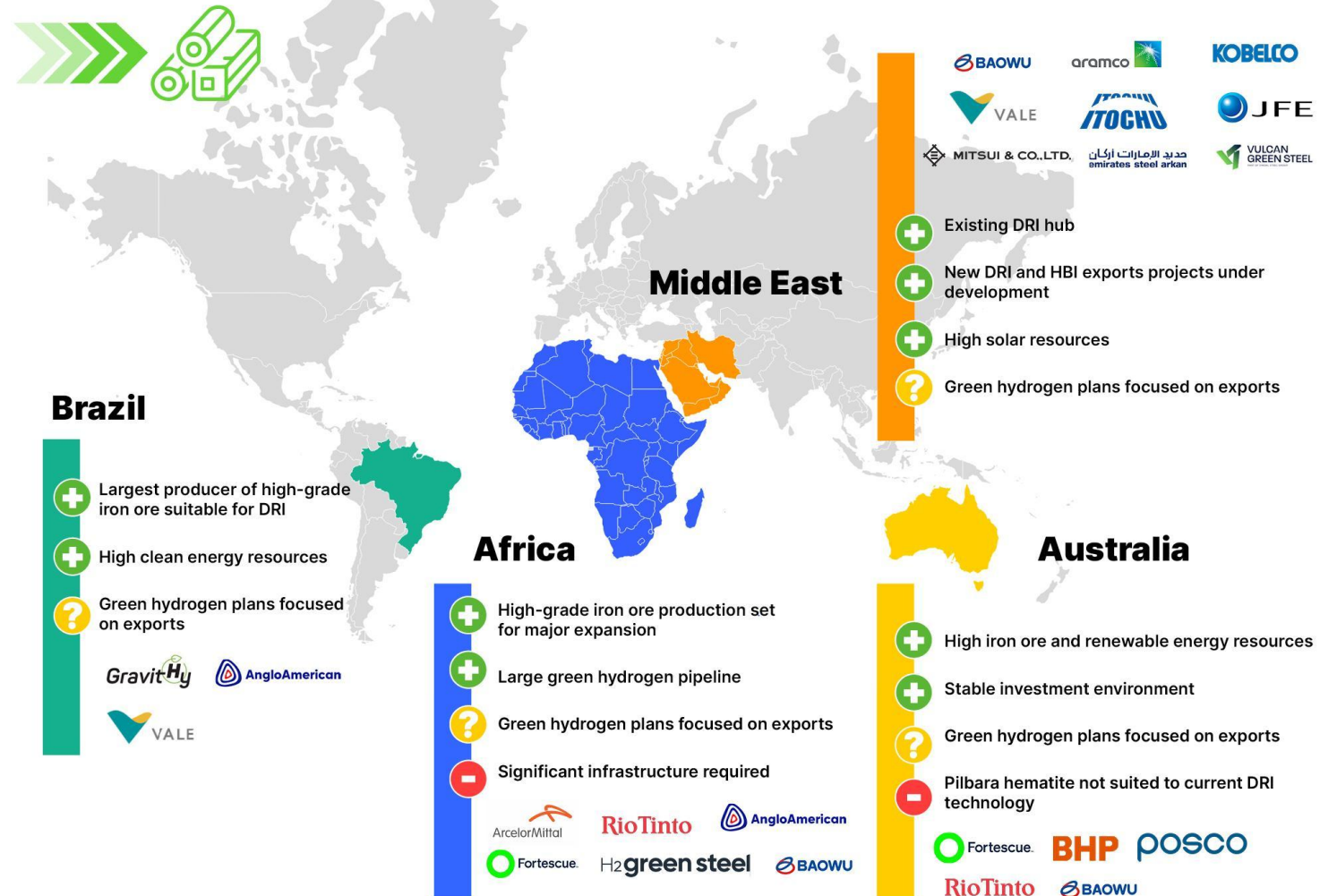
Tweak: Split production processes



Hurdle 2

Australia's iron ore quality is too low to make green iron.

Australia needs to step up if it wants to compete in the green steel race



IEEFA

IEEFA 2023

Hurdle 2

Australia's iron ore quality is too low to make green iron.

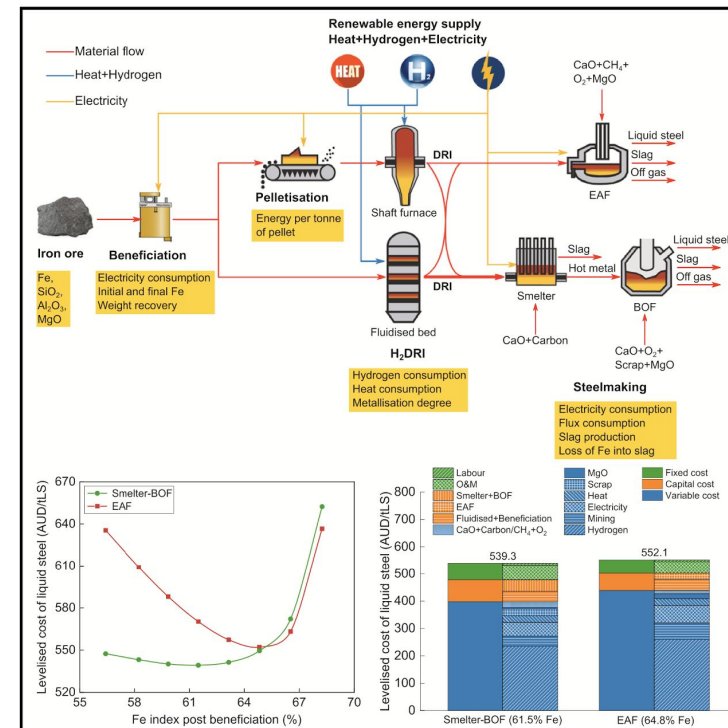
Tweak: Adapt technology

Cell Reports Sustainability

Article

Production of green steel from low-grade ores: An end-to-end techno-economic assessment

Graphical abstract



Authors

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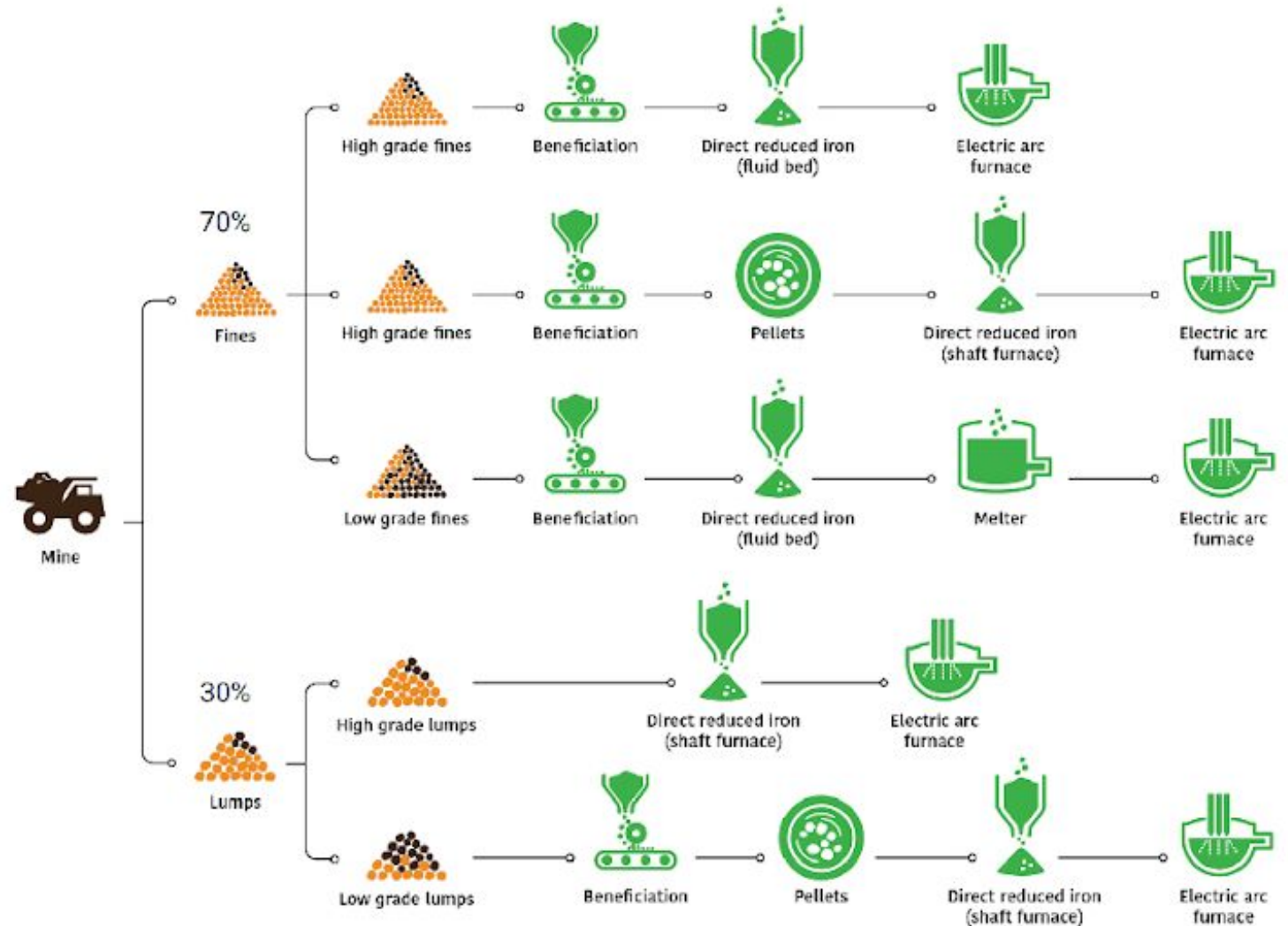
In brief

This study investigates the several pathways for producing steel using hydrogen and low-grade Australia iron ores, with the aim of lowering emissions, compared with traditional steelmaking. A two-step steelmaking process combined with fluidized bed reduction shows greatest promise, and it avoids the need for heavy beneficiation of ores. Under a 90 EUR/t carbon price and with projected hydrogen costs, this process could soon rival blast furnace routes.

Hurdle 2

Australia's iron ore quality is too low to make green iron.

Tweak: Adapt technology



WWF-Australia presentation "Green" Steel – Opportunities for the Australian Iron Ore Supply

Hurdle 3

Hydrogen doesn't seem to be living up to the hype.

Is Andrew Forrest's energy dream in peril? The future of green hydrogen in Australia explained

Fortescue announced 700 job cuts this week in a bid to remain 'lean'. So what does it mean for green hydrogen?

- Get our [morning and afternoon news emails](#), [free app](#) or [daily news podcast](#)



📷 Andrew Forrest says Fortescue 'is by no means winding back on our commitment to green hydrogen'. Photograph: Lukas Coch/AAP

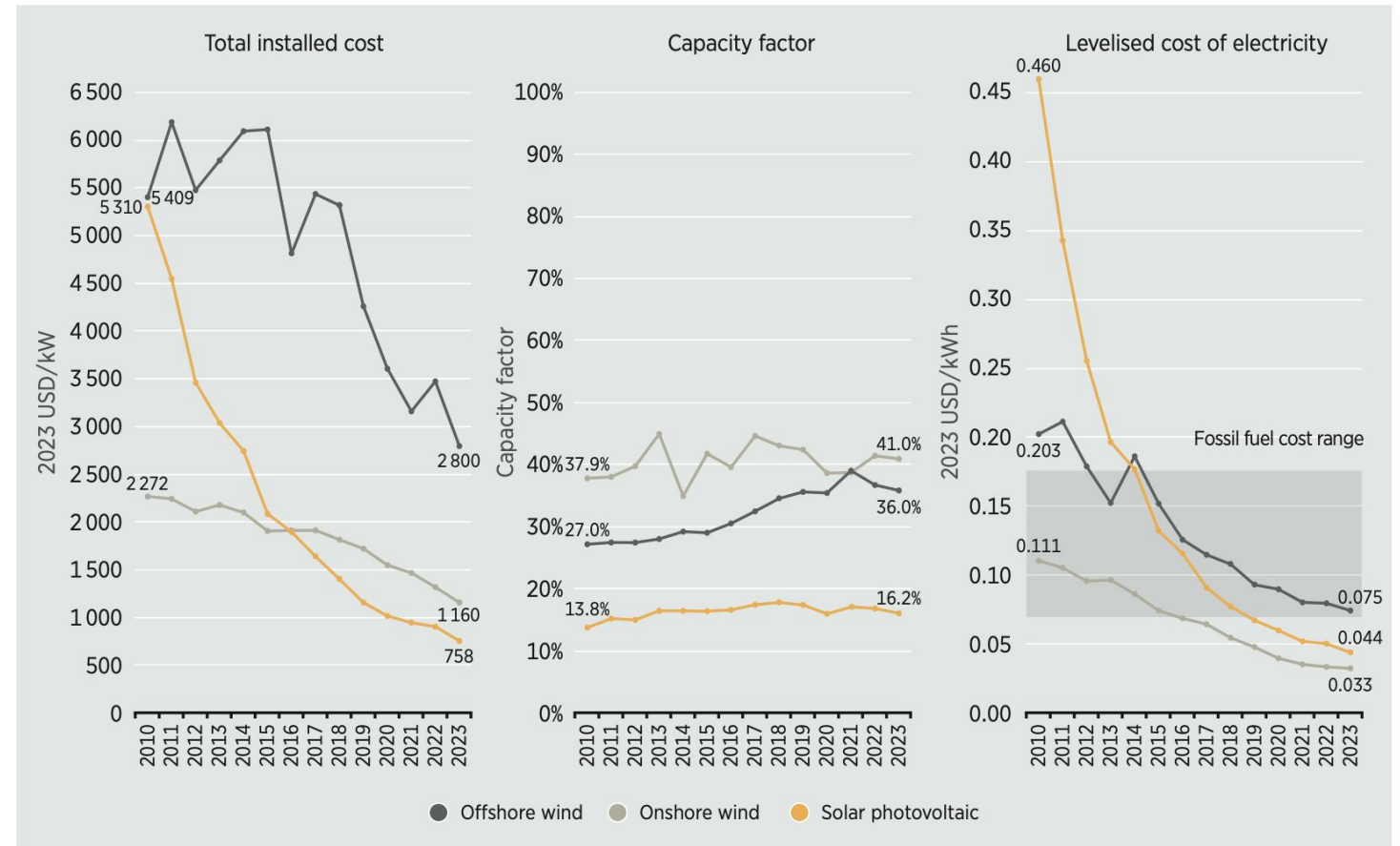
The Guardian

Hurdle 3

Hydrogen doesn't seem to be living up to the hype.

Tweak: Increase rate of learning and reduce cost

Figure 1.5 Global weighted-average total installed costs, capacity factors and LCOEs from newly-commissioned solar PV, onshore and offshore wind, 2010-2023

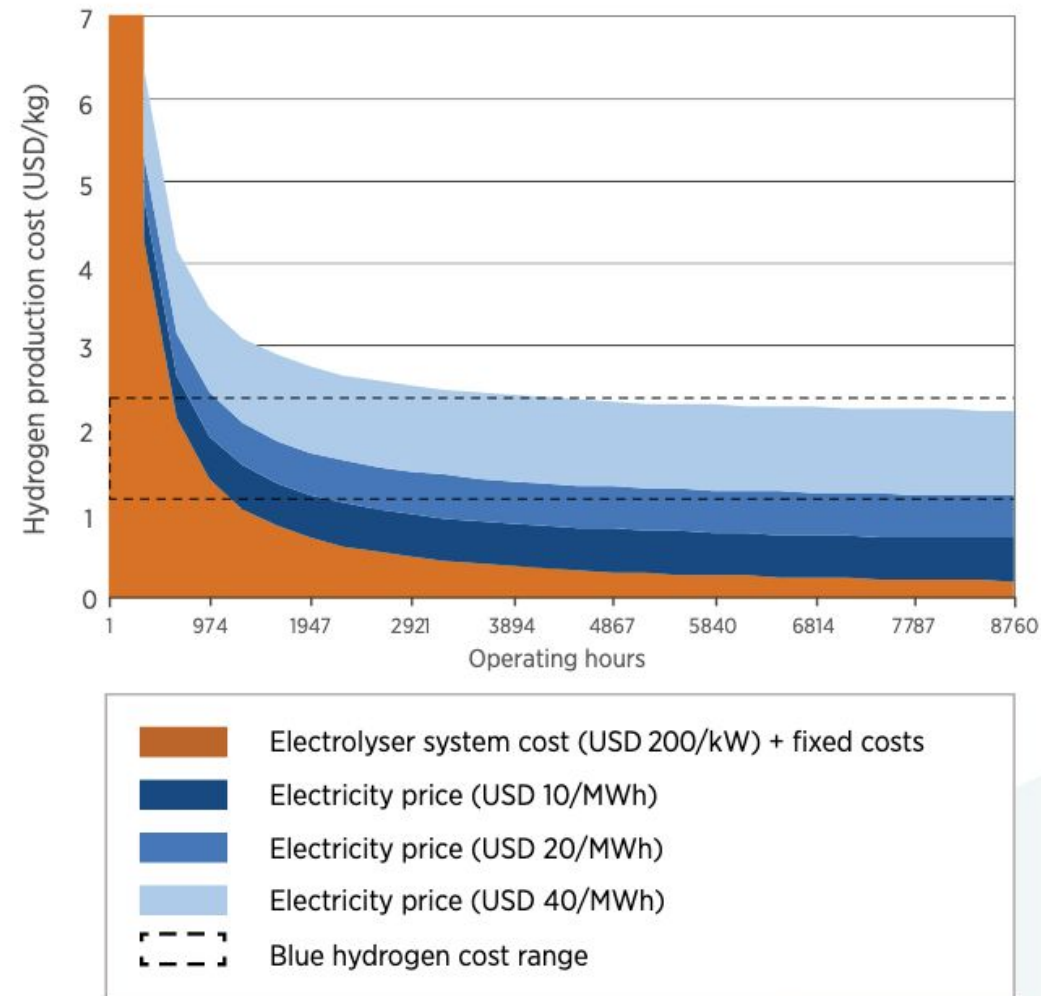


IRENA 2023

Hurdle 3

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Tweak: Increase rate of learning and reduce cost

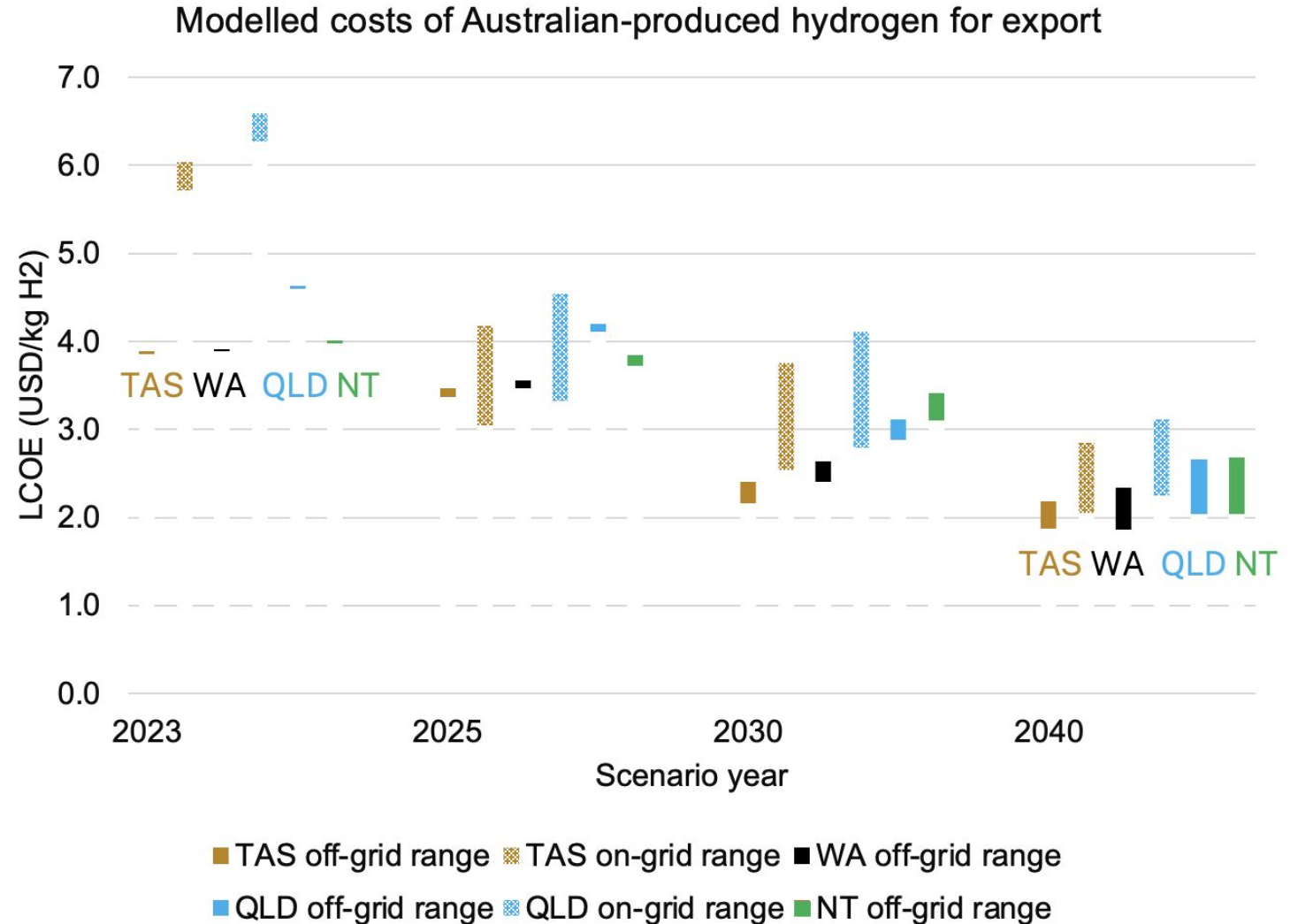


IRENA 2020

Hurdle 3

Hydrogen doesn't seem to be living up to the hype.

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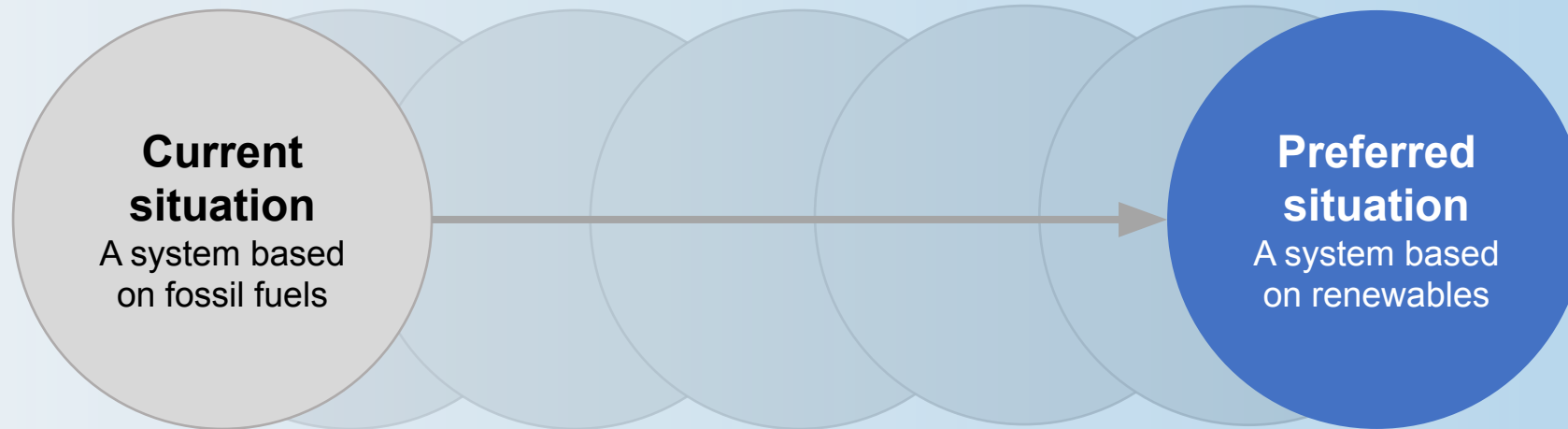


Fazeli, Longden, and Beck, 2023

Progress on Australia's design challenge is underway.

The design task

In the context of the global transition

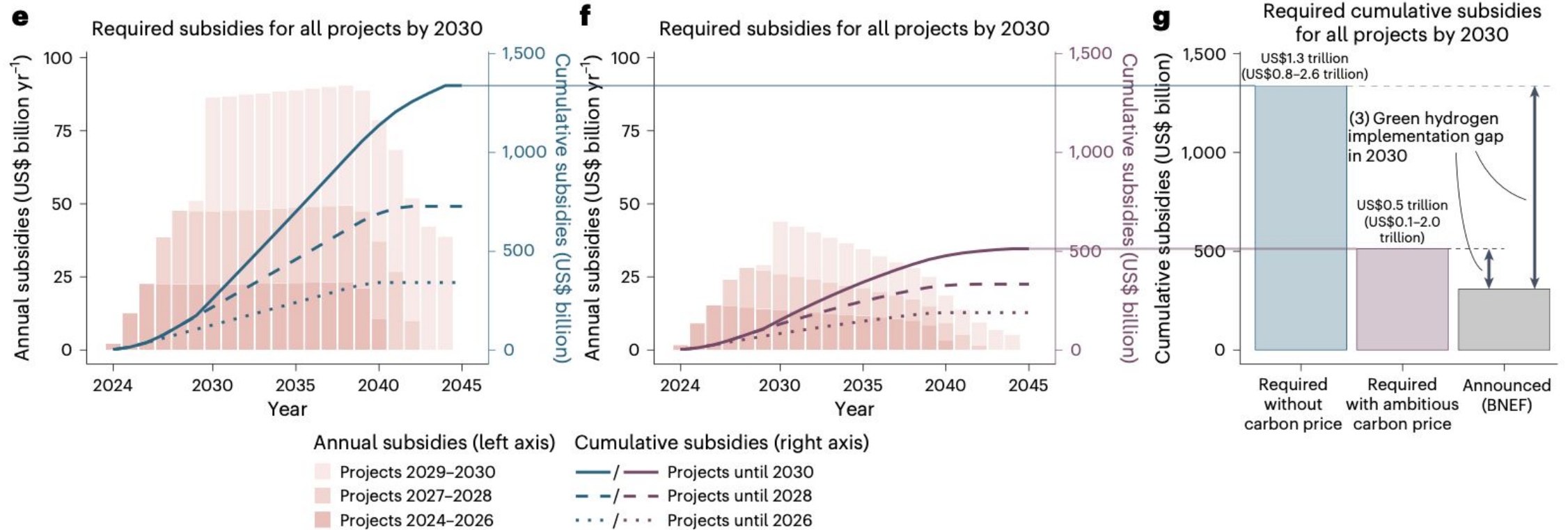


Policy mechanisms

1. **An efficient carbon pricing mechanism** – The Carbon Solutions Levy (CSL)
2. **Support for early movers and first-of-a-kind ventures** – may be in the form of grants and tax credits. Funding would come from CSL revenue.
3. **Government to provide common user infrastructure** – must not be a barrier for private investment.
4. **Engagement with trade partners** – diplomacy to build green commodity trade relationships.



Quick aside on carbon prices...



Odenweller & Ueckerdt 2025

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Thanks!

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New Energy Trade

	Australia’s potential market share	Today’s mitigation contribution	Global industry growth to 2060	Mid-century mitigation contribution
Iron / steel	40%	4.0%	10%	4.4%
Aluminium	30%	0.7%	30.40%	0.9%
Silicon & polysilicon	25%	0.2%	100% (Si), 300%(PSi)	0.5%
Ammonia & urea	25%	0.5%	300%	1.5%
Methanol (industrial)	25%	0.2%	30%	0.3%
Shipping	25%	0.4%	0%	0.4%
Aviation	25%	0.6%	100%	1.1%
Road freight	15%	0.1%	180%	0.4%
Total		6.7%		9.6%

	Export Revenue, contemporary market size	Export revenue, 2060 market size
Iron / steel	\$386 billion	\$386 billion
Aluminium	\$67 billion	\$89 billion
Silicon & polysilicon	\$11 billion	\$36 billion
Ammonia & urea	\$29 billion	\$90 billion
Methanol (industrial)	\$15 billion	\$29 billion
Shipping	\$43 billion	\$43 billion
Aviation	\$90 billion	\$158 billion
Road freight	\$54 billion	\$156 billion
Total	\$693 billion	\$987 billion