Scale and diversity = opportunity

Dr Alan Finkel

Chief Scientist of Australia

Federation University Gippsland, Churchill Campus

August 2019

Rev D

Imagine our planet 100 years from now…

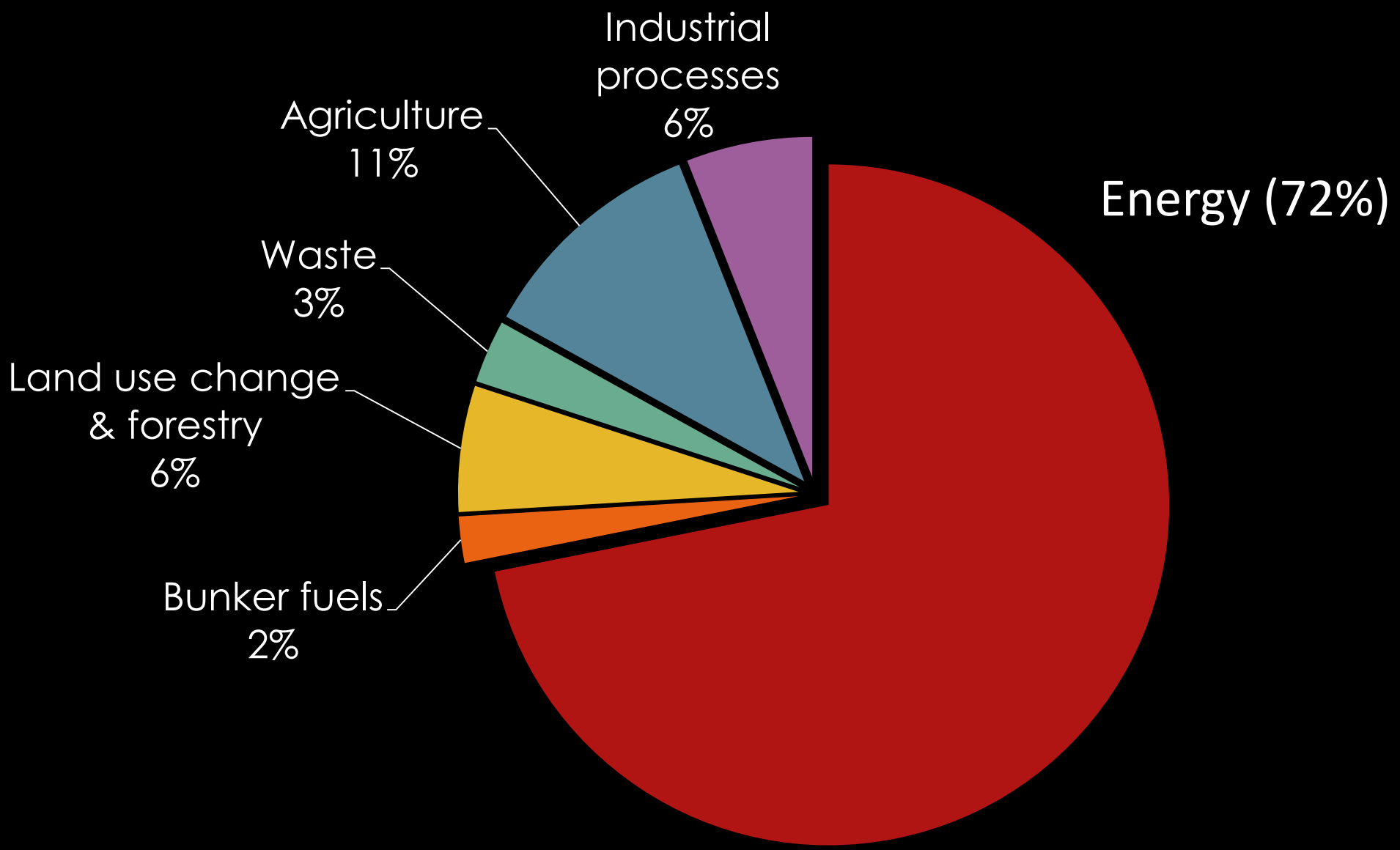
…still magnificent.

But there are many threats to that vision.

Greenhouse gas emissions –
a ***global*** and ***massive*** threat

Where to start?

Global Greenhouse Gas Emissions in 2013



Transforming energy provides biggest return on investment

However, our toolkit is restricted…

…by ***community*** and ***practical*** realities

Zero emissions toolkit

Unpopular Nuclear

Unpopular New large-scale hydroelectricity

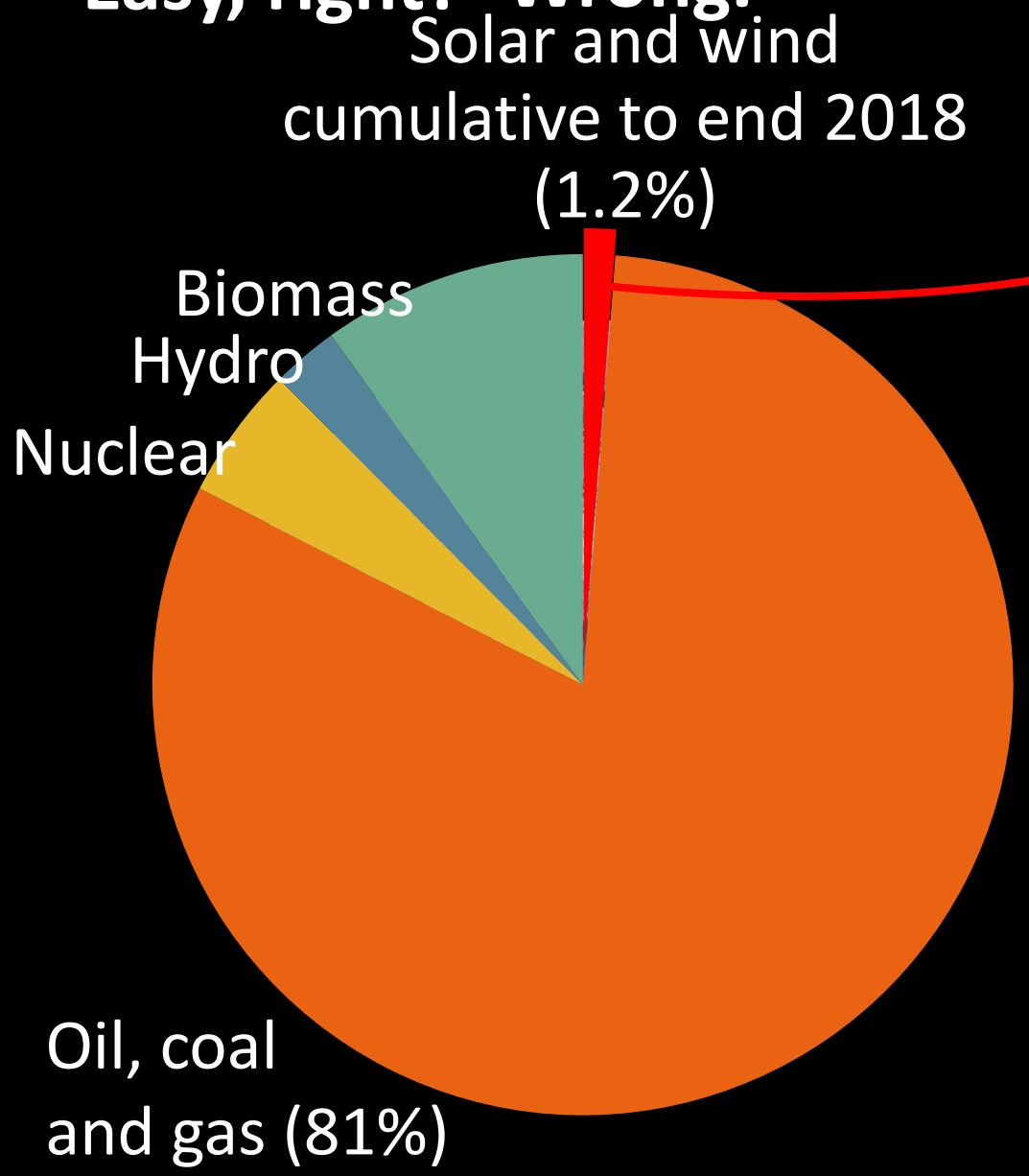
Not enough land Biofuels

Do not scale Geothermal, wave and tidal

✓ Solar

✓ Wind

Global energy mix 2018
Easy, right? Wrong.



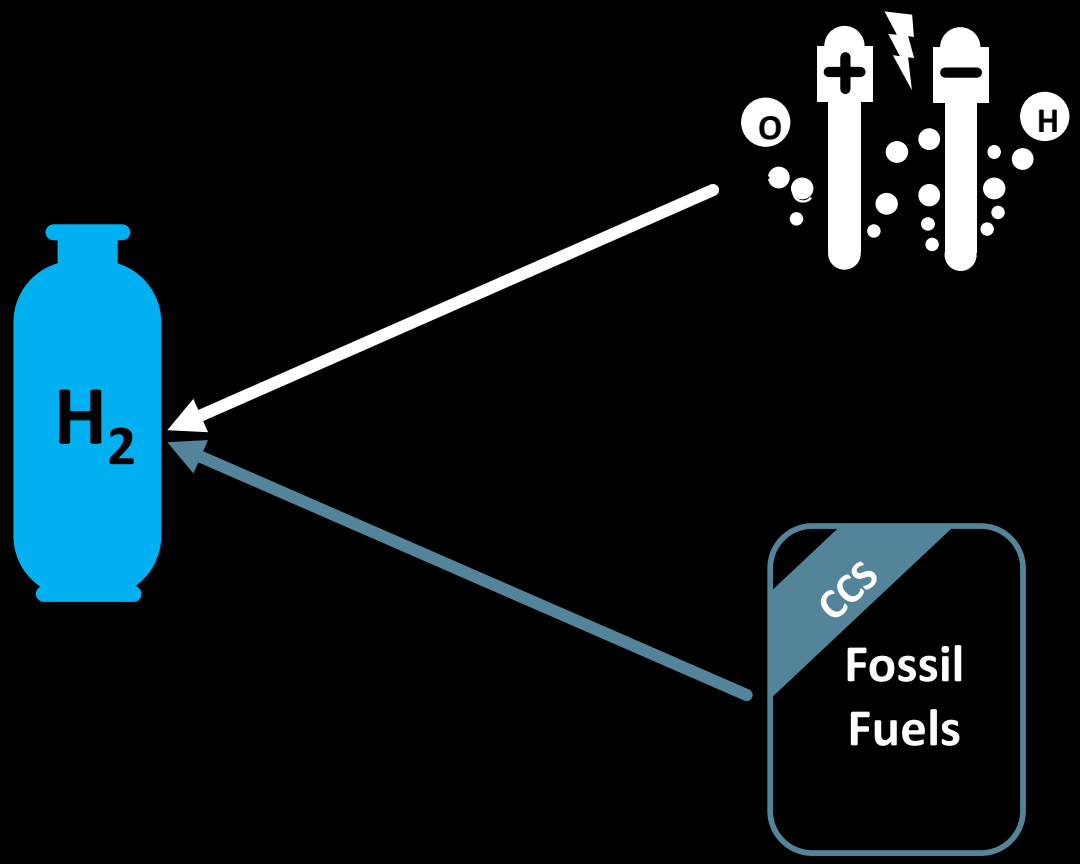
Need nearly 70x more solar & wind globally

Requires

- Strategic commitment
- Storage and more storage
- Long distance interconnectors
- Digitalisation
- And more…

Electricity meets most of our needs…

…but we also need a high density transportable fuel



There are two things that keep me up at night…

1. Scale
2. Diversity of supply

Scale is the challenge, and the opportunity

Imagine a world….

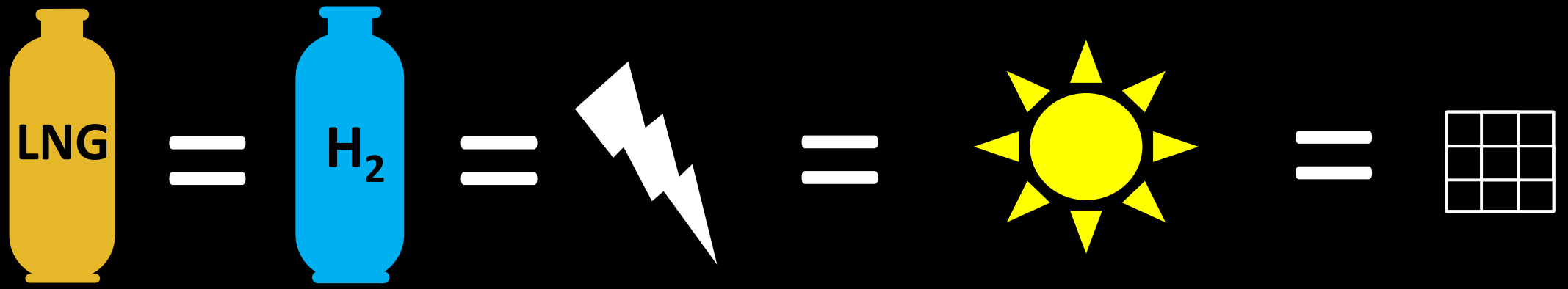
…where Australia produces hydrogen equivalent to our 2018 LNG exports

My assumptions for this exercise:

- Hydrogen produced from water using solar electricity
- Hydrogen exports will be *additional* to our LNG exports

Imagine a world….

…where Australia produces hydrogen equivalent to our 2018 LNG exports



70 Mt = 30 Mt = 990 TWh = 1,980 TWh = 18,000 km^2

x8 Australian electricity 2018 (900 GW solar)

¾ Anna Creek Station

There are two things that keep me up at night…

1. Scale
2. Diversity of supply

Diversity of supply
Something else?

Unpopular — Nuclear

Unpopular — New large-scale hydroelectricity

Not enough land — Biofuels

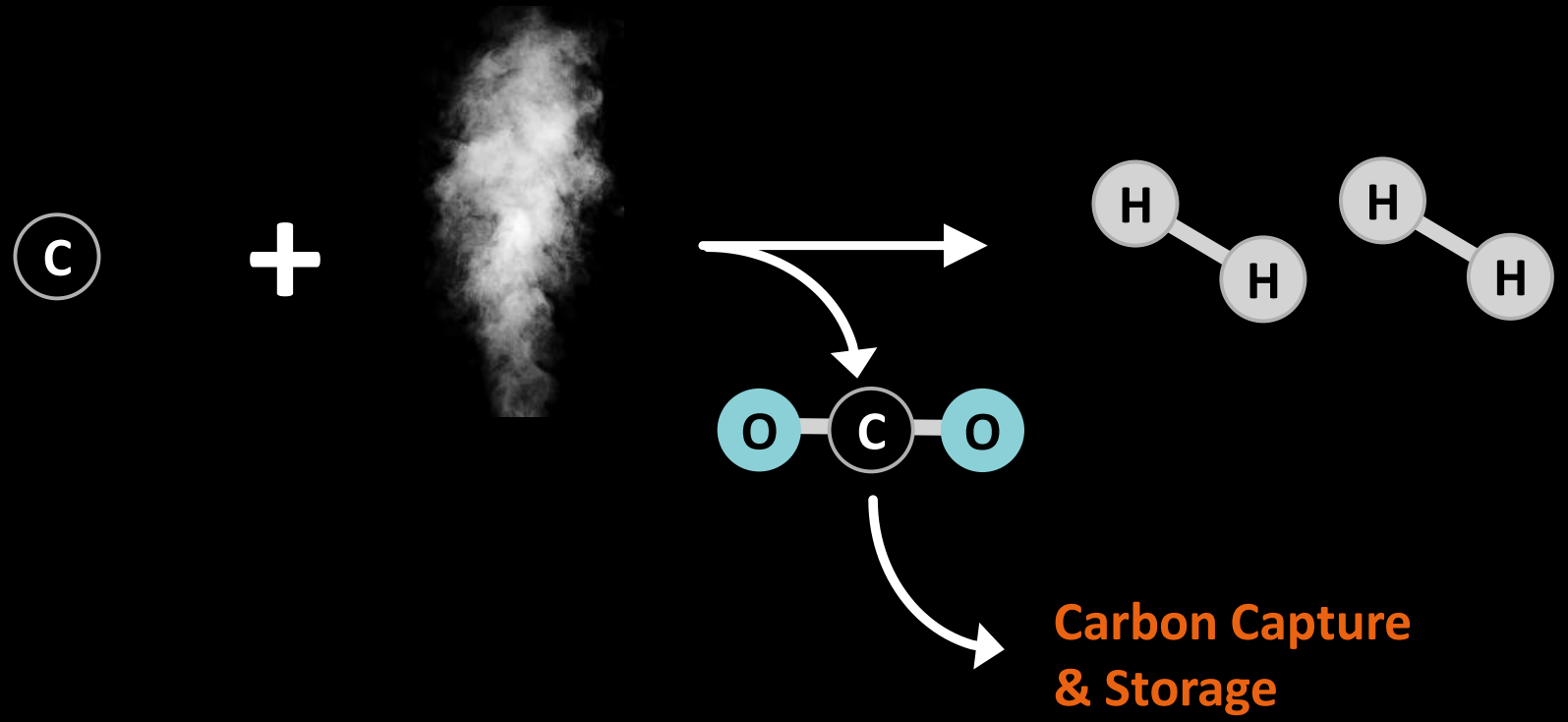
Do not scale — Geothermal, wave and tidal

✓ Solar

✓ Wind

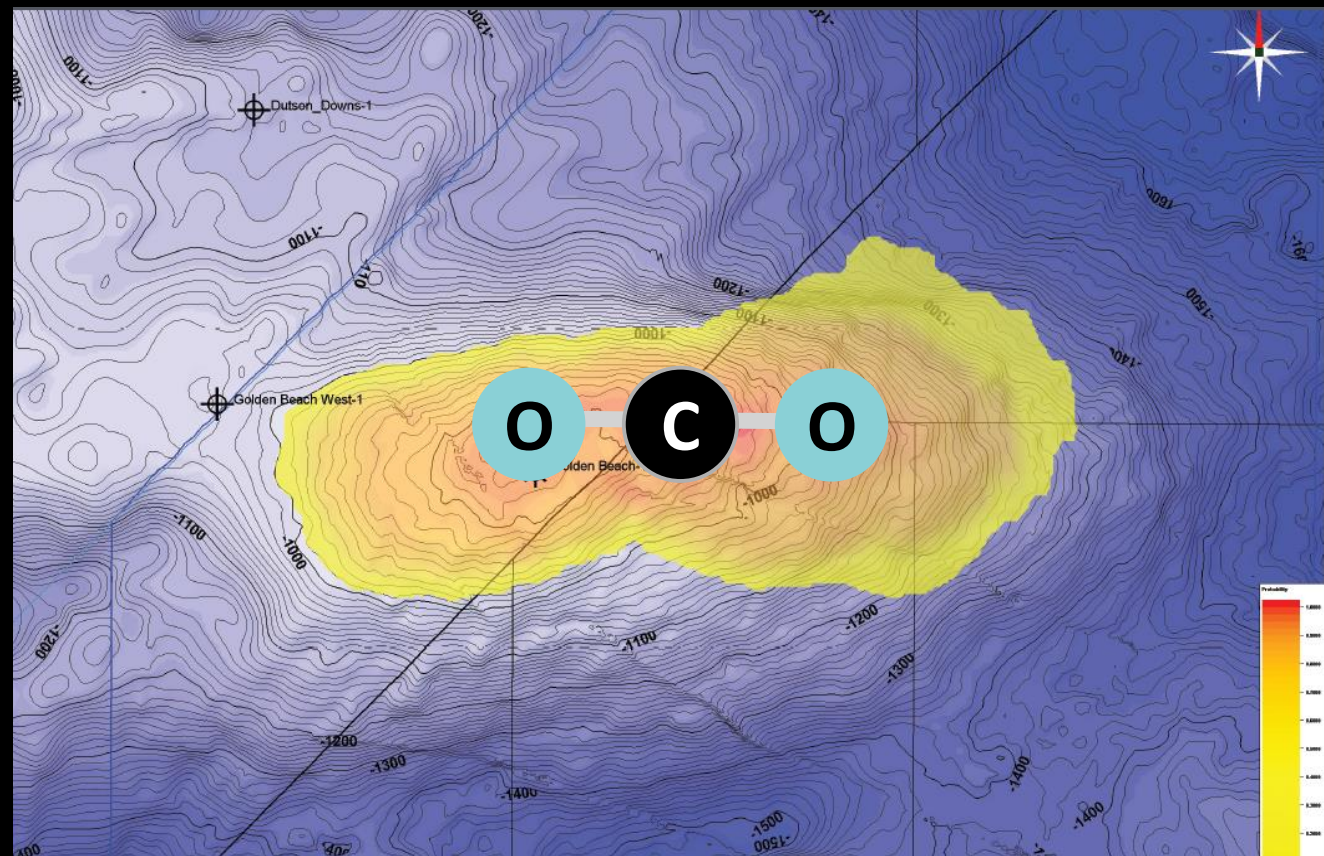
? Hydrogen from coal or natural gas

Coal and natural gas with Carbon Capture & Storage yield clean hydrogen and increased diversity




Bg 291

CarbonNet Project



Shipping hydrogen

Ammonia

Liquid hydrogen


HESC

Hydrogen Energy Supply Chain (HESC)

HESC pilot is intended to prove

- Production and logistics
- The hypothesis that coal gasification is the cheapest form of hydrogen production in the near to medium term

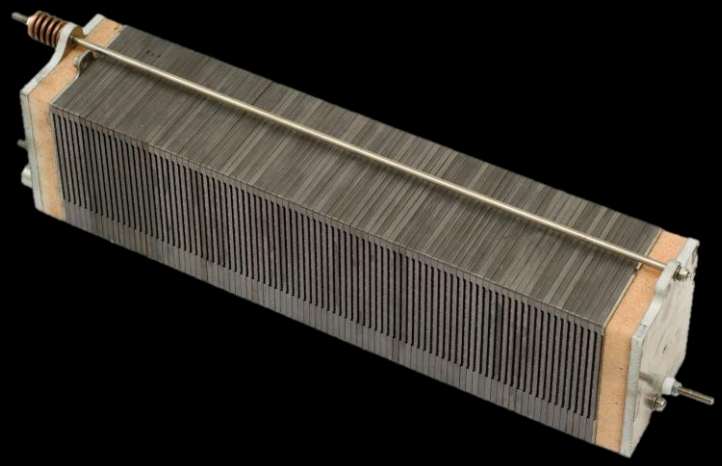
It’s not just a cost issue, hydrogen from coal or natural gas with CCS could be a *third, primary energy source* for the future

What's different this time?

1. ✓

2. Lower renewables costs and improved CCS cost profile ✓

3. Lower utilisation costs ✓




U.S. XPRESS
NIKOLA ONE
U.S. XPRESS
53'
LIFT POINT


654 101
CORADIA iLINT
ALSTOM


Hydrogen
Iwatani
Iwatani
わたしたちの町」
スト入賞作品
火気厳禁
無断立入禁止
OPEN
月-金
Hydrogen
Station
CLARITY
なにわ330
や 19-12

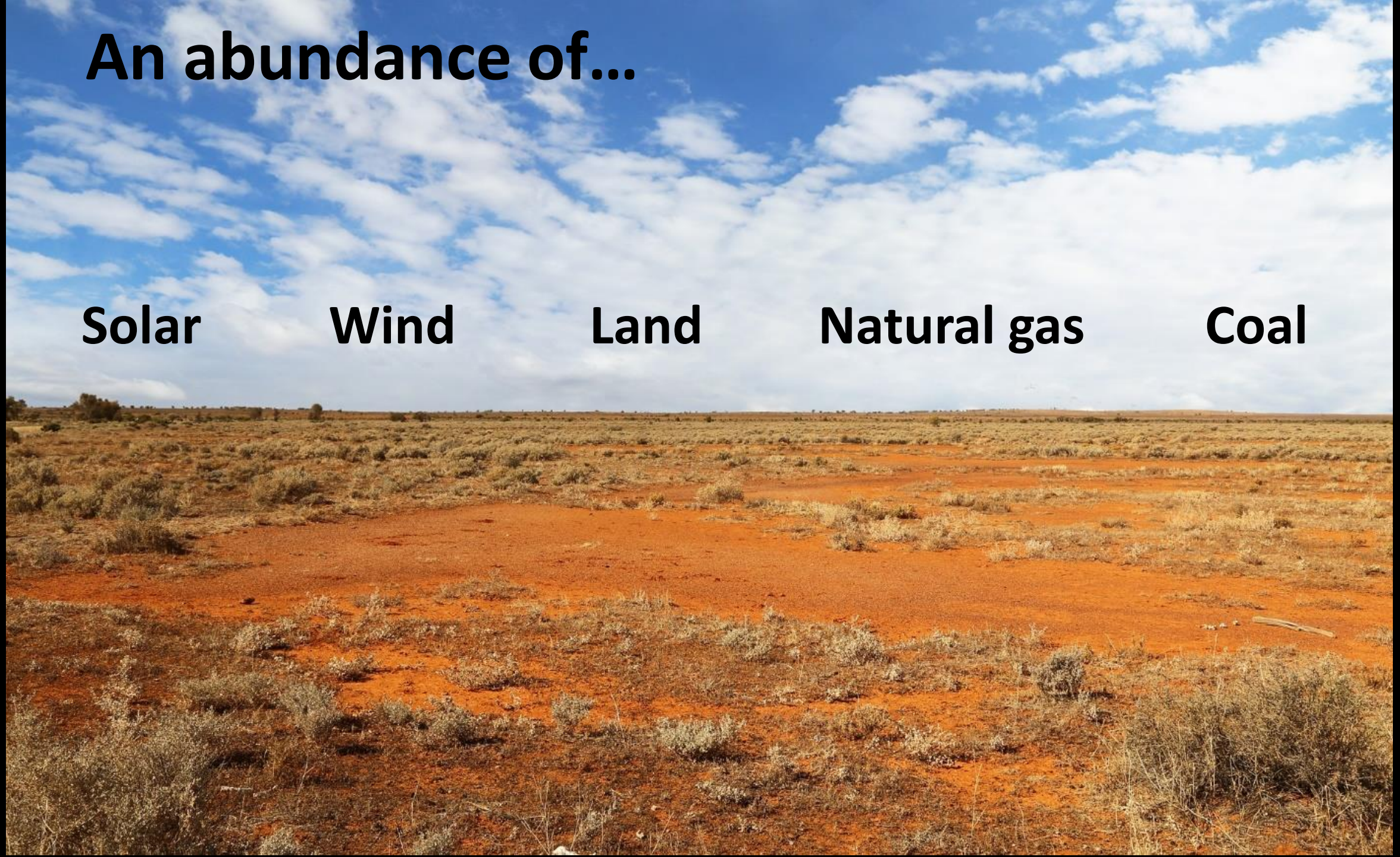
Artist’s impression

Direct combustion

- Up to 10% blend – no changes

This adds up to opportunity for Australia…

An abundance of…



Russia
Norway
Qatar

Algeria
Morocco
Saudi Arabia

Three challenges

- Scale — Opportunity!
- Diversity — Opportunity!
- Competition — Opportunity!

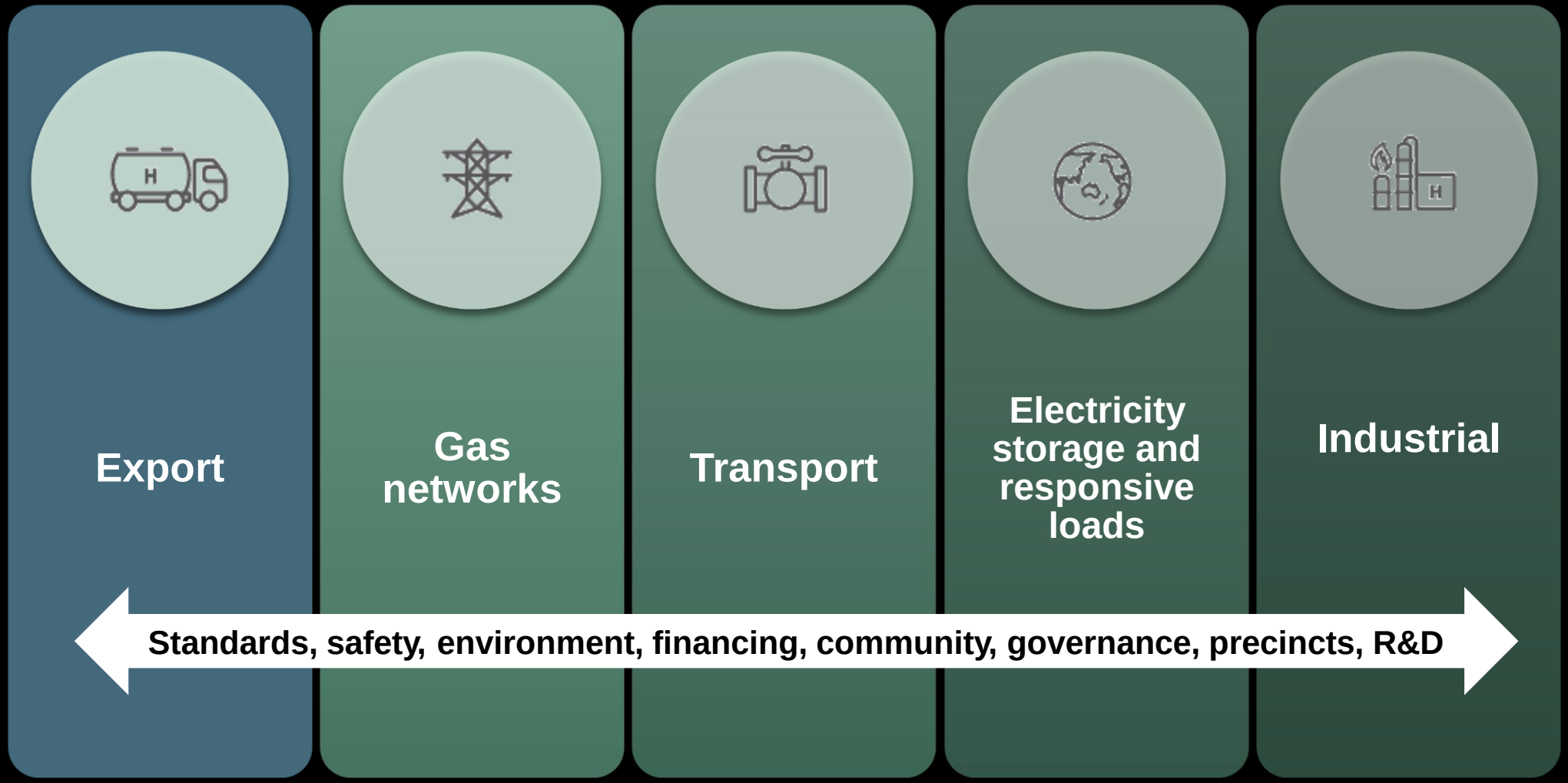
Australian Government

COAG Energy Council

NATIONAL HYDROGEN STRATEGY

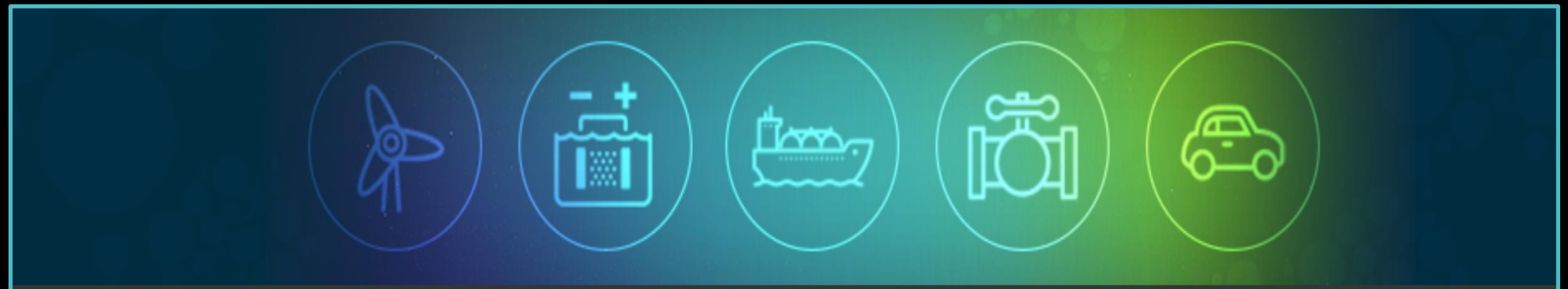
Request for Information – Discussion Paper

MARCH 2019


Export
Gas networks
Transport
Electricity storage and responsive loads
Industrial
Standards, safety, environment, financing, community, governance, precincts, R&D

National Hydrogen Strategy - request for input

Opened 1 March 2019
Closed 28 March 2019



National Hydrogen Strategy Issues Papers

Opened 1 July 2019
Closed 28 July 2019

Australian Government | COAG Energy Council

NATIONAL HYDROGEN STRATEGY

A framework to support states, territories, Commonwealth and companies…

…to develop a hydrogen industry that is safe, cost effective and of benefit to all Australians

Imagine our planet 100 years from now…

…still magnificent.

Thank you