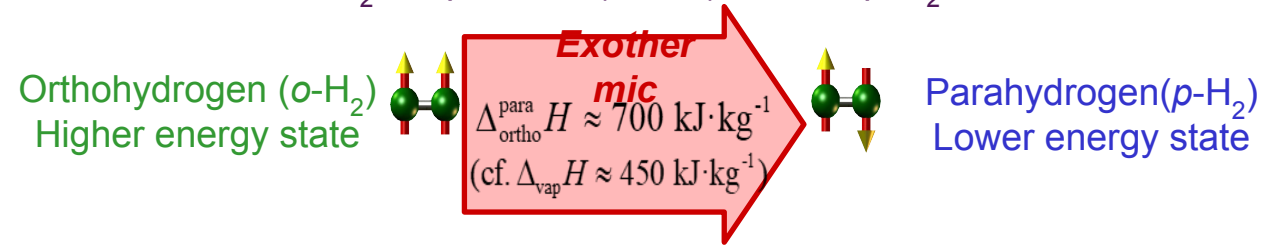


- Semi-analytical model for boil-off – temperatures and pressurisation
- Evaluating typical ship journey phases
- Extending model to handle liquid movement due to ship motion
- Experimental measurements of o-p catalytic behaviour with WSU
- Evaluating how to use the energy inputted in o-p conversion to use

Ambient temperature: Normal Hydrogen ( $n\text{-H}_2 = 3:1$   $o\text{-H}_2:p\text{-H}_2$ , i.e. 25 %  $p\text{-H}_2$ )  
 $\text{LH}_2$  temperature ( $\sim 20$  K): 99.8 %  $p\text{-H}_2$

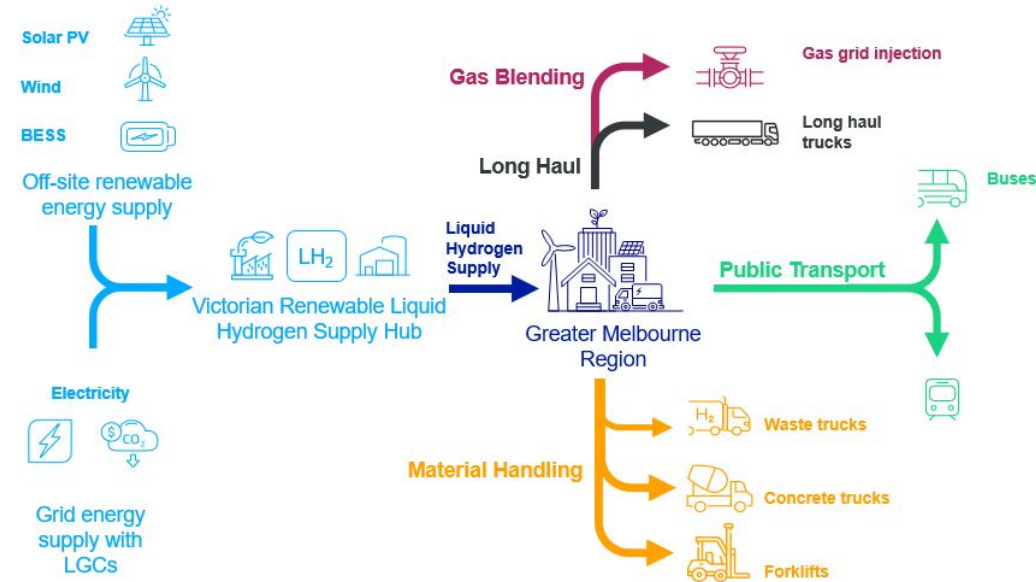
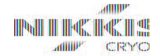


# Liquid Hydrogen Supply Hub

## Victorian Renewable Liquid H<sub>2</sub> Supply Hub Feasibility Study



Energy, Environment and Climate Action

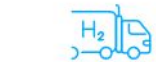


1 Off-taker assessment	2 Optimised supply chain configuration	3 Competitiveness assessment
Project tasks		
<ul style="list-style-type: none"> <li>Identify key end-use applications</li> <li>Conduct stakeholder interviews</li> <li>Rank off-takers based on defined criteria</li> <li>Identify a proposed portfolio of off-takers to match the Supply Hub development timeline.</li> </ul>	<ul style="list-style-type: none"> <li>Develop the cost-optimisation model in PROSUMER</li> <li>Determine the optimal energy supply chain configuration</li> </ul>	<ul style="list-style-type: none"> <li>Calculate KPIs for the optimised configuration</li> <li>Compare the KPIs to the non-renewable alternatives.</li> <li>Provide quantitative insight into the logistical supply chain</li> </ul>

### Liquid H<sub>2</sub> benefits



#### 1. Storage density



#### 2. Transport



#### 3. Faster refuelling

- Short-listed applications: waste trucks, forklifts, trains, gas grid injection, buses, concrete trucks, long haul transport
- LCOH \$14-16 AUD/kg ~80 % cost electricity for electrolysis and liquefaction (5 TPD)
- With collocation with RES -> LCOH \$8.4-9.7 AUD/kg -> at this price cost competitive with diesel for forklifts, buses, waste and concrete trucks

### Existing small scale liquefier (left from HESC project)



Potential Training and Research facility  
For proposed Scaling Green Hydrogen CRC



Dr Tom Hughes

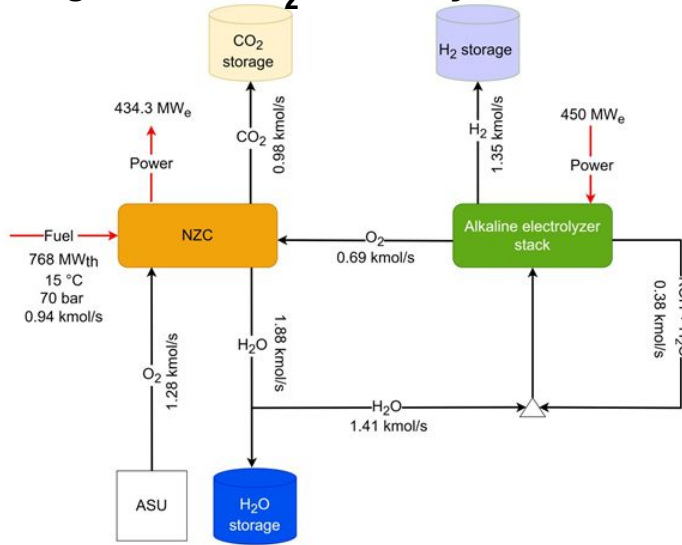


Professor Paul Webley

# Process Simulation, Integration and Decarbonisation Studies

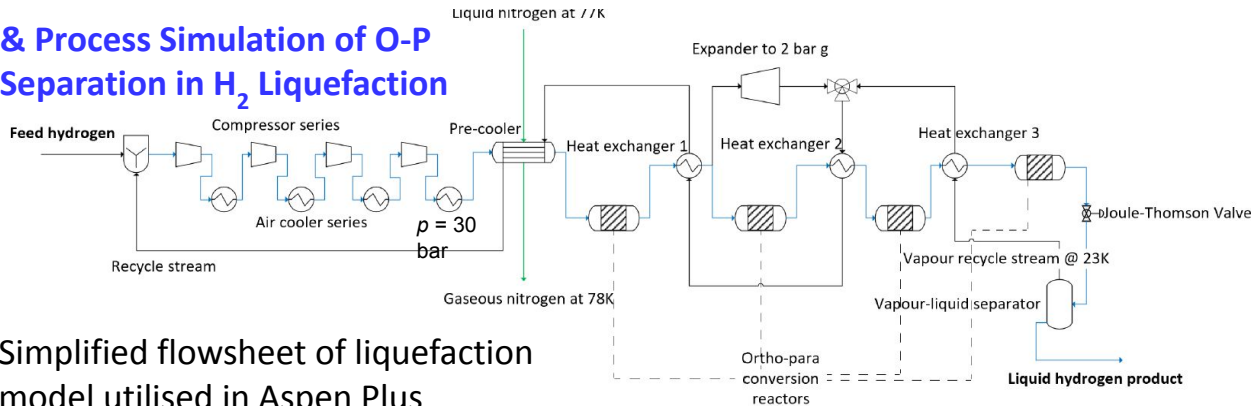


## Integration of H<sub>2</sub> electrolysis with Net Zero Oxyfuel Combustion



- Process integration of net-zero oxyfuel combustion natural gas power cycle (NZC) with alkaline electrolysis
- Heat and oxygen integration
- First law system efficiency 62.5%

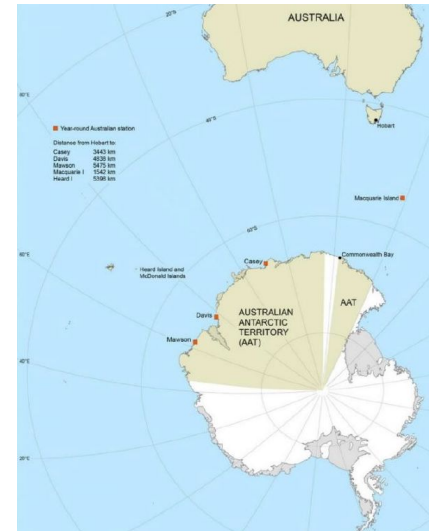
## & Process Simulation of O-P Separation in H<sub>2</sub> Liquefaction



Simplified flowsheet of liquefaction model utilised in Aspen Plus

Also study on cold recovery at LH<sub>2</sub> regasification terminal

## Decarbonisation of Australian Antarctic Operations



- Evaluate the use of green hydrogen to benefit Antarctic operations, research and resource transportation
- Financial and environmental impact between using diesel and hydrogen at Mawson station
- Opportunities for waste to hydrogen generation
- Benefit of hydrogen for current and future research operations in Antarctica

Other study of decarbonisation of airport operations