CALIBRATE 2024 PARTICIPANTS WORKSHOP

BLUE ECONOMY COOPERATIVE RESEARCH CENTRE

Australian Government
Department of Industry, Science and Resources
AusIndustry
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Tourist Islands, offshore RE, and hydrogen

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I undertook a PhD on this topic with the Blue Economy CRC because I wanted to further develop my knowledge on renewable energy offshore and how hydrogen could be used in decarbonising human efforts offshore.

Following my PhD, I wish to work applying my knowledge in the field further developing efforts in hydrogen, microgrids and renewable energy in engineering and design.

The potential impact of this research, for current and emerging industry needs includes decarbonised marine transport, hydrogen production offshore, DC microgrid use offshore, aquaculture, and offshore tourism. My research fits within the bigger picture of the emerging Blue Economy in that it is using offshore wind farms, hydrogen as an energy carrier produced offshore, use of wave energy, digital twins, and the DC microgrid lab to emulate these case studies for islands.

In this poster we will examine the opportunities, benefits and challenges for DC microgrids employing hydrogen for 100% renewable energy for Australia's islands. We will examine use cases for aquaculture, tourism, offshore energy, for emergency power, fuel for marine ships and light aircraft as well as for industry on islands producing hydrogen.

Tourism offshore transport and islands

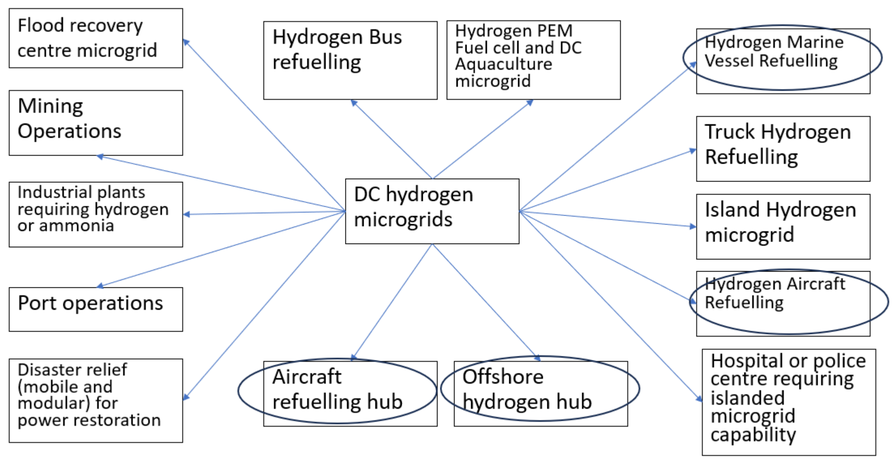
Tourist fuel cell powered catamarans and boats with electric motors will be quieter and cleaner. Hydrogen producing microgrids can support island operations renewable microgrids supporting power and water needs. Clean green renewable operations with no diesel, petrol, or gas. Working with operators to see what technologies would best suit them and build understanding. Australian islands, renowned for their commitment to environmental stewardship, are poised to set a groundbreaking example by retrofitting its current energy infrastructure with a direct current (DC) hydrogen microgrid. This comprehensive transformation encompasses the integration of solar panels, batteries, and an innovative hydrogen system, marking a significant leap towards a sustainable future. Sustainability and unique conditions on islands in Australia such as environment protection laws (reduce pollution), extreme weather conditions, and local renewable energy resources. The DC Hydrogen microgrid will help to create a fully sustainable community on an island (full water, food and fuel systems which can withstand storms, hurricanes, and intermittent lulls in energy production).

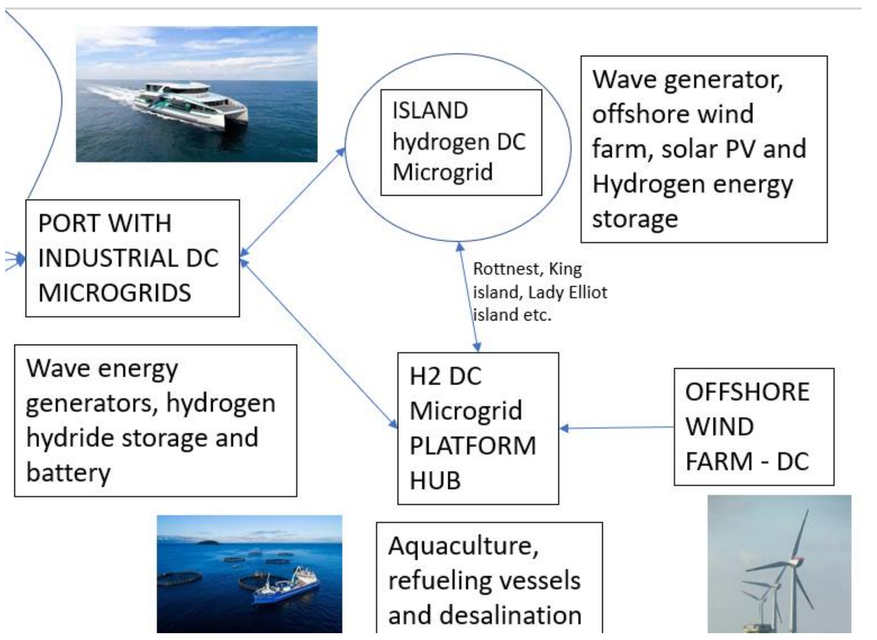
King island (Tasmania) – world leading solar and wind microgrid, has trialled wave energy

In this section we will explain the diagram of use cases and applications around the world. These do include renewable efforts in Queensland (Elliot and Hamilton), Western Australian (Rottnest) and Tasmania and King islands.

To initially reduce diesel generator from being used from 24 hours a day to removing fossil fuels for an island. The system is modular and allows for straightforward expansion. To grow a system and expand the system to a commercial grade, 3-phase system with additional solar panels, batteries, and associated infrastructure. Island renewable power system with solar panels, batteries, and hydrogen carrier storage system for energy storage for complete renewable energy use. The DC microgrid laboratory emulating this island will use lithium batteries for grid balancing and hydrogen storage emulation for fuel production and improve on simple controls using algorithms. Microgrids can help with an educational role and help with multiple island energy systems. Island resorts and settlements seek sustainability for energy and fuel needs and have different needs which can be modelled through the DC microgrid laboratory.

Improvements to the functions of the microgrid system and expansion for applications for a power microgrid using hydrogen. Improvements to renewable energy systems control through improved control mechanisms and hardware will enable new configurations for renewable energy systems on islands. Functionality of the island microgrids – how do they work and who are they for – Inter-island transport, distances of 100 to 1000km between islands for Mediterranean, pacific locations (resources) and island nature reserves such as the Galapagos. Port to island 100-1000km from shore with islands which are due for infrastructure upgrades and want to improve their sustainability.





Lady Elliot island moving towards full sustainability (Qld, Aust.) – solar and battery

Rottnest island which has solar and wind and is looking into hydrogen buses (WA, Aust.)