



# Delivering low-cost clean Ammonia through integrated CCS

Investor Briefing - AGM  
6 February 2024

PILOT ENERGY LIMITED  
ASX:PGY



*Kwinana Carbon Solutions marine transport - Conceptual CO<sub>2</sub> handling infrastructure (illustration only)*

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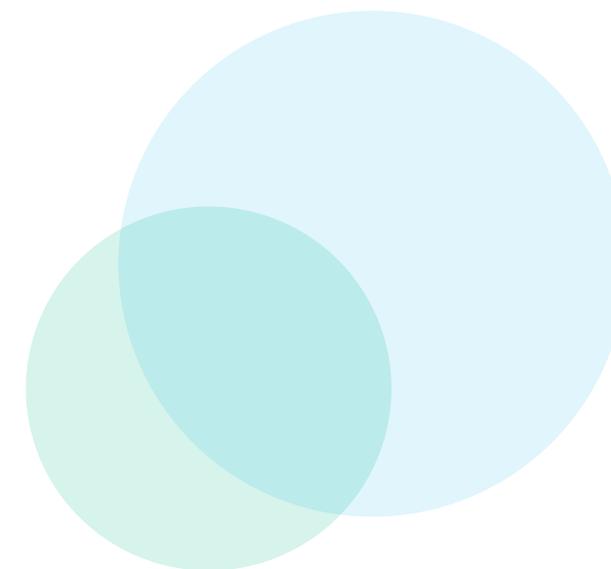
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## Competent Persons Statement

This announcement contains information on conventional petroleum and CO<sub>2</sub> Storage resources which is based on and fairly represents information and supporting documentation reviewed by Dr Xingjin Wang, a Petroleum Engineer with over 30 years’ experience and a Master in Petroleum Engineering from the University of New South Wales and a PhD in applied Geology from the University of New South Wales. Dr Wang is an active member of the SPE and PESA and is qualified in accordance with ASX listing rule 5.1. He is a former Director of Pilot Energy Ltd and has consented to the inclusion of this information in the form and context to which it appears.

## Authorisation

This presentation has been authorized by the Chairman and Managing Director on behalf of the Board of Directors of Pilot Energy Limited



# Key messages



## Mid West Clean Energy Project is an integrated CO<sub>2</sub> storage to Clean Ammonia export project

- Pilot is a producing oil and gas company transitioning to produce **Clean Ammonia supported by permanent CO<sub>2</sub> storage**
- The Mid West Clean Energy Project (MWCEP) is Pilot's **flagship clean energy transition Clean Ammonia production project**
- Existing operations are **ideal for transitioning to low-cost Clean Ammonia production** with full carbon capture
- Targeting production of **1.2 million tpa of low-cost Clean Ammonia for export by 2028**
- Clean ammonia production will have **ultra-low carbon-intensity** substantially beating EU, Japan, Korea & US standards
- Low-cost, low carbon-intensity Clean Ammonia production is made possible through **integrated CO<sub>2</sub> capture and storage**
- Initial development of **CO<sub>2</sub> storage project will be capable of providing up to 50 million tonnes of permanent storage**
- Aiming to provide over **1 million tonnes of CO<sub>2</sub> injection** annually through 2050
- Significant **potential to increase CO<sub>2</sub> storage capacity** through additional development
- Increase in CO<sub>2</sub> storage capacity will likely enable **increasing annual CO<sub>2</sub> injection rate**

# Vision

Transform existing assets and infrastructure to deliver an integrated cost competitive clean energy solution

## CURRENT OPERATIONS

Cliff Head Oil Field

&

Existing Infrastructure



Transition & Transform

Permanent CO<sub>2</sub> Storage



## CLEAN ENERGY RESOURCES

Wind



WESTERN AUSTRALIA

Solar



Clean Energy Resource hub

Perth

Bunbury

Clean Hydrogen / Ammonia



# 2023 – Key achievements



## Transition from feasibility to project development

Building project team with Project Director and Land Access manager supported by: **Genesis Energies:** Owner's Engineer/ **CO2Tech** as CO<sub>2</sub> storage technical adviser/ **8 Rivers:** core 8RH2 clean hydrogen production technology/**Advanced Energy Technologies:** offshore well construction

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## Advanced regulatory approvals for the Project

Declaration of Greenhouse gas storage formation anticipated in early 2024

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## Key focus on partnering arrangements

Samsung C&T MOU in October 2023

Advanced DD and negotiations underway with key strategic and financial Korean/Japanese and Australian parties

Securing commercial offtake arrangements for both Clean Ammonia and CO<sub>2</sub> storage (Blue ammonia: 8Rivers/SK – 250,000t & SCT – 500,000t)\*

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## Funding and Capital Raising

Raised ~A\$12M in 2023 – strong ECM support

# MWCEP development partnerships (MOUs)



**Svante**

Collaboration on solutions for an integrated carbon capture, transportation and storage solution to industrial emitters

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Collaborate on offering an integrated solution for marine transportation and offshore injection of CO<sub>2</sub> storage at the Cliff Head CO<sub>2</sub> Storage Project

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Collaboration to assess the potential deployment of an innovative water processing and CO<sub>2</sub> capture technology within the MWCEP

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Collaboration on a CO<sub>2</sub> capture & storage service solution targeting key emitters in the region surrounding the Cliff Head CCS Project

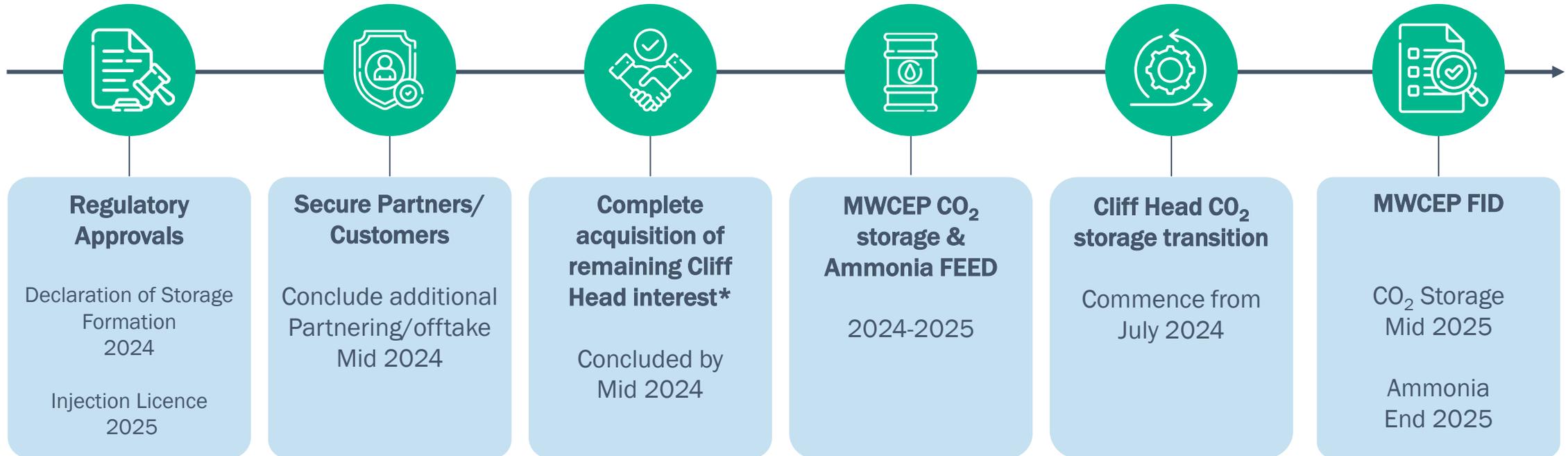
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Framework for Pilot and Curtin to progress R&A aligned with the MWCEP across CO<sub>2</sub> infrastructure, renewables and energy storage

\* Source: Details previously provided in relation to MoU's on the ASX platform and Pilot website

# 2024/2025 MWCEP milestone targets



# Strategy

Deliver low-cost clean energy by building off natural competitive advantages



Western Australia - a natural partner of production and supply of Clean Ammonia



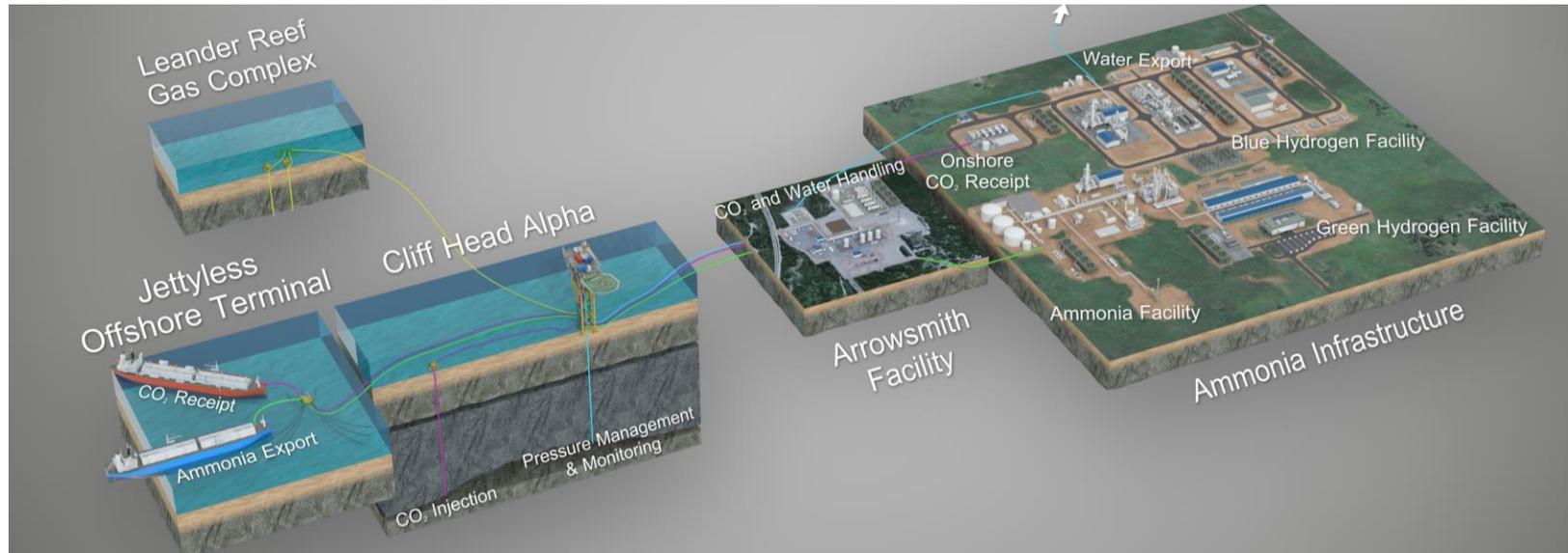
Australia  
Western, South, Queensland, Tasmania etc.

- Natural gas
- Renewables
- ★ Mid West Clean Energy Project

The Deliverables - Clean, Low-Cost and Achievable

# Mid West Clean Energy Project

## A Clean Ammonia export project with full carbon capture through integrated CCS



### Carbon Storage: Timing: ~2026

- Conversion of Cliff Head Offshore oil field to CCS
- Permanent CO<sub>2</sub> storage in depleted offshore oil field
- Offshore facilities to include direct offshore LCO<sub>2</sub> receipt capability
- **Over 1 million tpa CO<sub>2</sub> injection from 2026**
- Targeting continuous CO<sub>2</sub> injection through to 2050

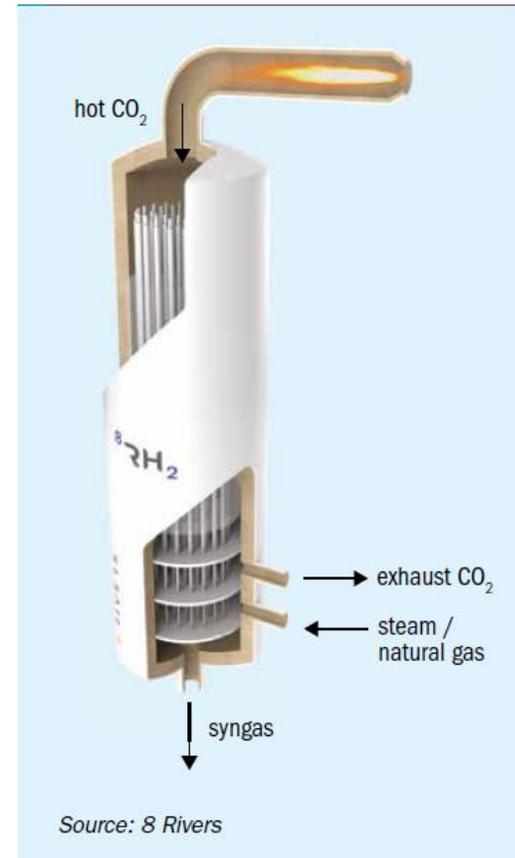
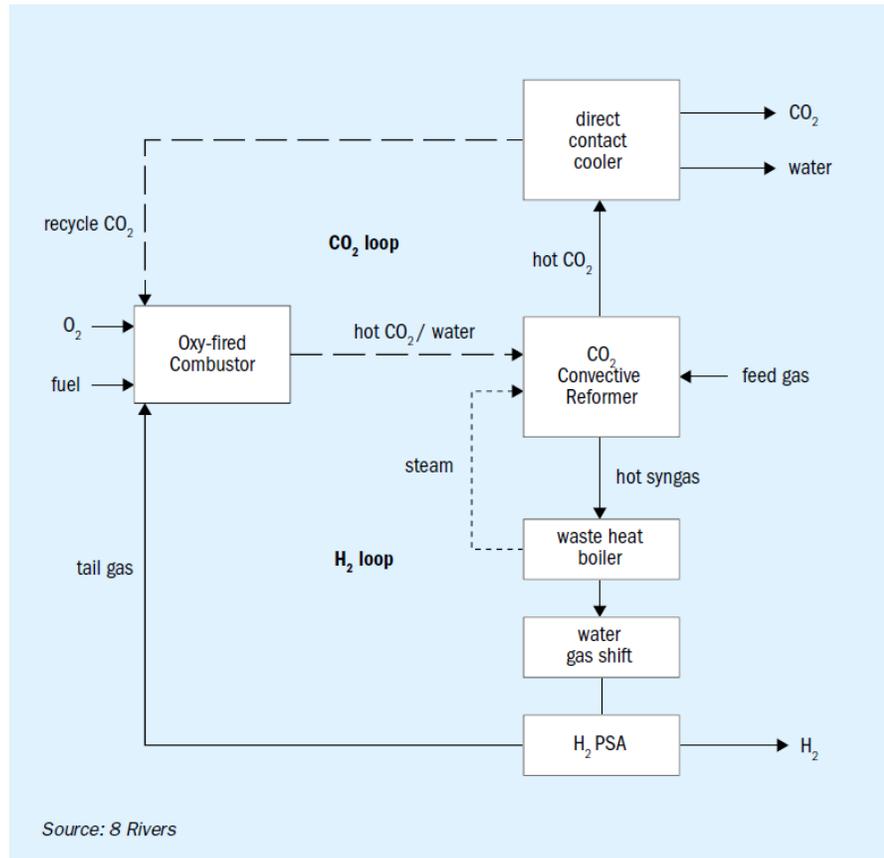
### Clean Ammonia Production: Timing: ~2028

- **Targeting Clean Ammonia production of over 1.2 million tpa**
- Clean Ammonia produced from combined Blue & Green Hydrogen Plant
- Blue H<sub>2</sub> with full carbon capture through integrated Cliff Head CCS
- Green H<sub>2</sub> from self-sourced industrial water supply + low-cost, behind-the-meter renewables
- Estimated levelized cost of ammonia (LCOA) of A\$400/tonne

\* Refer to Feasibility Results per ASX release on 28 March 2022, 7 June 2022 and 23 September 2022

# Pillar 1: The right technologies

Unique integration of CCS, renewables and proprietary technology enables production of low-cost Clean Ammonia



## 8 Rivers <sup>8</sup>RH<sub>2</sub> technology

- Proven technology
- High hydrogen production efficiency while requiring minimal capital costs compared to over conventional power cycles
- Market leading CO<sub>2</sub> intensity
- Minimal water consumption

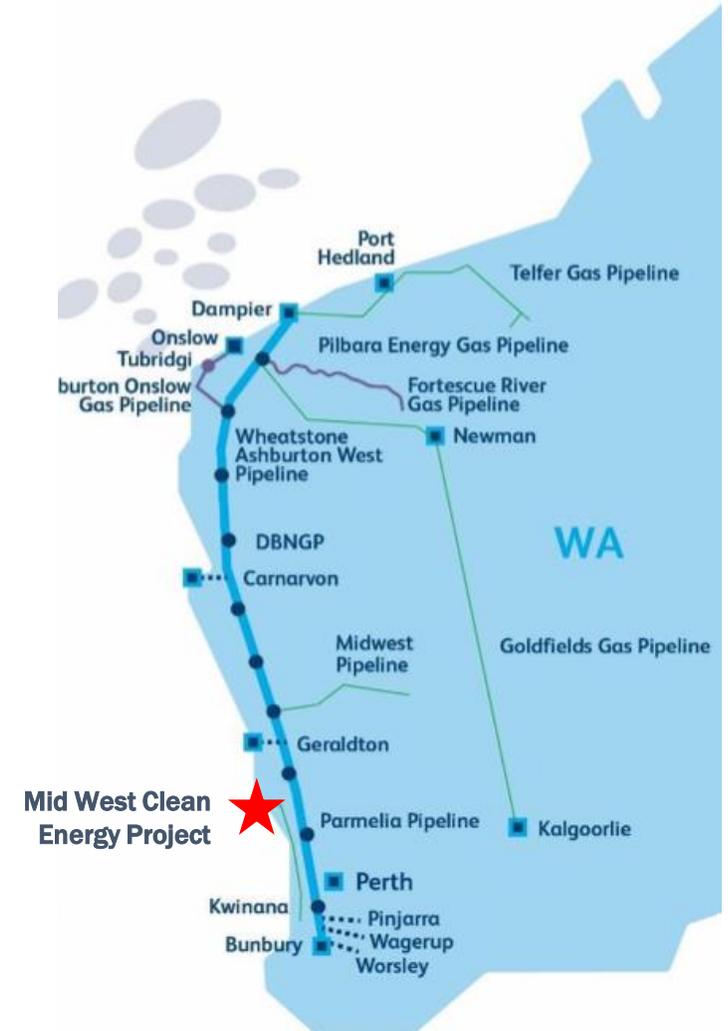
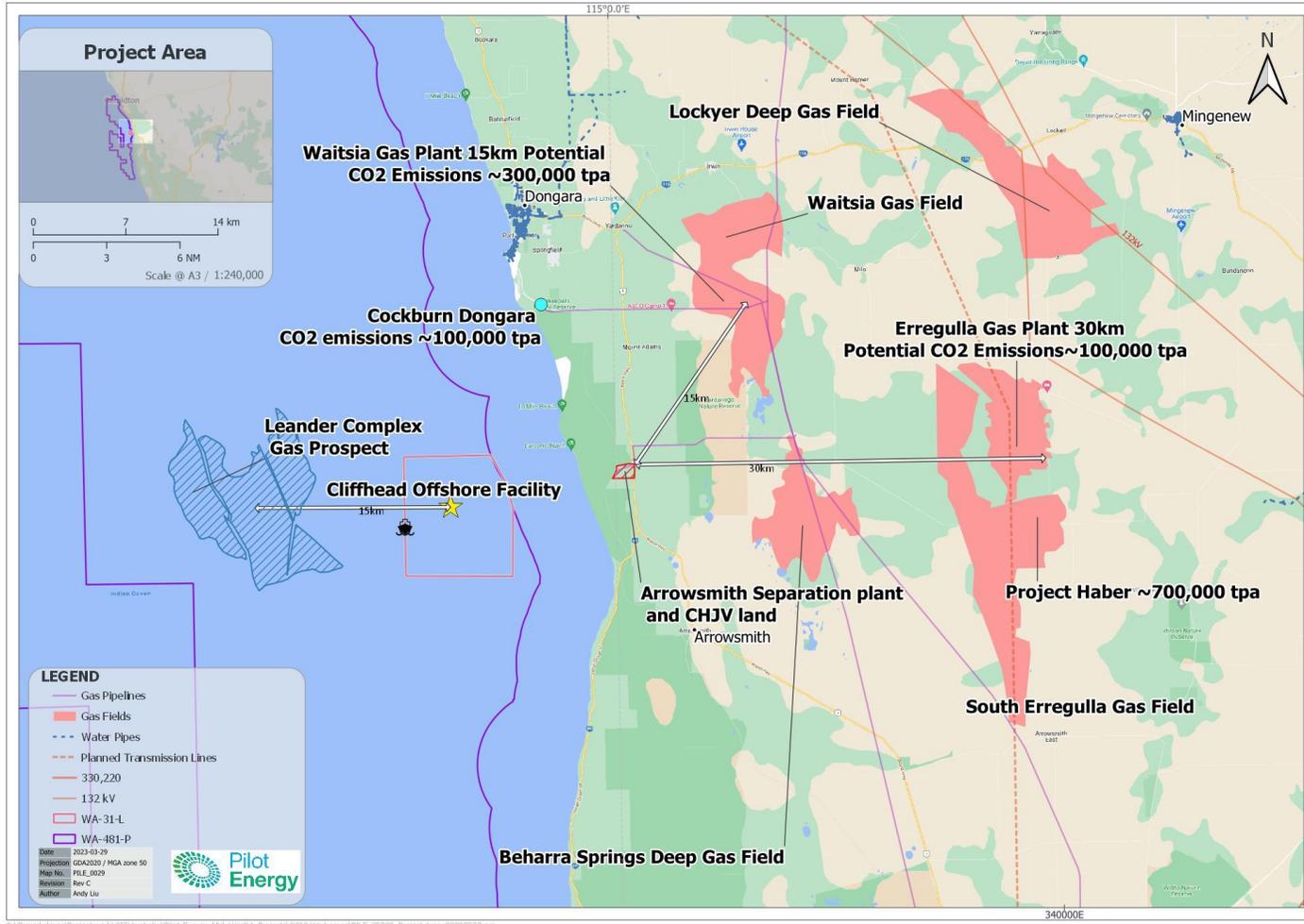
## A unique opportunity

- Blue Hydrogen only possible with CCS
- Integration of low-cost renewables delivers operational and capital cost synergies across both Blue and Green Hydrogen
- Compelling Low Carbon Hydrogen-to-Clean Ammonia solution with clear cost advantage

Integration of CCS and low-cost renewables through 8 Rivers technology delivers clean cost-competitive power, Hydrogen and Ammonia

# Pillar 2: Abundant feedstock gas supply

Multiple and abundant gas supply sources and Western Australian gas policy keep feedstock prices competitive with US

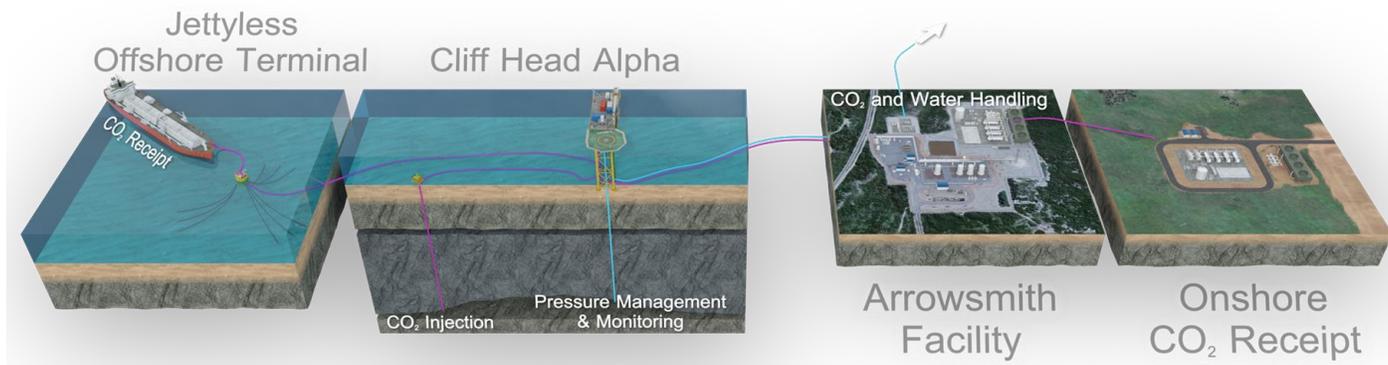


\* Source: Third Project environmental impact assessments & internal estimates

## Pillar 3: CO<sub>2</sub> storage facility

**Cliff Head CO<sub>2</sub> Storage Facility is a key enabler of low-cost Clean Ammonia production**

- Foundation for development of Clean Ammonia production
- Brownfield re-development utilizing existing Cliff Head Oil Field facilities
- Clear Commonwealth regulatory pathway with application lodged with NOPTA
- Minimal risk and capex requirements through re-use of existing reservoir & facilities
- Aiming to provide over 1 million tpa of CO<sub>2</sub> storage continuing through 2050
- Levelized cost of storage (LCOS) of less than A\$20/tonne of CO<sub>2</sub> (excluding transport)
- Targeting first CO<sub>2</sub> injection from onshore CO<sub>2</sub> receiving facility 2026



See Pilot Energy website for CCS Project video at <https://www.pilotenergy.com.au/videos-webcasts>



# Pillar 4: Globally competitive renewables provide growth platform



## Large-scale, cost-competitive renewables provide platform for Green Hydrogen-to-Clean Ammonia production

### Mid West Renewable Energy Projects Feasibility Study Results

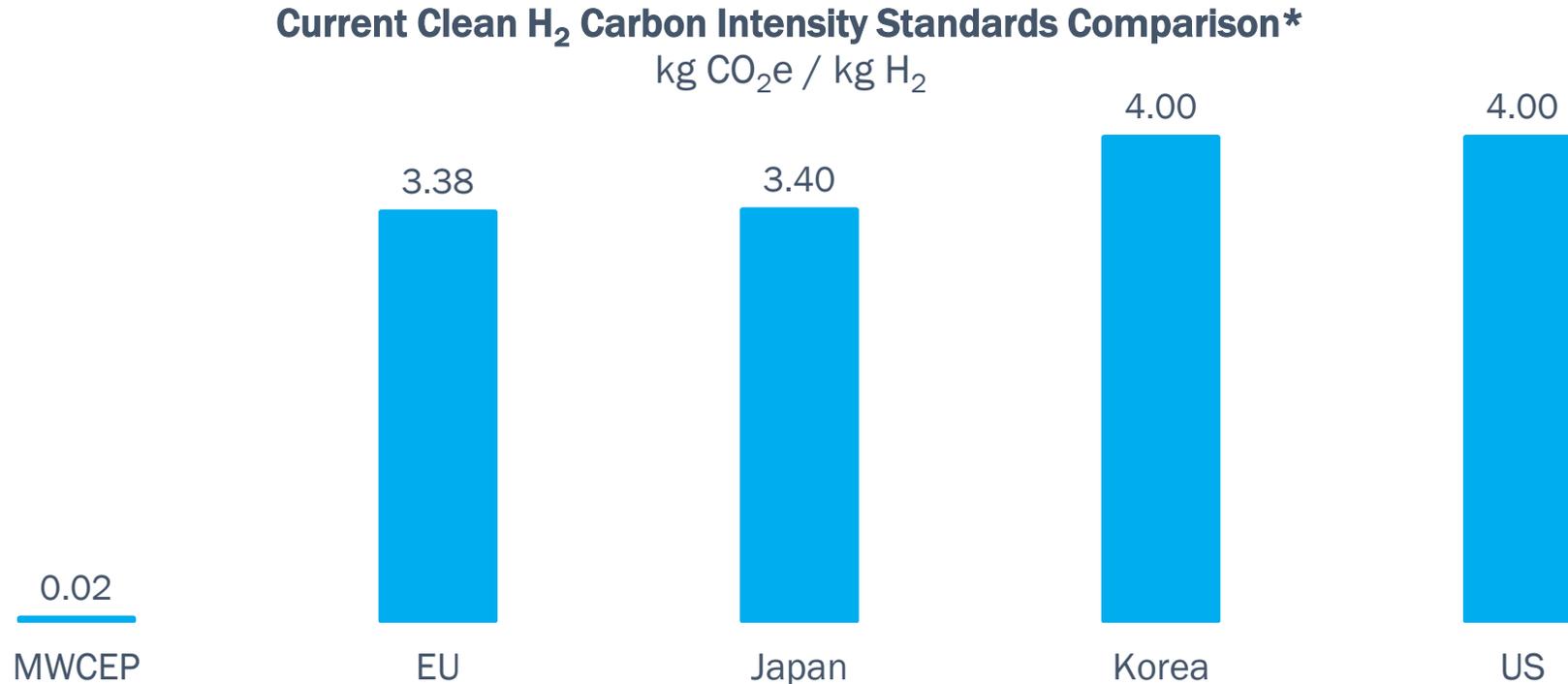
- Levelized Cost of Energy (LCOE) vs CSIRO 2023 GenCost Report
- Technical generation resource (MW)



\* Source: Refer to Feasibility Results per ASX release on 28 March 2022, 7 June 2022 and 23 September 2022. Adjusted for CPI presented as \$2023

# Deliverable 1: Clean – the carbon intensity comparison

Mid West Clean Energy Project exceeds current Clean H<sub>2</sub> Carbon Intensity standards for EU, Japan, Korean & US



**Combination of breakthrough 8RH2 Gen 2 technology with integrated CCS and behind-the-meter renewables delivers low Carbon intensity**

\*Sources: Argus Media article 18 April 2023 – South Korea outlines clean hydrogen certification system and Pilot Feasibility Study ASX release 28 March 2022, 8 Rivers Gen2 8RH2 Design Basis Scope 1 MWCEP blue ammonia emissions

# Deliverable 2: Low-cost – cost competitive clean ammonia



## Cliff Head CCS enables cost competitive industrial scale Blue Hydrogen production

### Blue hydrogen production only possible with direct/integrated CCS

- Production capacity of Blue Hydrogen with 98% of CO<sub>2</sub> capture

### Produced through proven and well established, scalable technologies

- Blue Hydrogen production has been in commercial operation since 1982

### Hydrogen from natural gas is the primary input for vast majority of ammonia

- 95% of 190mmtpa of global ammonia production of hydrogen from natural gas

### Ammonia from blue hydrogen is both a low cost and clean energy source

- Blue hydrogen and ammonia expected to be lowest-cost clean option<sup>1</sup>

### Excellent solution for transport and supply of hydrogen

- Ammonia excellent “vector” and lowest cost form of H<sub>2</sub> transport and supply

### Established market and supply chain

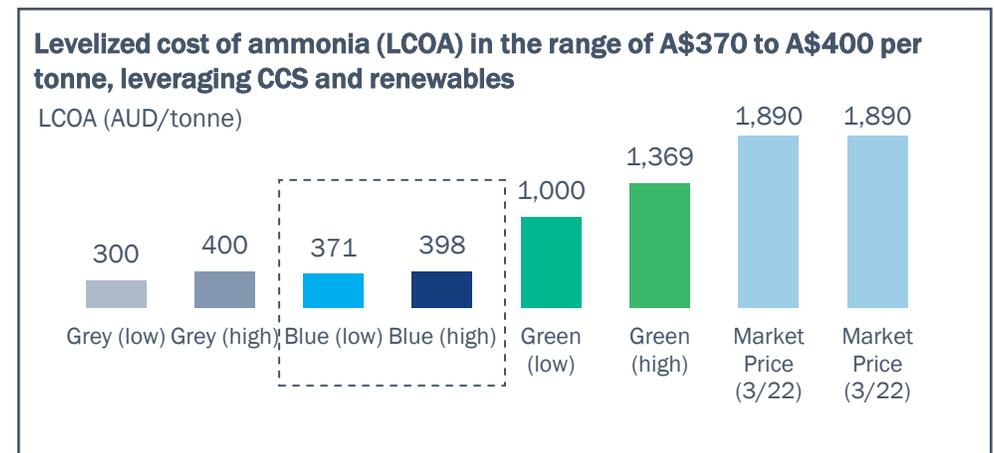
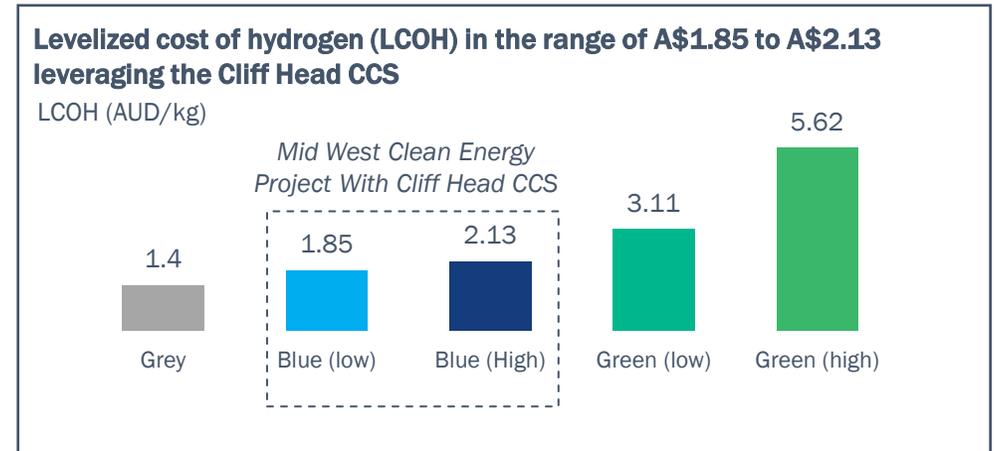
- Well established, large-scale production and global supply chain

### Clean Ammonia is a CO<sub>2</sub>-free energy source

- Proven CO<sub>2</sub>-free fuel can be produced from either Blue or Green Hydrogen

#### Sources

1. Global CCS Institute Blue Hydrogen Report April 2021. Figure 6 (RHS of slide) taken from the same report.
2. CE Delft Feasibility Study into blue hydrogen July 2018 estimates that blue hydrogen production with 95% direct/integrated carbon capture and storage will produce 0.64/kg of CO<sub>2</sub> process emissions per kg of hydrogen produced resulting in total annual CO<sub>2</sub> process emissions of ~25.6 kTonnes of CO<sub>2</sub>
3. Global CCS Institute 2021.



Sources: SP Global, Cost, logistics offer “blue” hydrogen market advantages over “green” alternative 19 March 2020 and Pilot Feasibility Study ASX release 28 March 2022

# Drivers of low-cost Hydrogen – the Bloomberg NEF view\*

## The key inputs for both blue and green Hydrogen

### Blue\*

#### Natural gas prices

The lower the gas price, the lower the LCOH<sub>2</sub> for blue hydrogen. In Australia, the location of the project can be a key determinant of gas price.

#### Power prices

The lower the power costs, the lower the LCOH<sub>2</sub>. Connecting to the grid vs behind the meter.

#### Technology selection

ATR has slightly lower capital costs when high rates of CO<sub>2</sub> capture is required, and ATR also uses less natural gas. However, ATR uses more electricity.

#### CCS costs

CCS costs are driven by electricity and natural gas prices and accessibility of storage facilities/infrastructure.

### Green\*

#### Capacity factors

Higher capacity factors lead to lower LCOH<sub>2</sub>. Projects with both solar and wind can increase overall capacity factor which increases electrolyser efficiency.

#### Power prices

The lower the power costs, the lower the LCOH<sub>2</sub>. Connecting to the grid vs behind the meter.

#### Technology selection - electrolysers

Currently, Chinese alkaline electrolysers are the cheapest on market but is difficult to procure and has long lead times.

Western alkaline electrolysers are a more costly alternative to Chinese Electrolysers.

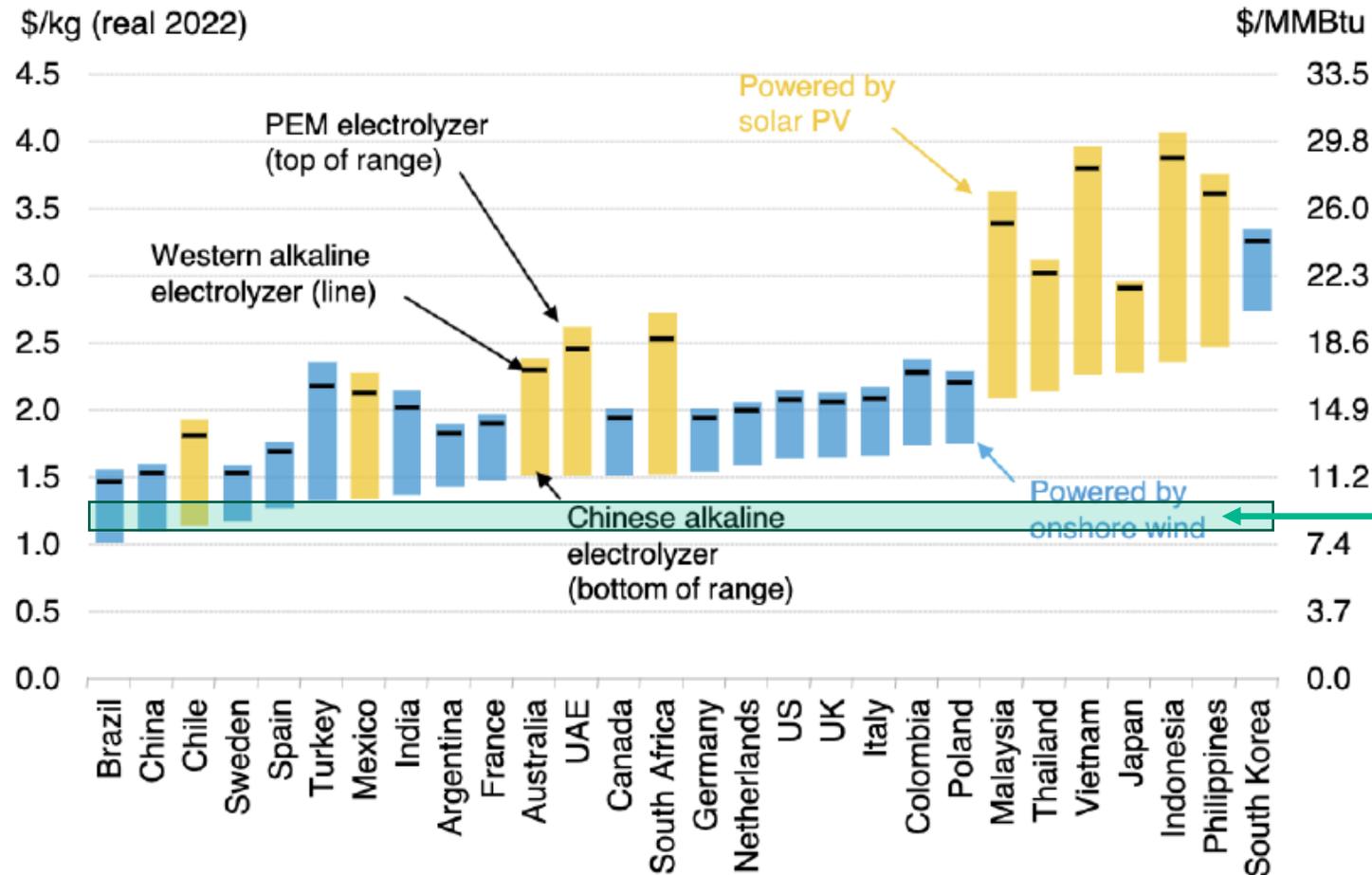
Proton exchange membrane electrolysis is a newer technology and currently the most expensive.

\*Source: Bloomberg New Energy Finance Report 2023 Hydrogen Levelized Cost Update: Cost of Capital and inflation take hold, July 10, 2023

# Deliverable 2: Mid West Clean Energy – globally cost competitive



LCOH<sub>2</sub> from cheapest available renewable power in 28 markets, 2030\*



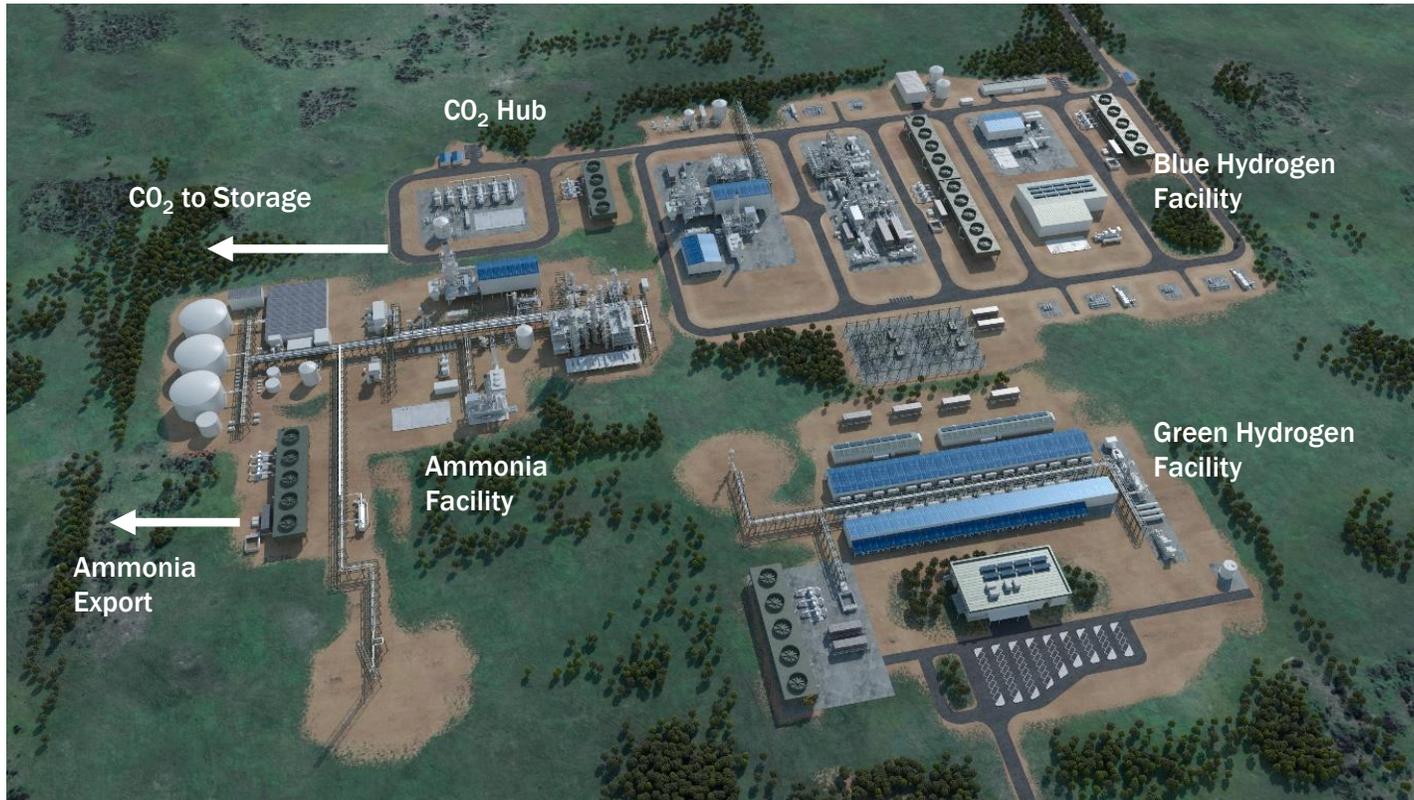
**MWCEP Clean H2 cost (real)**  
**USD 1.20/kg – USD 1.38/kg\*\***

Makes MWCEP competitive with projects from the cheapest 5 regions, Brazil, China, Chile, Sweden and Spain

\*Source: Bloomberg New Energy Finance Report 2023 Hydrogen Levelized Cost Update: Cost of Capital and inflation take hold, July 10, 2023

\*\* Source: Refer to Feasibility Results per ASX release on 28 March 2022, 7 June 2022 and 23 September 2022. 65 cent exchange rate applied to feasibility study results that delivered AUD 1.85 to 2.13/kg Blue H2 LCOH

# Deliverable 3: Achievable – bringing it all together



## Ammonia production

- Targeting ammonia production of up to 1.2 million tpa of cost competitive clean ammonia for export
- Blue Hydrogen production utilising 8 Rivers <sup>8</sup>RH<sub>2</sub> technology integrated with Cliff Head CO<sub>2</sub> Storage
- Abundant nearby conventional gas supply for Blue Hydrogen production
- Green Hydrogen electrolysis system can integrate with <sup>8</sup>RH<sub>2</sub> Blue Hydrogen technology.
- CO<sub>2</sub> Storage project provides long-term self-sourced industrial water for Green Hydrogen production
- Oxygen produced from Green Hydrogen electrolysis used for Blue Hydrogen production
- Low-cost, behind-the-meter renewables provides power for CO<sub>2</sub> Storage through to Clean Ammonia production
- Potential to self-supply gas with exploration success in Pilot's offshore North Perth Basin permit

**Integrated production system maximises use of all production streams – Power, Heat, Water, Hydrogen, Oxygen & Nitrogen – No waste**

# Corporate overview



## ASX Code: PGY

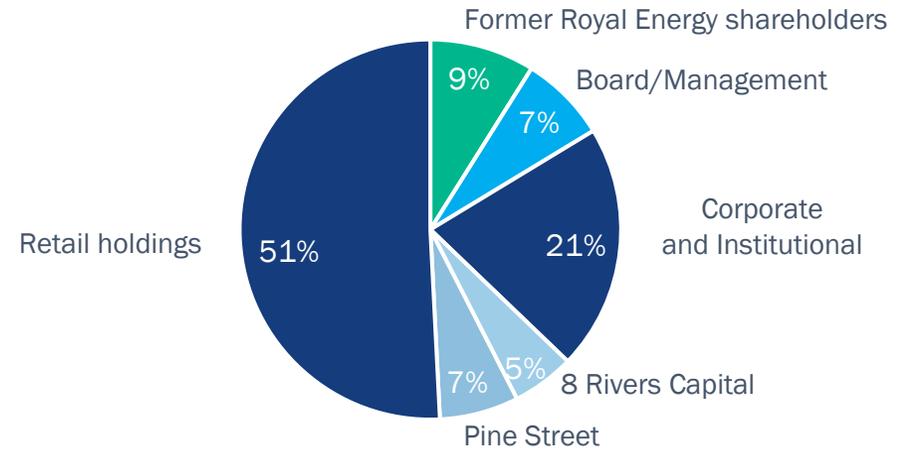
### Capital Structure

Issued shares	1,163 million
PGY share price	~\$0.03 (02/02/2024)
• 52-week range	~\$0.010 to \$0.033
Market Capitalisation	~\$35 million
• 52-week range	~\$10 million to ~\$38 million

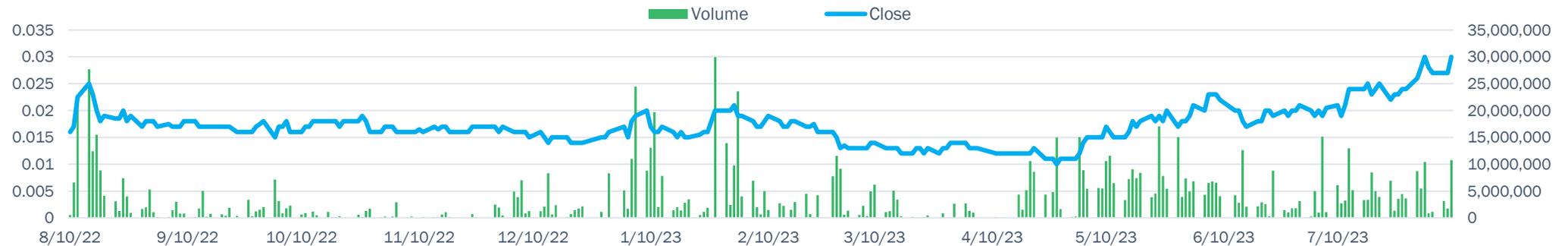
### Development Pipeline

Stage 1	Carbon Management	over 1 million tpa
Stage 2	Clean NH3 Production	1.2 million tpa

## PGY Shareholder Analysis



## Share Price



# Proven & experienced Board



**Brad Lingo**

**Executive Chairman**

30+ years international senior executive experience  
 Upstream/midstream energy, energy infrastructure, finance  
 Proven track record of creating & growing shareholder value



**Tony Strasser**

**Managing Director**

Extensive oil & gas experience including project and financial management, corporate finance and M&A 25+ years  
 Proven record in oil & gas with shareholder backing through multiple ventures



**Daniel Chen**

**Non Executive Director**

17+ years of international business, project management and leadership experience in large scale transport and logistics  
 Corporate advisor to private Australian oil & gas companies since 2018



**Bruce Gordon**

**Non Executive Director**

Corporate Finance and Corporate Audit Specialist in the Natural Resources Sector  
 25+ years acting for, and advising, ASX and International oil and gas companies.  
 Extensive public company accounting, financial reporting and corporate governance knowledge



# Management Team



**Cate Friedlander**

**Company Secretary & General Counsel**

Experienced corporate / commercial lawyer in upstream & midstream energy - ASX and international.

Chartered Governance Professional.

Member of Governance Institute of Australia.



**Nick Watson**

**GM Corporate Development**

Over 20 years energy industry experience

Corporate/strategic development and operational experience across hydrogen, energy and oil & gas



**Jonas Jacobsen**

**Development Director - MWCEP**

20 years global experience as technical leader specialising in emerging technologies within clean energy generation, transmission and infrastructure sectors.



**Mike Lonergan**

**Head of Upstream**

Michael is a petroleum geophysicist with 35 years of domestic and international oil and gas experience across a wide range of E and P assets. He has held senior technical and project management roles during his career, having worked for Delhi Petroleum, Oil Company of Australia, Origin Energy, Rohol-Aufsuchungs Aktiengesellschaft, Mosaic Oil, AGL, Pangaea Resources and Denison Gas.



# Key next steps

Over the next 12-18 months Pilot will be focused on the activities to deliver the Cliff Head CO<sub>2</sub> Storage Project



## Corporate

- Conclude arrangements with prospective project partners & customers
- Conclude corporate and project funding arrangements



## Project implementation

- Permitting
- Site Acquisition
- Commercial Offtake
- Front End Engineering and Design (FEED) for CO<sub>2</sub> Storage and Pre-FEED for Ammonia
- Commence prospective Engineering Procurement, Construction and Maintenance (EPCM) contractor engagement



Next 12 - 18 months aimed at securing necessary regulatory approvals, securing commercial off-take arrangements and completing a FEED to enable final investment decision (FID) for the Cliff Head CO<sub>2</sub> Storage Project.

## Contact Details

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