

SNAPSHOT

Renewable Hydrogen (H₂) Cost-Benefit Analysis for Australian Red Meat Processors (RMPs)

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Project Description

Hydrogen offers RMPs the following potential advantages:

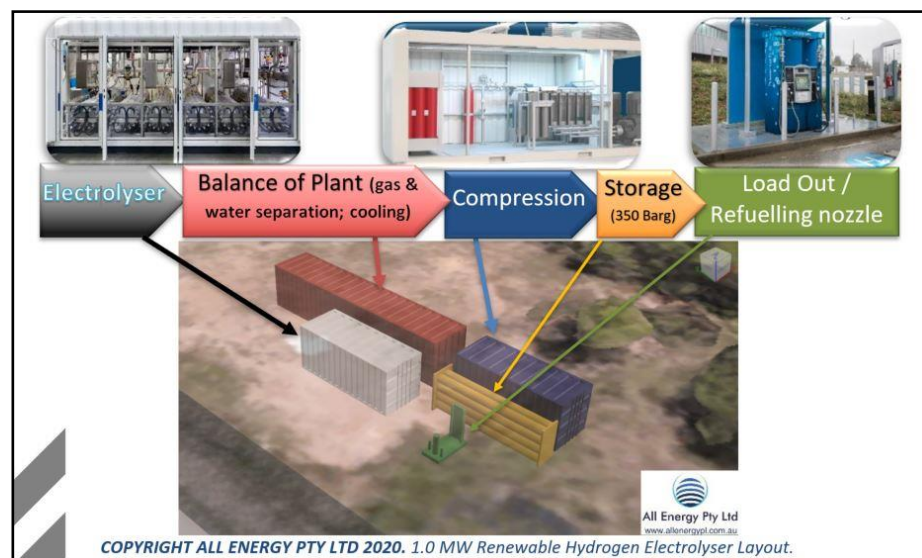
- Lower cost transport fuel compared to diesel, unleaded, and LPG.
- Lower cost on-site electricity compared to diesel generators.
- Energy security by producing fuel inhouse and/or domestically thereby reducing reliance on existing liquid fuel supply chains.
- No greenhouse gas (GHG) emissions.
- No particulate, NO_x, or SO_x emissions when used in a fuel cell thereby offering the opportunity to increase air quality within factories and in local environments.
- Regional / remote area energy storage and utilization.
- Noise minimization when used in a fuel cell (i.e. the same as an electrified solution).
- Co-creation of oxygen (for waste water treatment aeration) and thermal energy (to reduce fossil fuel usage).

Project Content

Feasibility study for an RMP considering:

- Hydrogen as a transport fuel for refrigerated trucks, hook bins, and other heavy vehicles,
- Hydrogen forklifts and light vehicles,
- Power generation for off-grid, peak shaving, and emergency power applications,
- Public refuelling hubs for transport vehicles (e.g. sale to logistics sub-contractors),
- Sale into the general market as industrial hydrogen for oil refining, metal works, glass manufacture, R&D, etc.

Presented below is an indicative layout of a 1.0 MW electrolyser for producing hydrogen. When making hydrogen via electrolysis, low cost power is the key parameter which could be sourced from co-located PV solar arrays, wholesale power, off-peak power, or biogas engines.



Some high level numbers for a 1 MW electrolyser module on a per annum basis:

- H2 production: 121 tpa nominal (159 tpa system rating).
- Energy consumption: 5,950 MWh pa (nominal). 38% from PV solar, balance from off-peak grid. Max.: 1.4 MWe.
- Operations and Maintenance: as per an industrial chemical facility; main daily maintenance is on rotating equipment; electrolyser stack replacement after ~64,000 hours. Approx. 9% of capex pa.
- Water demand: ~1416 tpa of potable or low salinity (e.g. sterilisation water).
- Co-products: 968 tpa oxygen and hot water (~50 Deg C).
- 121 tpa H2, when used in a fuel cell truck, equates to ~726 kL of diesel. Depending upon utilisation and a number of other parameters, this equates to approx. five (5) B-doubles.

Benefit for Industry

Samples of the types of hydrogen devices currently available include:

Depending upon the efficiency of the fuel cell device, 1 kg of H₂ provides the same brake power (i.e. the output power of a motor) as approximately six (6) litres of diesel when used in a fuel cell, or towards twelve (12) litres when used in a dual-fuel system displacing ~9% of diesel usage.

Payback periods for different hydrogen power generation and mobility devices. Utilising hydrogen available at approximately \$3 / kg H₂, payback periods for devices include:

- 6 years for B-doubles
- 5 years for forklifts
- 3 years for semi-trailers.
- 2 years for a hydrogen fuel cell generating stationary electricity (displacing diesel) and generating hot water (displacing LPG) allowing \$1/kg for transport of hydrogen from RMP to feedlot.
- 7 years for a hydrogen fuel cell providing peak shaving at a RMP facility (i.e. reduction in grid power costs).

Vehicle Description	Image / Information	
B-doubles / road trains: - Wester Star with Horizon FC by Hyzon Motors. - Kenworth with Toyota FC Mercedes Eonic platform		
Hook frames for Roll-On/Roll-Off bulk waste hook bin containers e.g. Mercedes Eonic platform available in Australia via SuperiorPak.		
Refrigerated delivery: - Mercedes Eonic platform - Hino 700 Series platform (not yet available in Australia)		
Any ridged configuration up to ~30 tonnes - Mercedes Eonic platform for cement and waste collection trucks.		
Any truck-trailer combination: - Hyundai Xcient platform to 34 tonnes. - Hino 700 Series platform (not yet available in Australia) to 25 tonnes.		
Light vehicles: 5 seater Source: - Toyota MIRAI, Hyundai - NEXO FWD SUV		
Forklifts: - Hyster - Toyota Materials Handling		

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