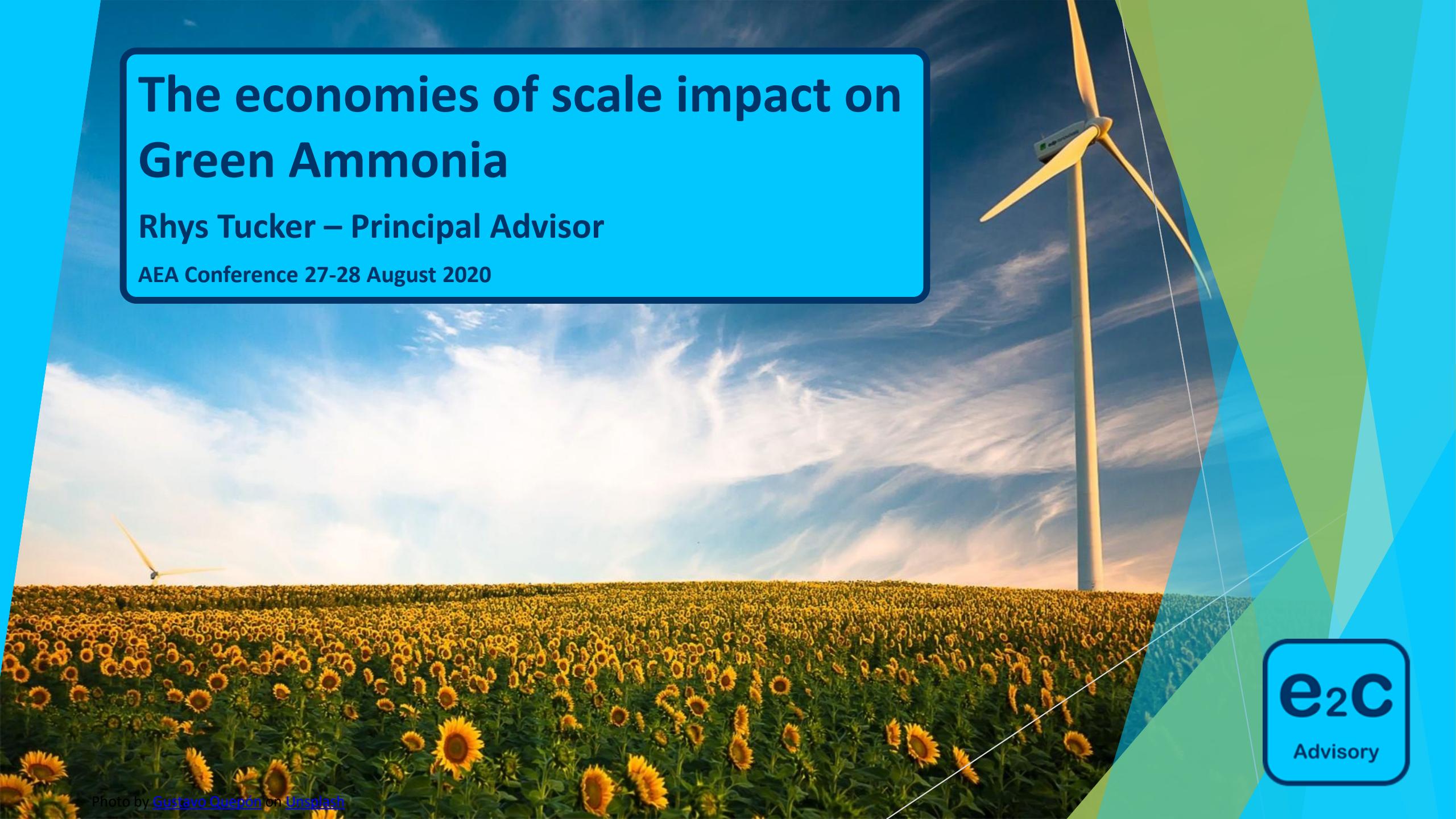


# The economies of scale impact on Green Ammonia

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AEA Conference 27-28 August 2020



# Disclaimer

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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



Hydrogen



Air Separation

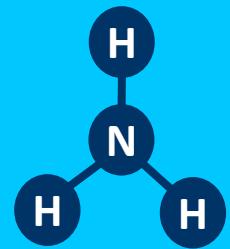


Nitrogen

## Case Study



Ammonia  
Synthesis



Green  
Ammonia

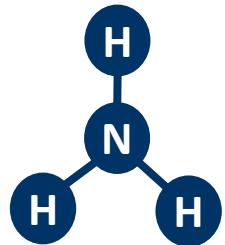


# Opex

- 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 H<sub>2</sub> electrolysis  
10MW, 100MW and 1GW



Assumed lean operations  
at the smaller scale

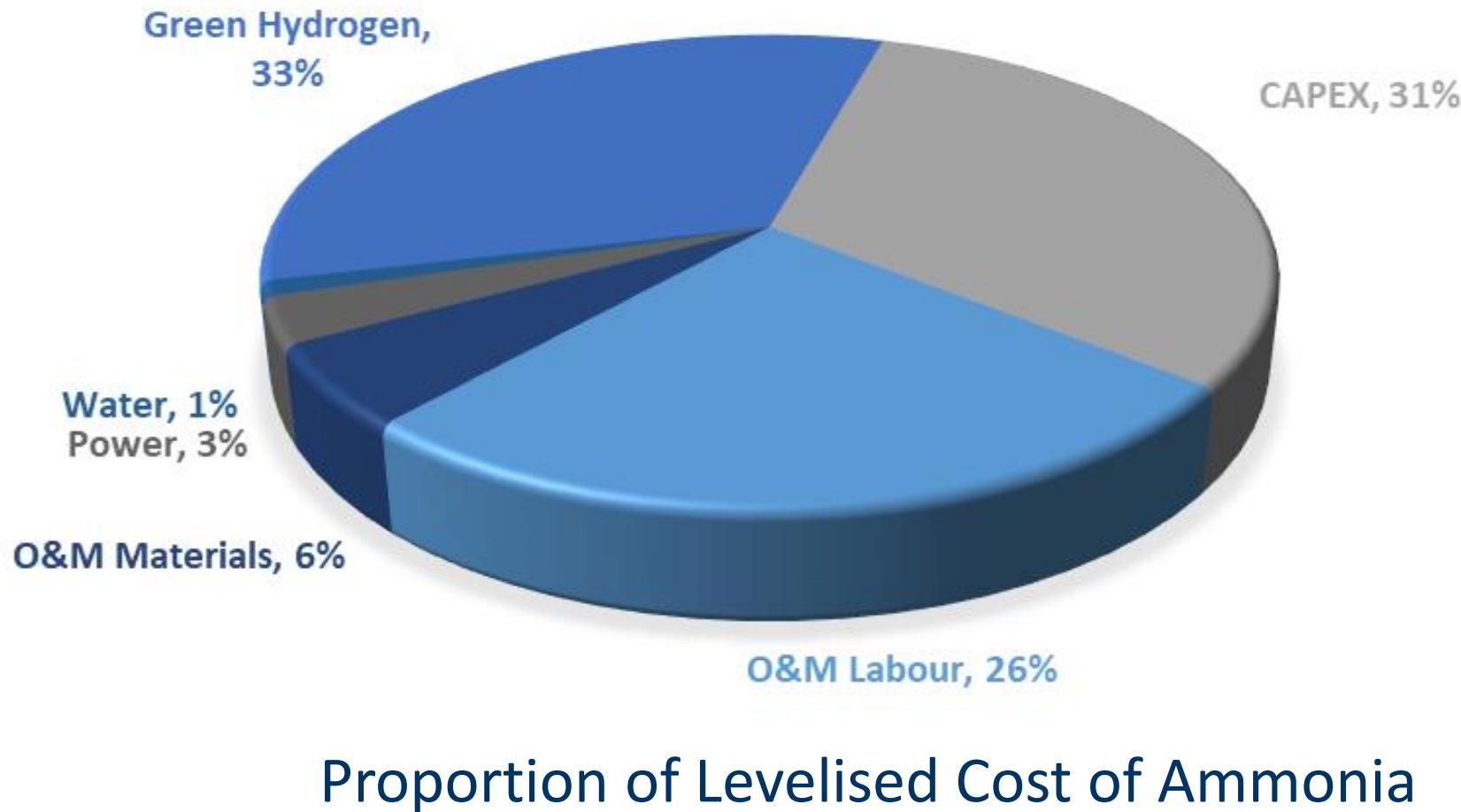


A 'Now Hiring' sign is positioned on a grassy lawn in front of a building. The sign is white with black text and is mounted on a metal frame. The background shows a street with trees and a clear sky.

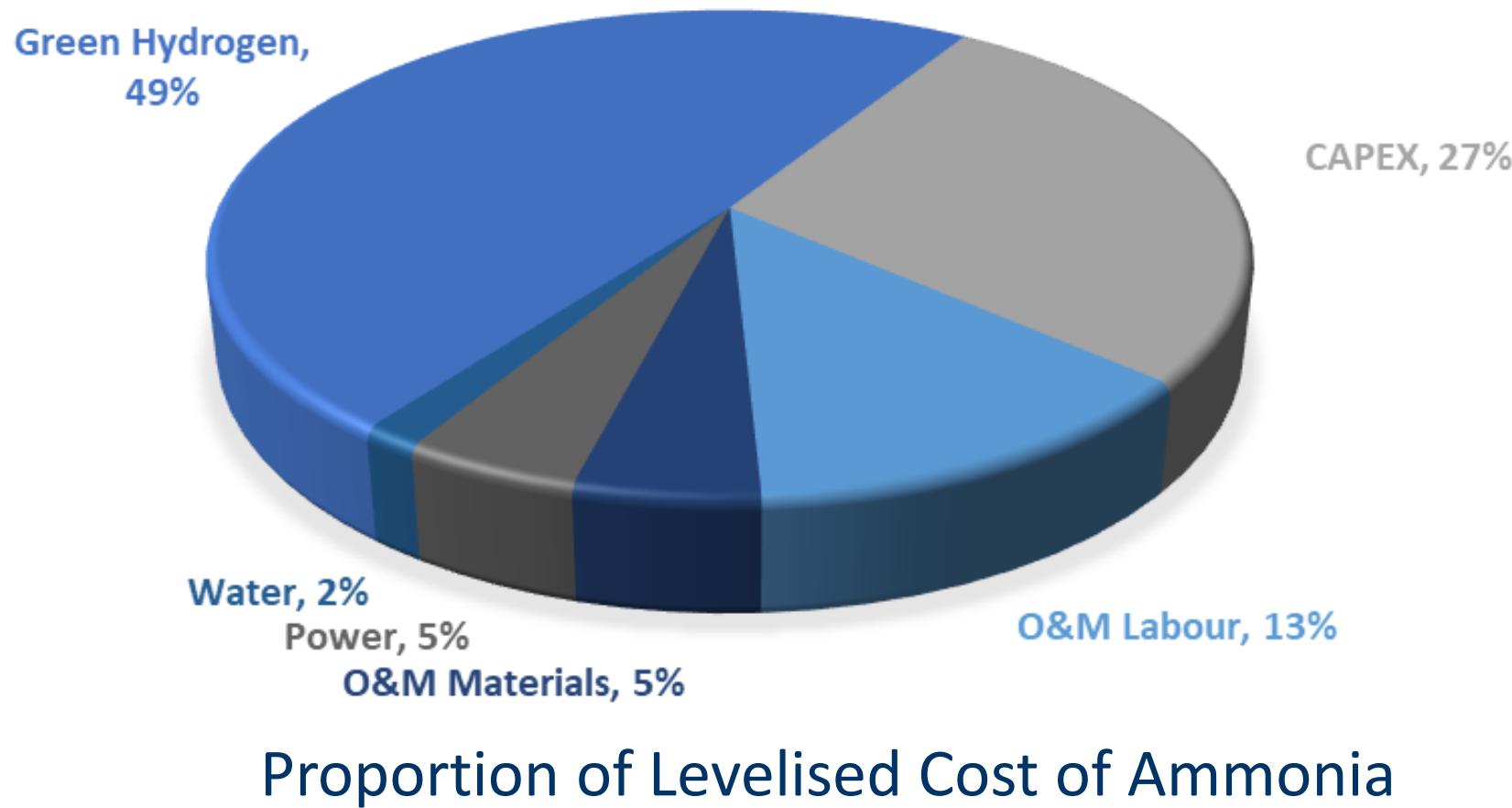
NOW  
HIRING



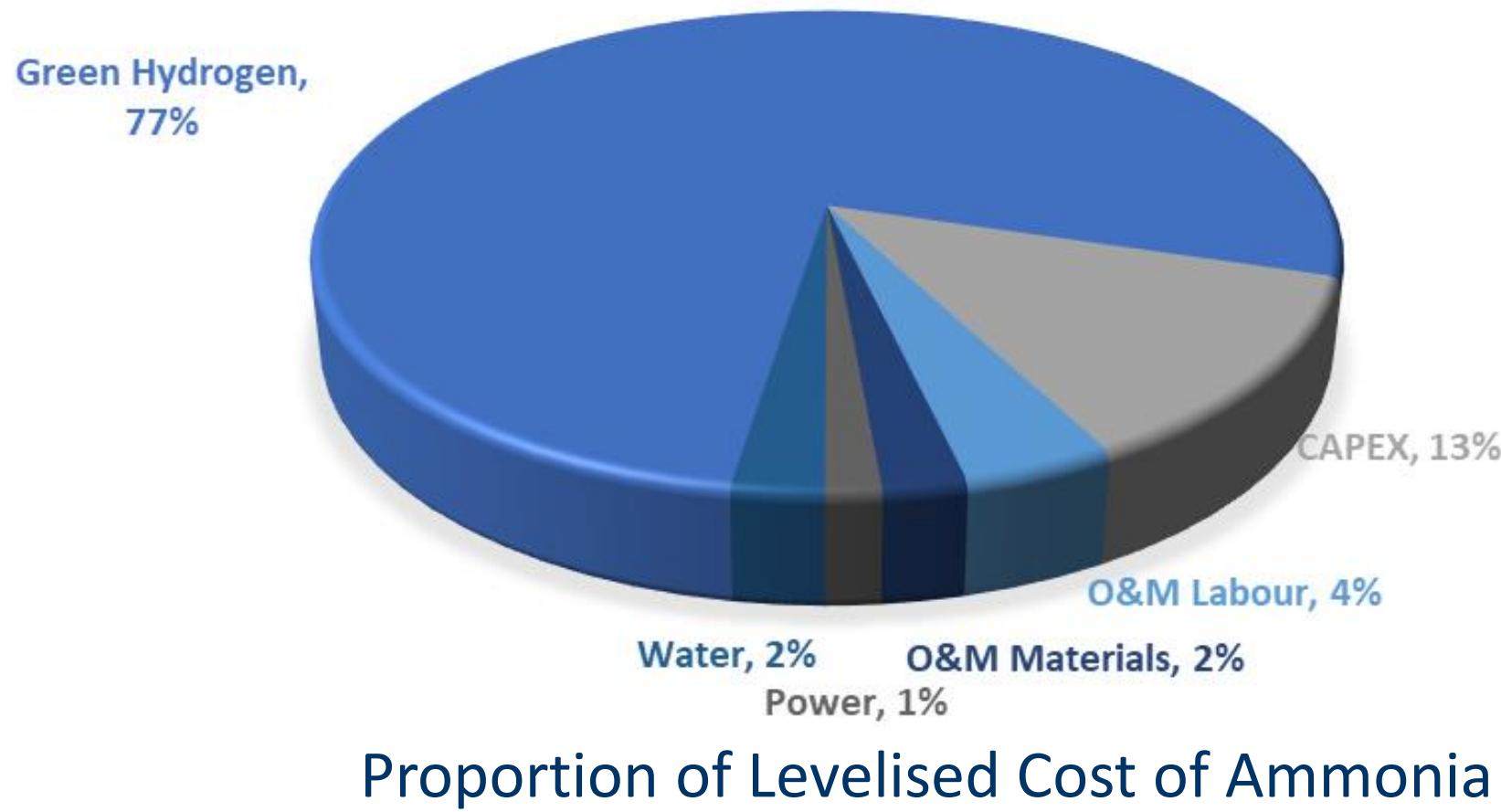
# Green Ammonia Case - 25 TPD



# Green Ammonia Case - 250 TPD



# Green Ammonia Case - 2500 TPD



# Case Study Results - Summary



# 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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Principal Advisor



“Energy and chemical conversion specialists”

