

The economies of scale impact on Green Ammonia

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“A 100 megawatt renewable hydrogen production facility could contribute an estimated 100 to 150 jobs, while a 1,000 megawatt facility, which could be feasible by 2030, could support around 2,000 megawatts of renewable energy investment and contribute an estimated 1,000 to 1,200 jobs.”

Tasmanian Government, [Tasmanian Renewable Hydrogen Action Plan](#), March 2020

1MW = 1 Job



“A cautiously optimistic scenario could see an Australian hydrogen industry generate about 7,600 jobs.”

“If global markets develop faster, consistent with the energy of the future scenario, estimates rise to around 17,000 jobs.”

Australian Government, [Australia's National Hydrogen Strategy](#), November 2019



What if.....



Energy Minister Angus Taylor is aiming for \$2 a kilogram hydrogen. Source AAP

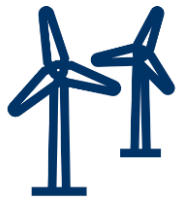
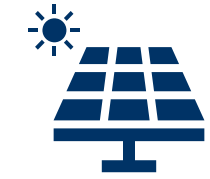
\$2/kg hydrogen

=

Per-tonne of ammonia,
the hydrogen cost
alone is ~\$350



Green Ammonia



Renewables



Air



Electrolysis



Air Separation



Hydrogen

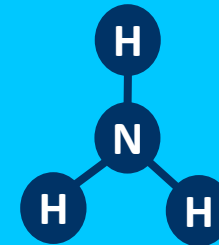


Nitrogen

Case Study



Ammonia
Synthesis

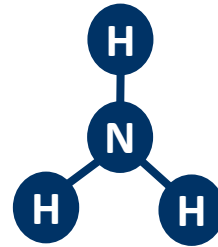


Green
Ammonia



Opex

- Green Hydrogen
- Power
- Water
- O&M* Material
- O&M* Labour



Capex

- Ammonia Synthesis
- Air Separation
- Utilities
- Infrastructure

Cost of Green Ammonia

*Operations and Maintenance

Case Study Basis

- Ammonia Capacities 25, 250, 2500 TPD
- Estimated Workforce 15, 25 and 100 FTE



Equivalent H₂ electrolysis
10MW, 100MW and 1GW



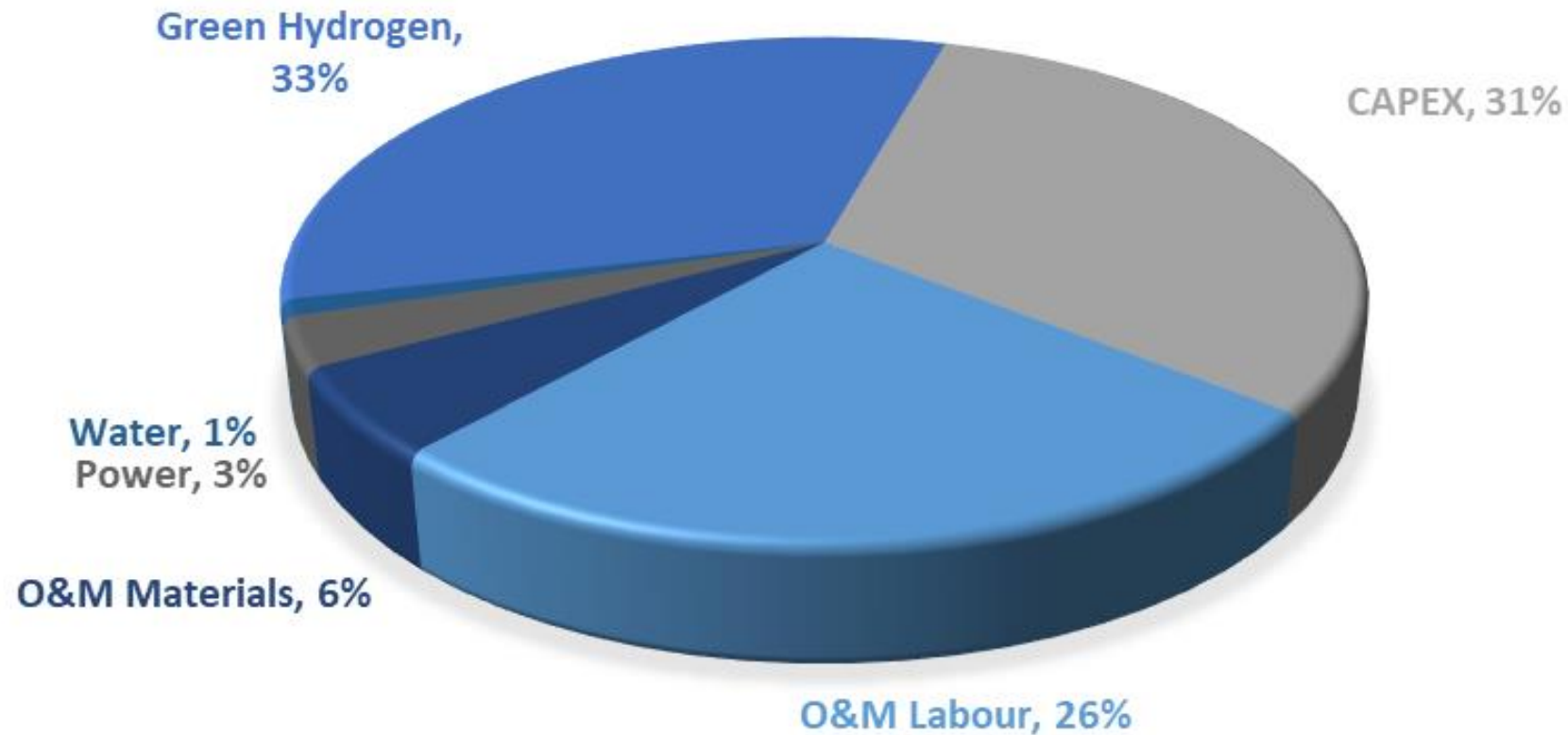
Assumed lean operations
at the smaller scale



**NOW
HIRING**



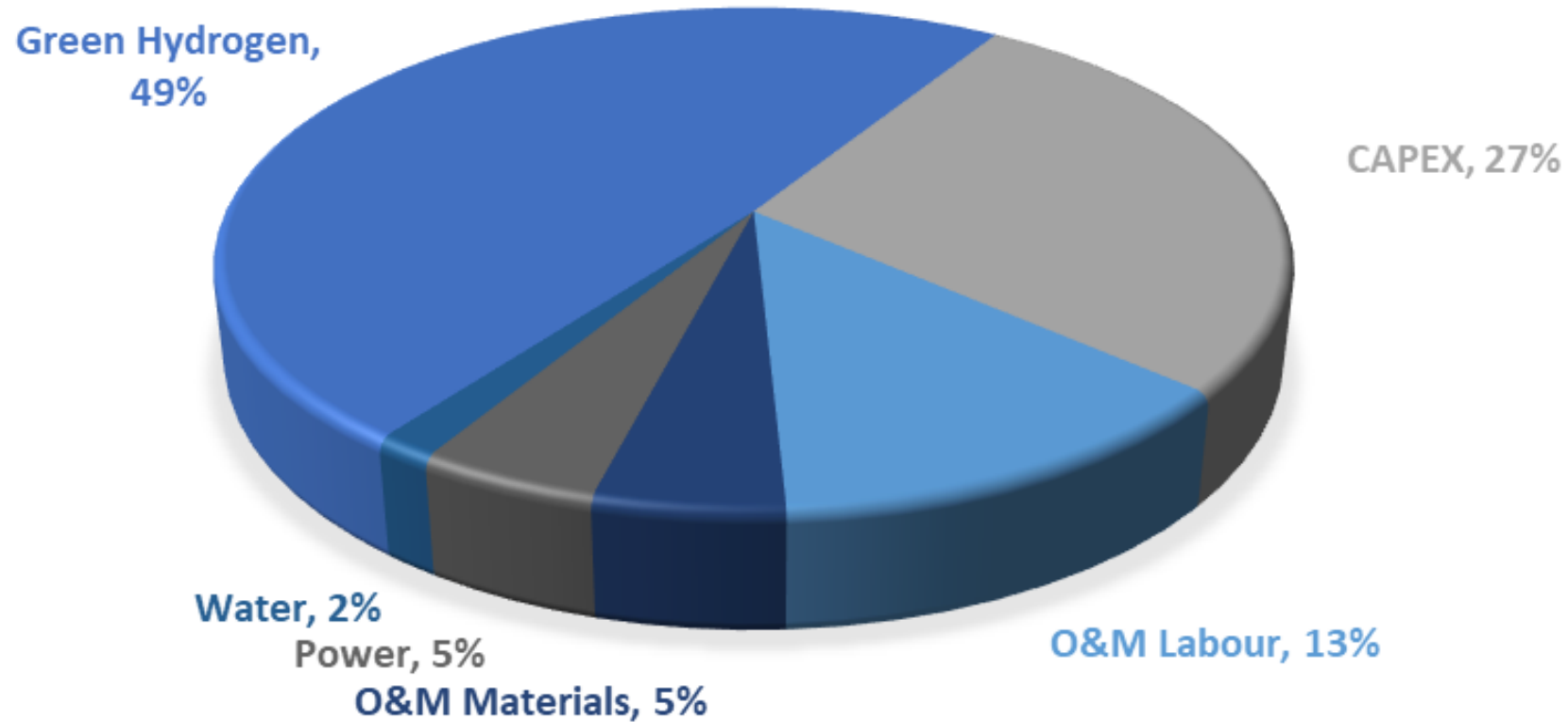
Green Ammonia Case - 25 TPD



Proportion of Levelised Cost of Ammonia



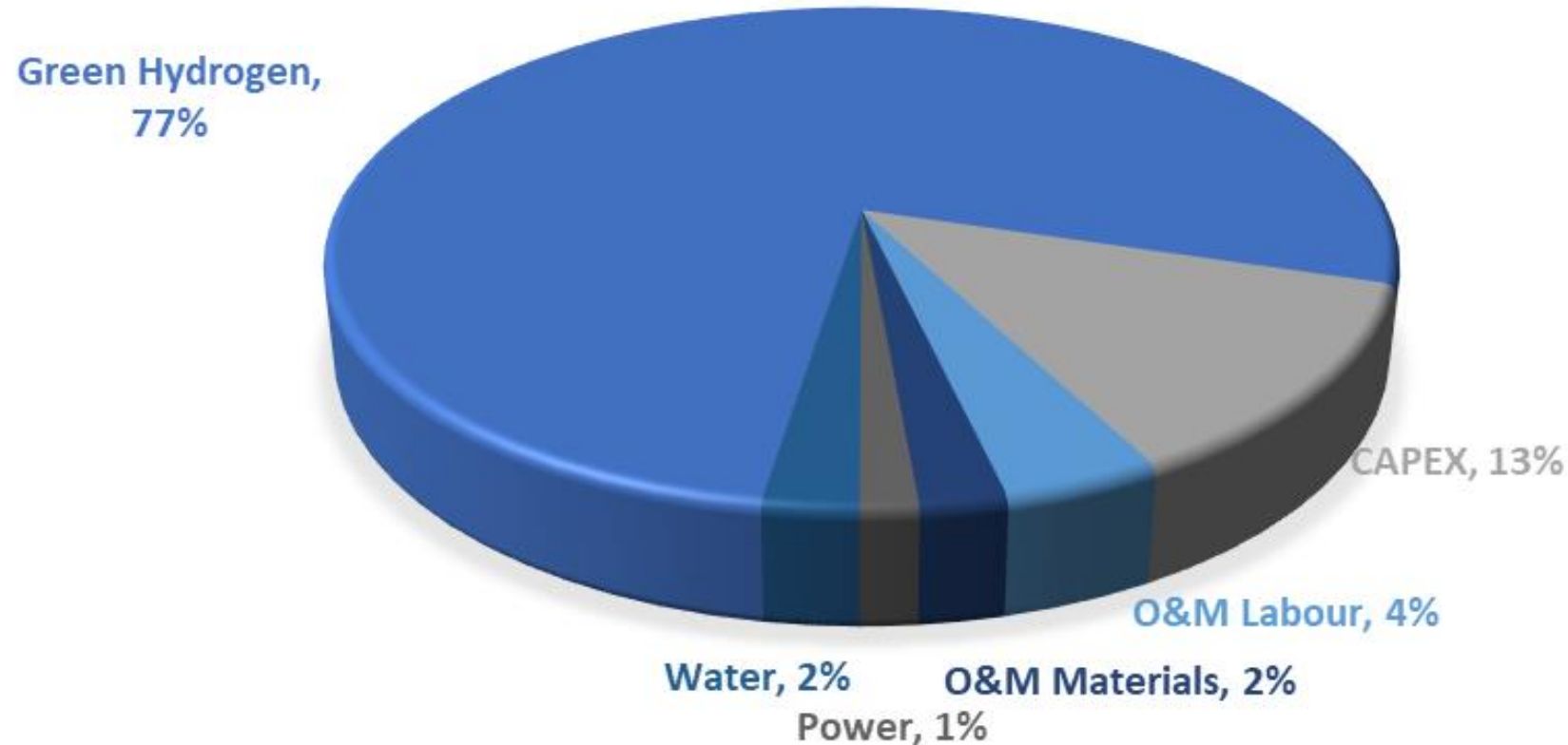
Green Ammonia Case - 250 TPD



Proportion of Levelised Cost of Ammonia



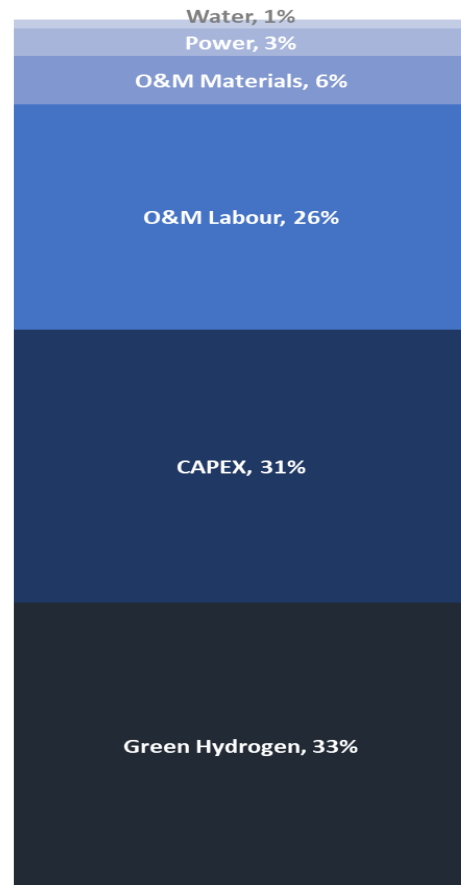
Green Ammonia Case - 2500 TPD



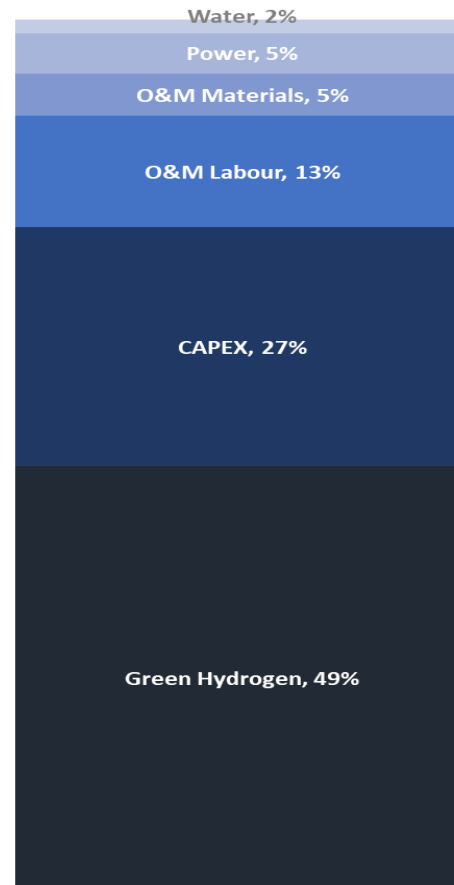
Proportion of Levelised Cost of Ammonia



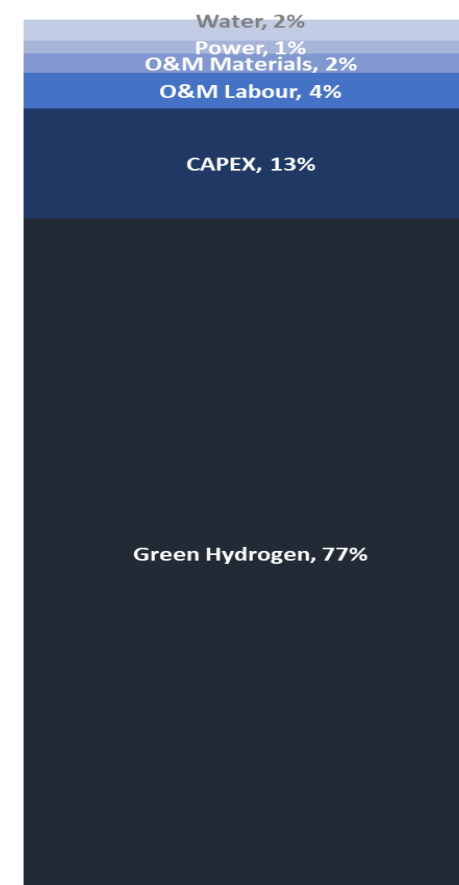
Case Study Results - Summary



GREEN AMMONIA
25 TPD



GREEN AMMONIA
250 TPD



GREEN AMMONIA
2500 TPD



Observations

- Labour cost exaggerated at small scale
- Green hydrogen cost ultimately drives commerciality at large scale
- Large scale the economical path to job creation
- Cost of carbon could make a difference / Green premiums

Options for small scale green ammonia

- Unmanned facilities
- Co-located with existing facilities
- Co-located with allied industries



Questions ?

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“Energy and chemical conversion specialists”

