Renewable Ammonia Opportunities

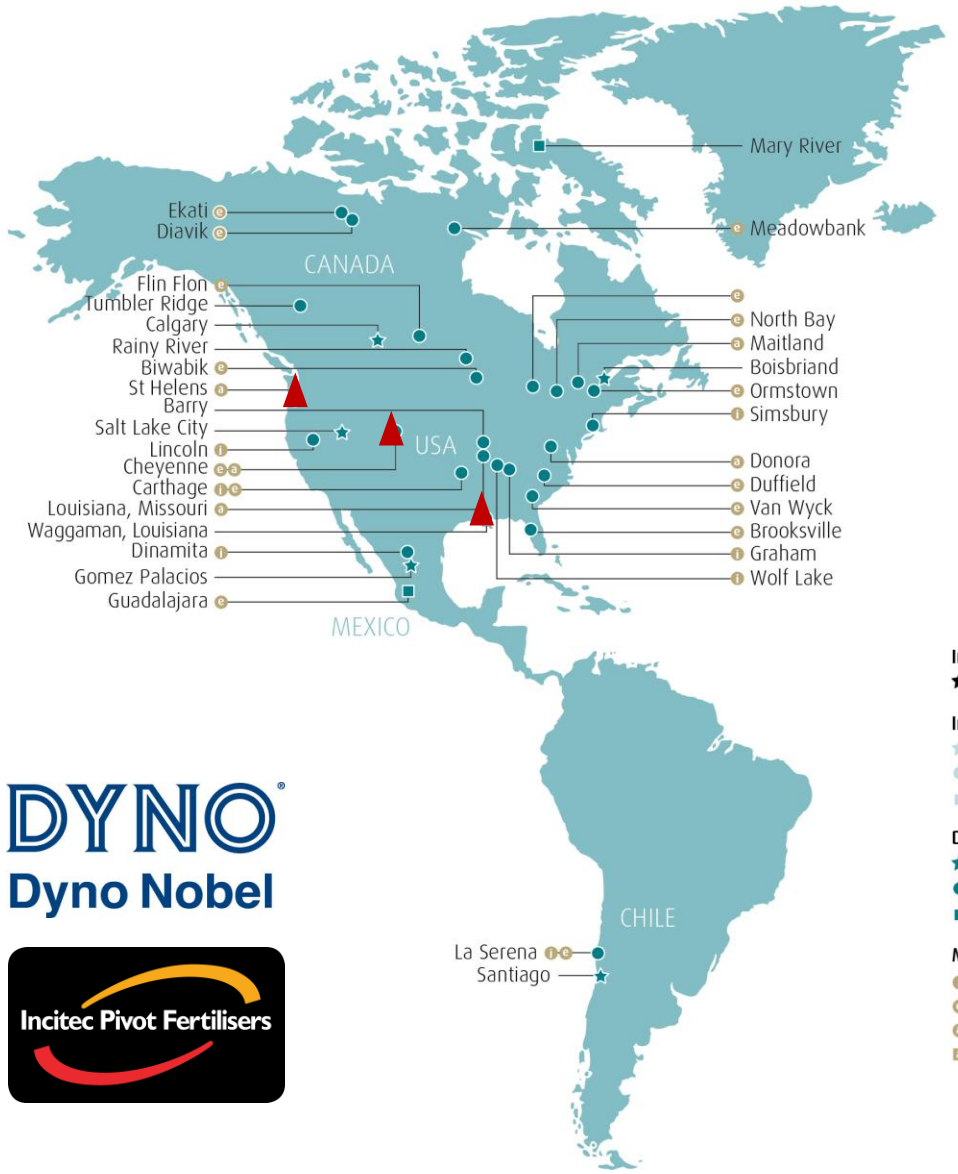
Ammonia Energy Conference 2022 Australia

24-26 August 2022

Incitec Pivot Limited

INNOVATION ON THE GROUND

IPL - Who we are



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Quantum Fertilisers

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Manufacturing legend
i Initiation
e Emulsion
a AN
a Long term AN supplier

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In the Australian economy, ammonia is also about resource extraction and the mining industry

- Ammonia is currently used to make **ammonium nitrate** for resource extraction
- Extraction of new world minerals required for new technologies
- Quarry & Construction to rebuild infrastructure as the physical impacts of climate change increase
- High efficiency explosives technologies that reduce both energy use and GHG emissions by matching explosives density to borehole geology

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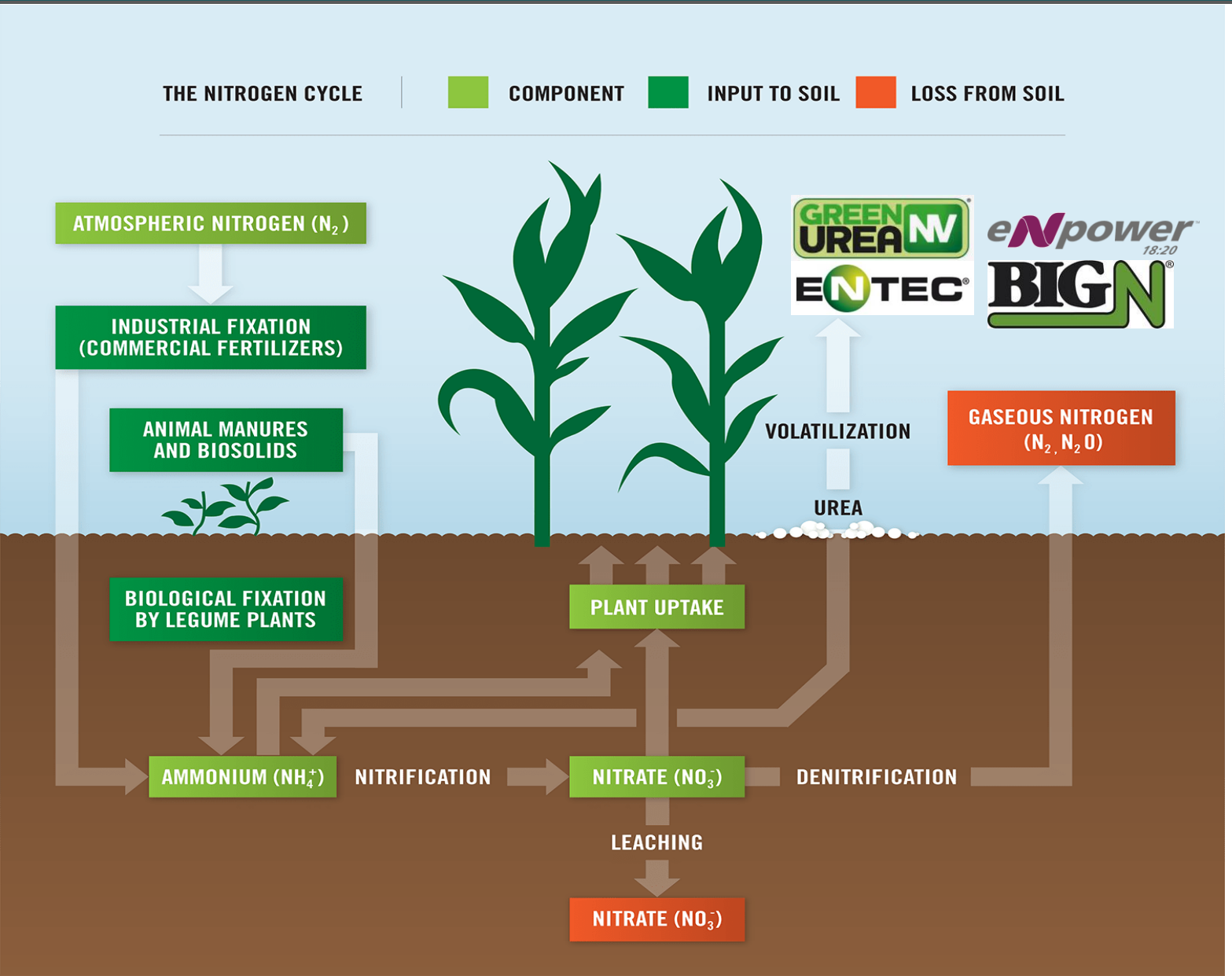
In the Australian economy, ammonia is also about food security and the agriculture industry: H as the carrier for N (in the nitrogen cycle)



- **Ammonium Phosphate** and **sulphate of ammonia fertilisers**
- The resulting increased yields from nitrogen ferts are currently feeding more than 1/3 of the world's population (both yields and protein)[1]
- For food security in a world impacted by climate change, even more intensive agriculture is required
- Enhanced Efficiency Fertilisers (EEF) are treated with a N inhibitor to reduce GHG emissions as N2O

Pathway to an export Ammonia Energy industry

1. **Demonstration scale - 1-10 MW electrolysis**
2. **Industrial scale - 100-200 MW electrolysis**
3. **Export Scale – 1000 MW electrolysis**

Current State

?

Future State

- **Does anyone here think that this industry will skip stage 2?**
- To get there, Stage 2 requires:
  - investment
  - a market that provides acceptable returns
  - logistics for storage and transport
- Is there a market that will provide acceptable returns for H2 at industrial scale now?
- Feedstock replacement is the highest existing $ return for solar H2 at an industrial scale

Gibson Island Green Ammonia – Partnership with FFI

- Gibson Island ammonia plant was built in 1969.
- In October 2021, IPL and FFI announced a partnership to investigate producing industrial scale green ammonia.
- FFI have found the project is technically feasible
- Progressing to Front End Engineering Design (FEED) study by end 2022.
- Currently proposed that FFI would construct an on-site water electrolysis plant and develop & operate the hydrogen manufacturing facility, with IPL operating the ammonia manufacturing facility.
- The new water electrolysis facility would produce up to 50,000 tonnes of renewable hydrogen per year and be a complete replacement of Gibson Island's current gas feedstock = more than 300,000 tonnes of green ammonia for Australian and export markets.

"Pending further approvals, this project could be Australia's first industrial scale green ammonia production facility, demonstrating existing infrastructure can be retrofitted"

Waggaman Louisiana – CCS hotspot

- WALA is a highly efficient 800,000 tpa ammonia plant built in 2016
- CH4 feedstock for H2 for ammonia produces very pure CO2 stream
- Louisiana has ideal geology for sequestration
- Close to existing CO2 pipeline infrastructure
- Highly trained, highly skilled workforce that is well suited for building additional pipelines and operating sequestration wells.
- Q45 Tax Credit incentive makes it a business proposition - seeking MOU
- (V45 Signed this week gives green ammonia a boost)

WALA currently captures some of its pure CO2 to make melamine at a neighbouring plant

IPL, Keppel and Temasek partnership – Newcastle and Gladstone

- The three parties signed a memorandum of understanding (MOU) to investigate the feasibility of producing green ammonia in QLD & NSW for export to meet the rapidly growing market demand for carbon-free energy globally, including Singapore.

- Includes working closely with the Queensland and NSW Governments to explore the feasibility of essential infrastructure, licences and approvals to facilitate the production and export of green ammonia.
- Both Gladstone and Newcastle have been nominated by the Australian government as future hydrogen hubs.

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1. Erisman, J.W., M.A. Sutton, J. Galloway, Z. Klimont and W. Winiwarter (2008) How a century of ammonia synthesis changed the world. *Nature Geoscience*, Vol. 1 (Oct.): 636-639.