

Regional Green Ammonia Development – Planning for Truly Sustainable Development

Mick Scrivens

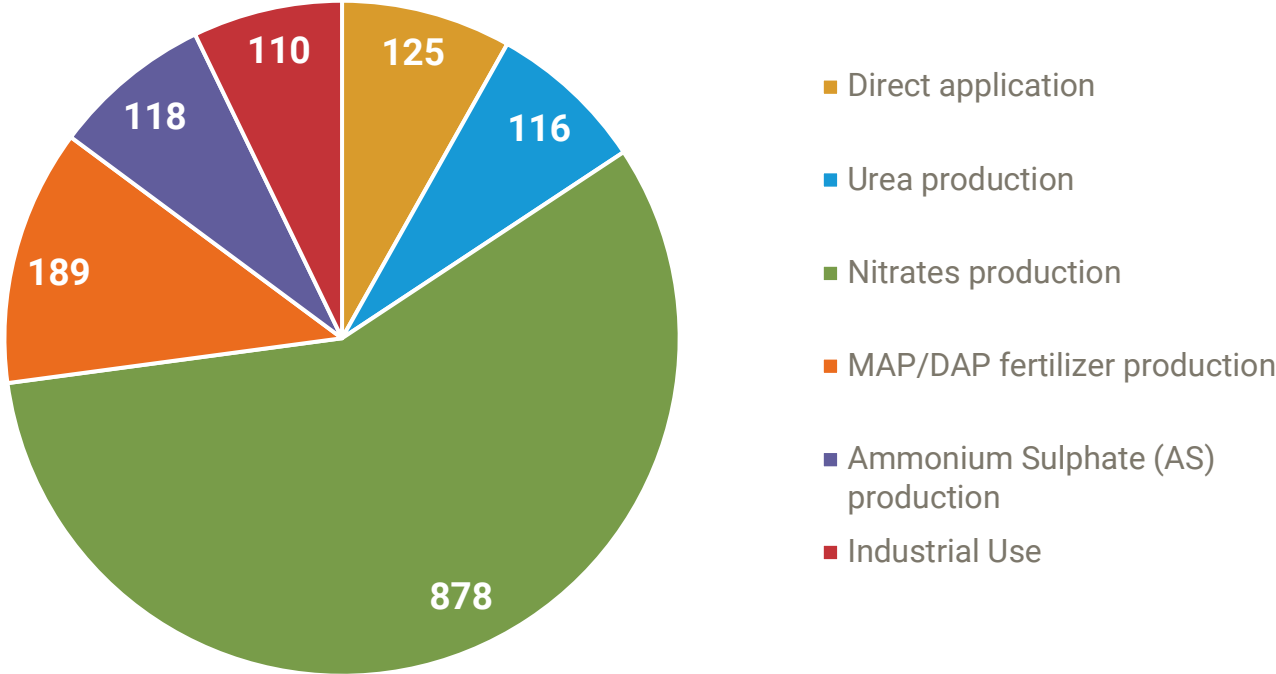
Director, Australasia, Black & Veatch

Australian Consumption (Pre-Ukraine Conflict)

Today, Australia's domestic consumption of ammonia largely goes to nitrates/explosives supplied to the mining industry while fertilizer is imported

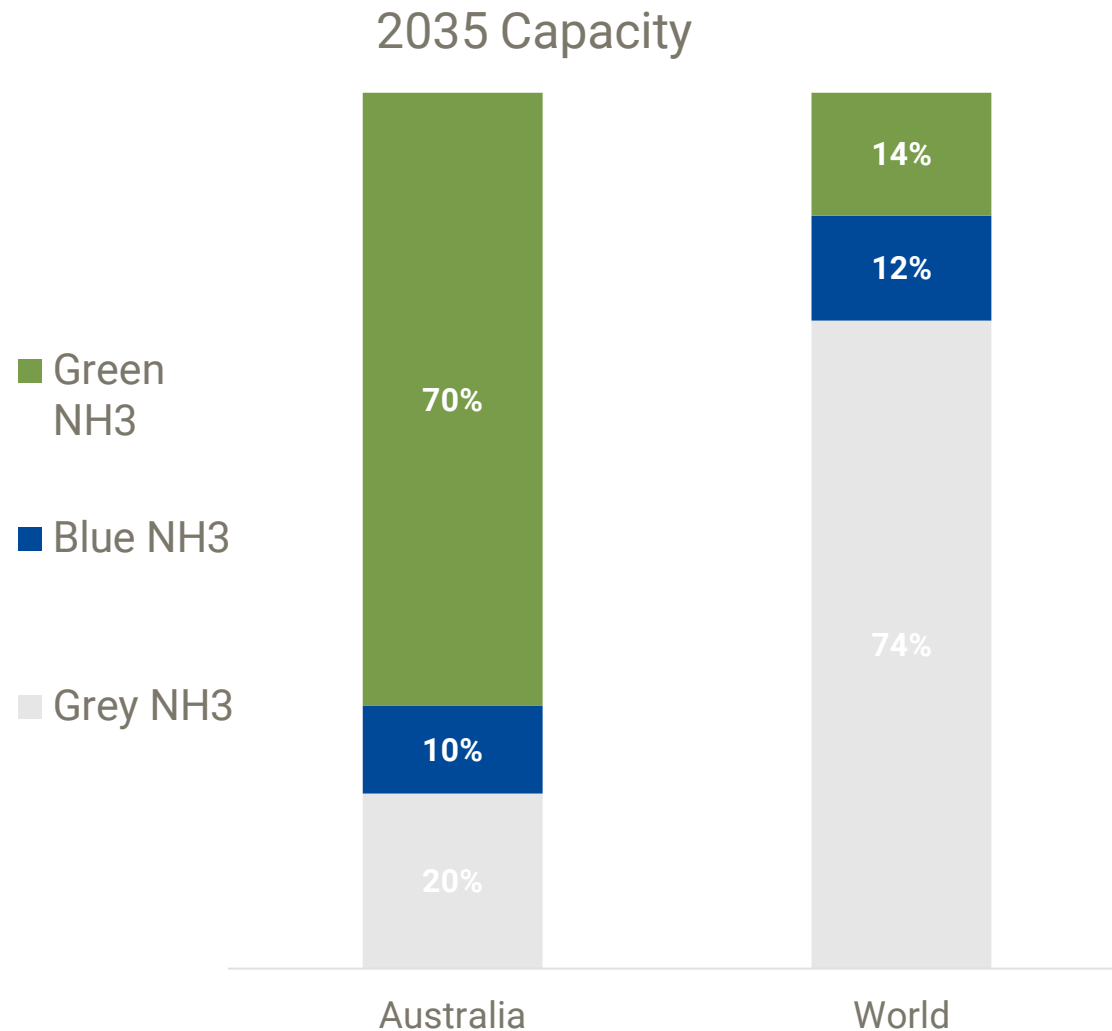
Ukraine conflict has heightened food security concerns and impacted imported cost of fuel and ammonia

2021 Consumption (kt)



Pre-Ukraine Conflict: imports of ammonia @ \$77.7m in 2020, greater than exports @ \$48.5m

2035 Capacity Outlook: Australia Compared to the World



- Australia has the **world's largest pipeline** of renewable hydrogen projects
- Australia could account for **13% of global carbon-free ammonia** supply by 2035 and be the world's **largest exporter** of carbon-free ammonia
- Near-term **“transition offtakers”**:
 - Domestic agriculture (esp. given impact of Ukraine conflict)
 - Co-firing ammonia decarbonizing Asia's (young) coal power plants

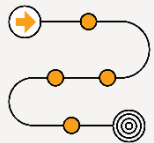
Integrated Development and Planning



Funding



Off-Taker Agreements

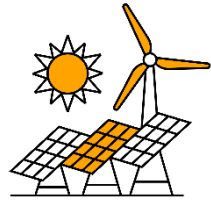


Planning & Tech Selection



Safety & Environment

Planning



Upstream Renewable Energy



Upstream Water Supply



Gas Supply (and Carbon Capture)

Feedstock



Hydrogen & Ammonia Processing

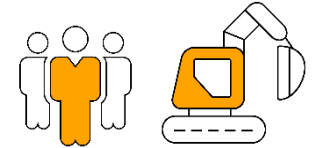


Export & Import Port Infrastructure



Pipeline & Vessel Development

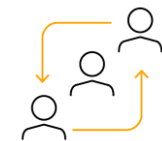
Processing & Distribution



Labour & Skills



Community Infrastructure



Social License & Consultation

Sustainable Development

Water is a Feedstock!

6 June 2023: 'El Niño alert' – Australia, Bureau of Meteorology

- Think resiliency > supply
- Water is key for commercially sustainable ammonia production
- Ammonia production is water intensive process



Fitzroy to Gladstone Pipeline

Lower Fitzroy River -> Gladstone
Capacity: 30 GL per annum
State and Federal Collaborative
Planning and Development
Purpose: Security; reliability; industry
development (including Hydrogen and
Ammonia)
Construction underway
Due: 2027

Ammonia production is water intensive

Water use per ton of Ammonia across select processes

1.7	Electrolysis	Source of H ₂ → little room for improvement
0.8	Water treating effluent	Opportunity to reduce with Zero Liquid Discharge (ZLD) approach
4.3	Cooling of electrolysis	Basis is Cooling Tower; alternative methods such as air cooling or indirect sea water cooling use little/ no water
2.7	Cooling of ammonia production	
1.3	Ammonia steam system	Steam drains, blowdowns, etc

Learning from Gladstone

- Boom and bust impacts on regional towns: coal, mining, LNG
- Human logistics – airport expansion
- Accommodation demands
- Rents and cost of housing impact on local families
- Increased demands on medical & essential services
- Increased demands on port operations
- Upskilling local industry to support NH3 & H2 industries
 - Operations
 - Handling
 - Transportation
 - Maintaining facilities



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