Port Lincoln Green H2/NH3 Supply Chain Demonstrator

Ammonia – Hydrogen 2.0 Conference | 22-23 August 2019

COMMERCIAL in CONFIDENCE

OUTLINE

- H2U – the Hydrogen Utility™

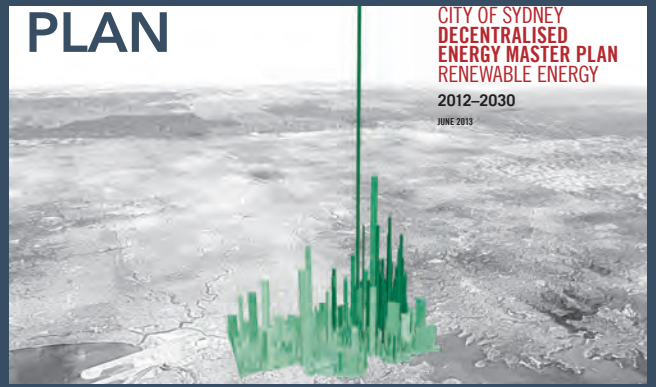
- Port Lincoln Green H2/NH3 Supply Chain Demonstrator
  - SCOPE
  - LAYOUT and DESIGN
  - GRID INTEGRATION
  - POWER GENERATION

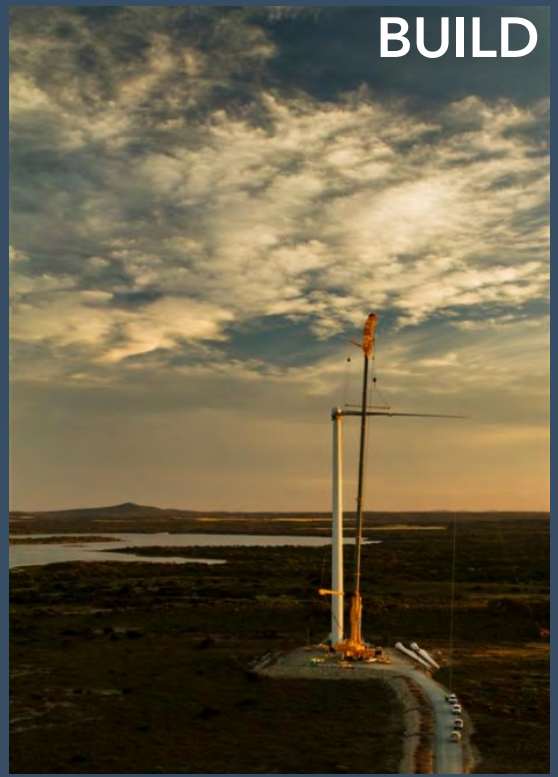
- Scaling Up: Integrated Green H2/NH3 Complex

H2U – THE HYDROGEN UTILITY™

- Privately owned hydrogen infrastructure developer and renewable energy integrator
- Australia's leading developer of renewable-energy integrated hydrogen infrastructure
- Business model built on technical capabilities and key relationships with technology suppliers, infrastructure financiers, off-takers and renewable energy developers
- Pipeline of large-scale renewable hydrogen and ammonia projects
- Strategic alliances with leading renewable energy infrastructure developers
- Member of Japan Green Ammonia Consortium

H2U | COMPANY PROFILE





SPECIALIST DEVELOPER OF HYDROGEN INFRASTRUCTURE SOLUTIONS

PORT LINCOLN | PROJECT OVERVIEW

SCOPE

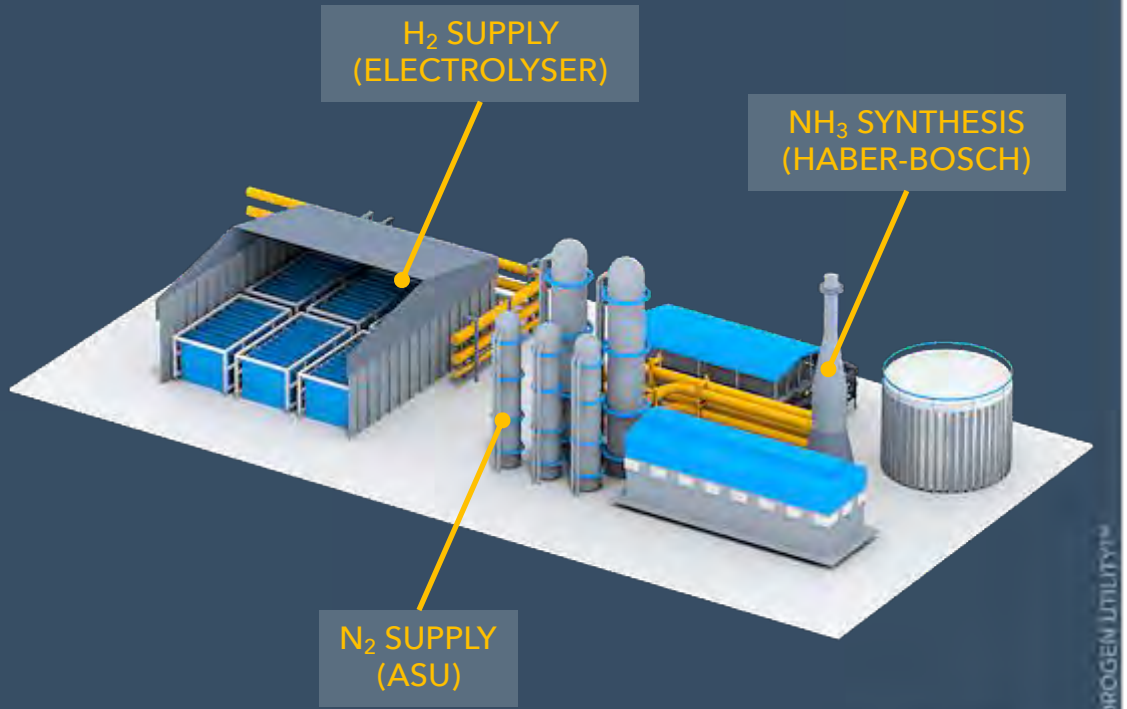
- 35-40 MW electrolysis plant
- network support services
- constrained renewable assets
- 60 tpd distributed ammonia production
- 2x16 MW H2 OCGT
- export market development

FUNDING SUPPORT (SA Govt RTF)

- $4.7m GRANT
- $7.5m LOAN

TIMELINE

- Q2-Q4 2018 – Bankable feasibility study
- Q1-Q3 2019 – Project financing
- Q4 2019 – Q1 2020 - FEED
- Q2 2020 – Site Development
- Q3 2020-Q2 2021 - Construction
- 2021-2022 – Trial operation, ramp-up
- 2022-2047 – Commercial operation



PORT LINCOLN | EYRE PENINSULA

GATEWAY TO SA WHEATBELT

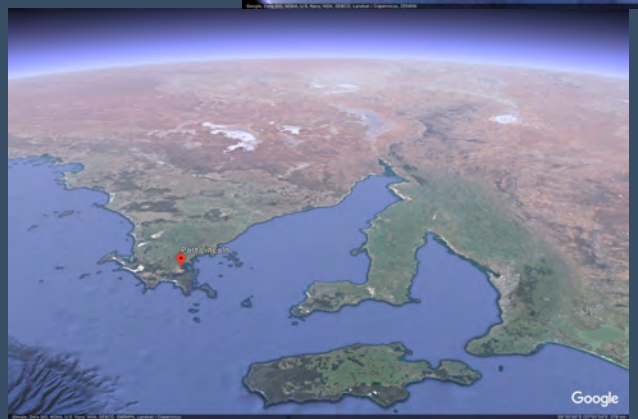
- Fertiliser/Input Logistics
- Product Handling and Export

END OF NATIONAL GRID

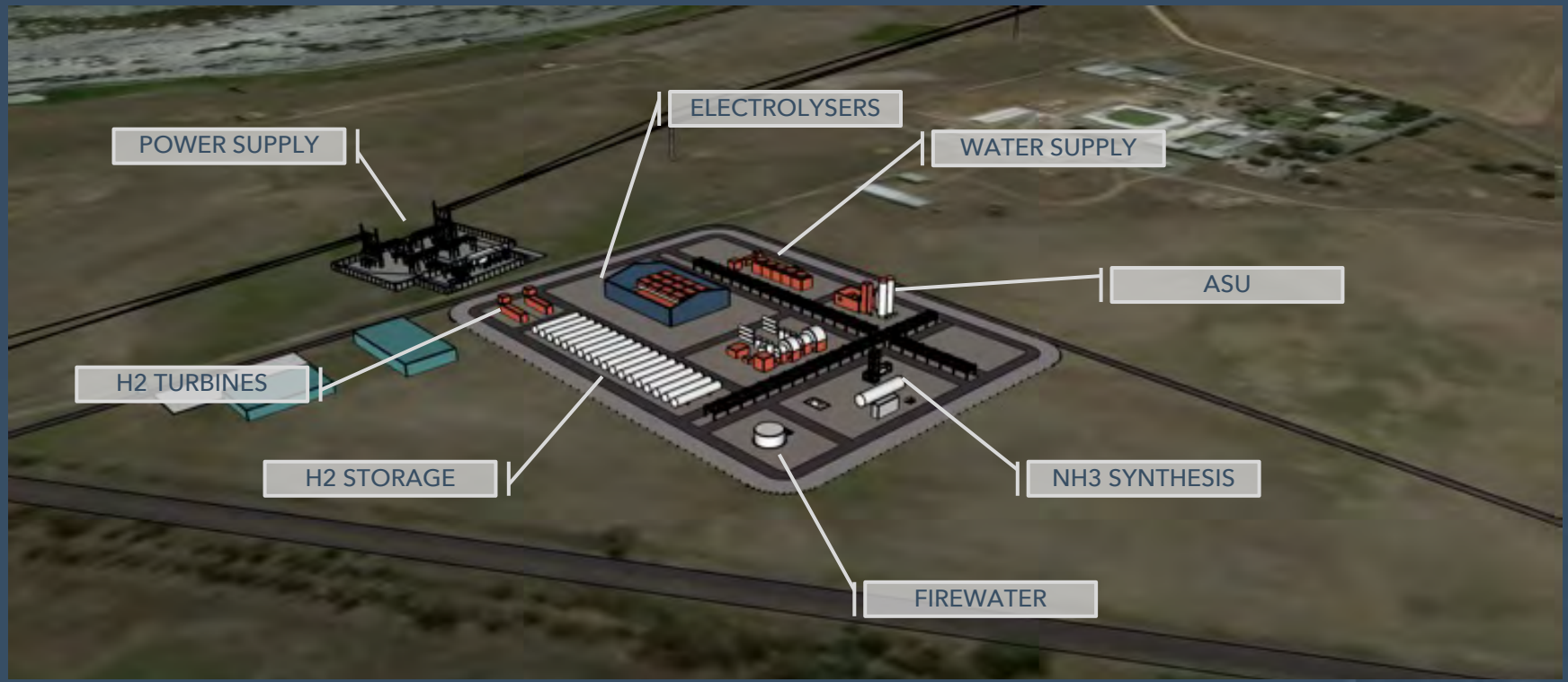
- Last Transmission Substation on SE Grid

RENEWABLES POTENTIAL

- Best Wind Potential on Mainland Australia
- Wind Farms with 50%+ CF (new technology)
- 14 GW of Technical Wind Potential

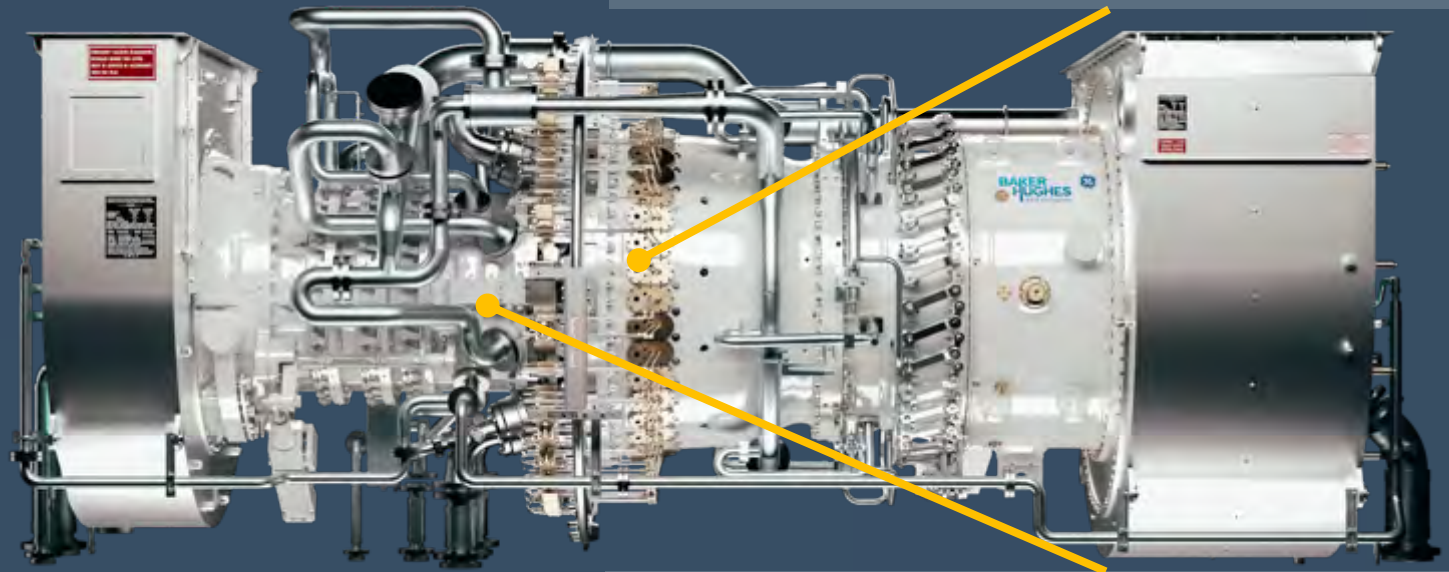


PLANT LAYOUT | OVERVIEW



H2 POWER GENERATION (2x16 MWe) | NOVA LT PLATFORM

ANNULAR COMBUSTORS
FLAME STABILITY FOR 100% H2 OPERATION (incl. START-UP)

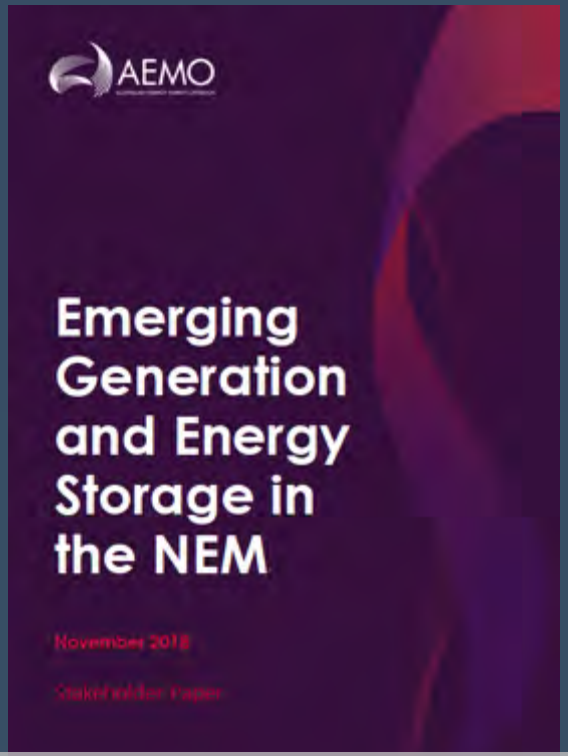


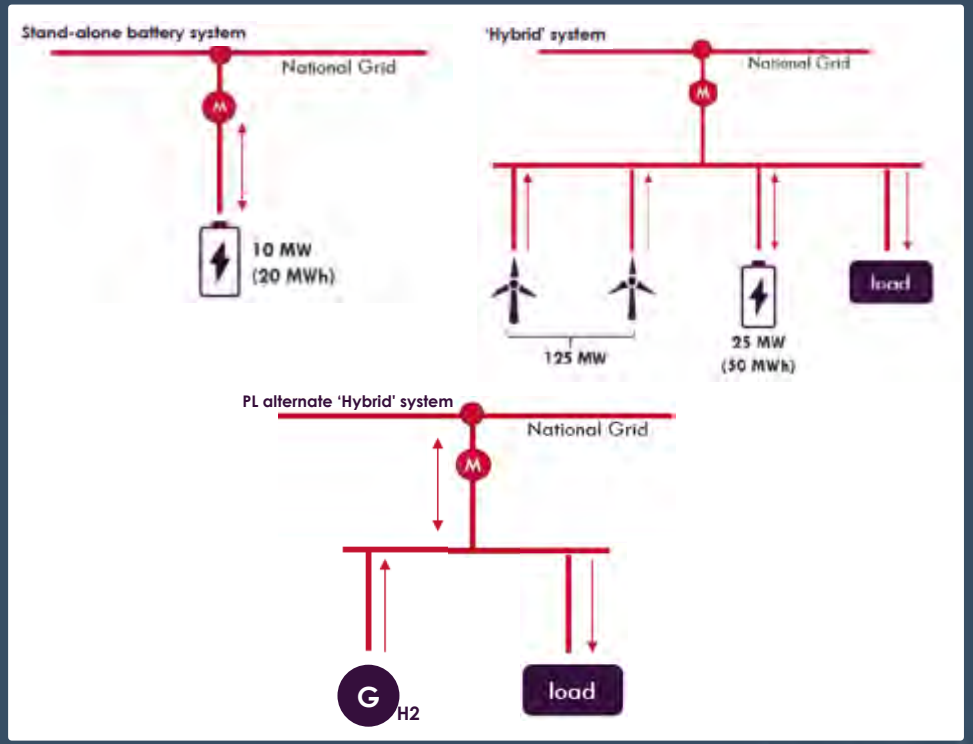
DUAL SHAFT CONFIGURATION
LOAD FLEXIBILITY WITH FAST RAMP-UP RATES

BHGE/H2U COMMERCIALIZATION PARTNERSHIP JANUARY 2019

HYDROGEN UTILITY™

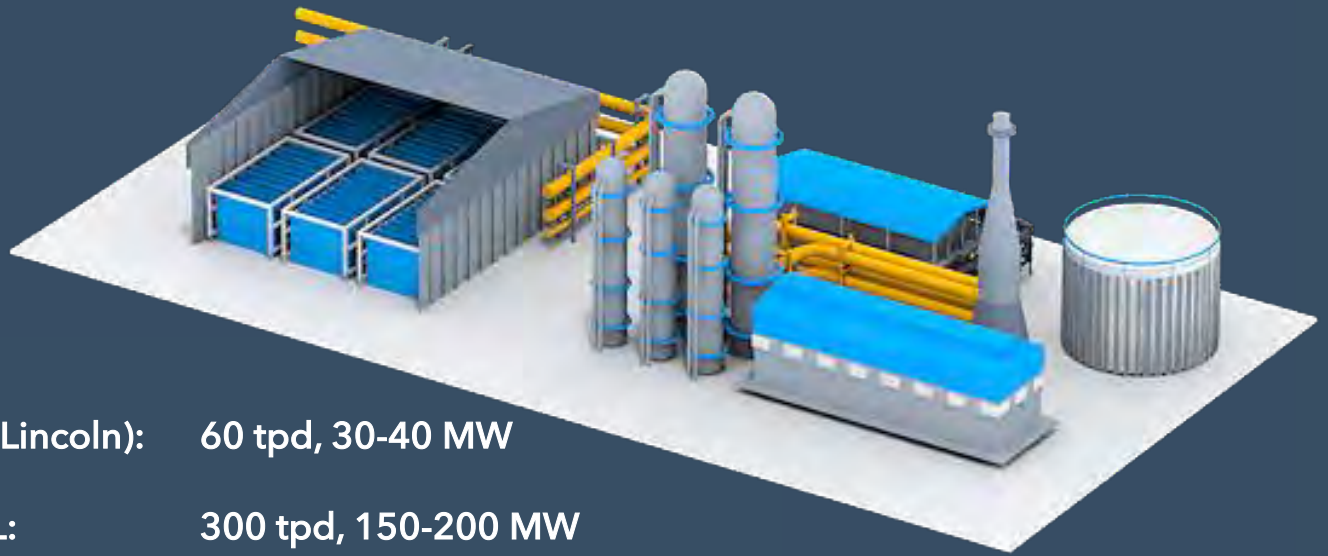
PORT LINCOLN | AEMO EMERGING GENERATION AND STORAGE





CURRENT NETWORK OPTIONS: ALTERNATE VIEW OF 'HYBRID' SYSTEMS

GREEN H2/NH3 PLATFORM | PLANT SCALE



SMALL (Pt Lincoln):	60 tpd, 30-40 MW
REGIONAL:	300 tpd, 150-200 MW
WORLD-CLASS:	1,000+ tpd, 750-1000+ MW

PORT LINCOLN AS A PROTOTYPE FOR LARGE-SCALE DEVELOPMENTS

REGIONAL-SCALE | AGRICULTURAL/MINING VALUE CHAINS

MINING AND RESOURCES VALUE CHAINS

EXTRACTION	PRIMARY PROCESSING	TRANSPORT	BLENDING AND STORAGE	PORTS AND SHIPPING	DISTRIBUTION CHANNELS	PROCESSING AND REFINING	FINAL CUSTOMERS

PRODUCTION	PRIMARY PROCESSING	TRANSPORT	BLENDING AND STORAGE	PORTS AND SHIPPING	DISTRIBUTION CHANNELS	PROCESSING AND REFINING	FINAL CUSTOMERS

AGRICULTURE VALUE CHAINS

MULTIPLE VALUE-CHAIN OPPORTUNITIES FOR H2 AND DERIVATIVES (NH3)

WORLD-CLASS | EXPORT-ORIENTED DEVELOPMENTS

TARGET MARKETS

SOUTH KOREA

National Champion in Fuel Cell Vehicle technology (Hyundai)

Large FC Bus Procurement Program (2018 Winter Olympics)

Established market for MW-scale stationary FC

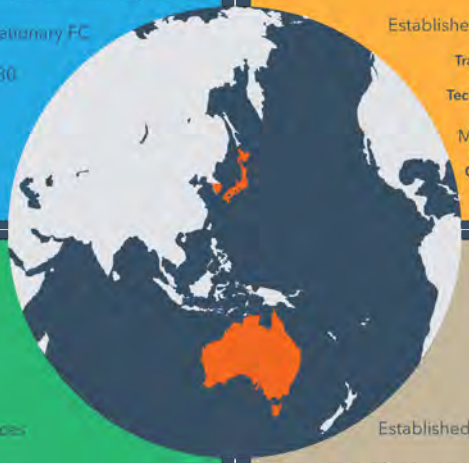
H2 surplus projected to hold till 2030 (all fossil based)

JAPAN

H2 and Fuel Cells firmly established in National Energy Policy
Strategic Energy Plan (2014)
2020 Tokyo Olympics

Established Corporate & Industrial Ecosystem
Vehicle OEMs: Toyota, Honda, Nissan
Trading Houses: Mitsubishi, Sumitomo, Mitsui
Energy Companies: J-Power, Tokyo Gas, JX
Technology Companies: Chiyoda, KHI, Toshiba

METI-funded Supply Chain Initiatives
KHI: Brown Coal (Latrobe Valley), Liquid H2
Chiyoda: Oil&Gas (Borneo), Organic Carrier
AIST: early R&D, NH3 as carrier



World class Wind and Solar Resources

Projected Renewable Surplus >2025

Large Development Potential

RENEWABLE ENERGY POWERHOUSE

Established Trading & Technology Partnerships

Mature Engineering and Financial Services Ecosystem

Nation-leading Industry Attraction and Clean Energy Policies

INVESTMENT READY

AUSTRALIA UNIQUELY POSITIONED TO SUPPORT NEW HYDROGEN TRADE

H2-HUB™ CAPE HARDY

GREEN-FIELD PORT DEVELOPMENT

- CAPE-SIZE VESSEL CAPABILITY
- 1,100 Ha INDUSTRIAL PRECINCT

CO-LOCATION OPPORTUNITIES

- Grain Product Exports
- Magnetite Exports
- Mineral Processing

STAGED DEVELOPMENT APPROACH

- PHASE 1 – Master Plan
- PHASE 2 – Domestic Uses
  - Grain Industry (Fertilizer)
  - Mining Industry (Explosives, Chemicals, Fuel)
- PHASE 3 – Export Market Development

HYDROGEN UTILITY™

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