CALIBRATE 2024 PARTICIPANTS WORKSHOP

BLUE ECONOMY COOPERATIVE RESEARCH CENTRE

Australian Government, Department of Industry, Science and Resources, AusIndustry, Cooperative Research Centres Program

Optimizing the Operational Control for Energy Management in Low-voltage Standalone Hydrogen-based DC Microgrids

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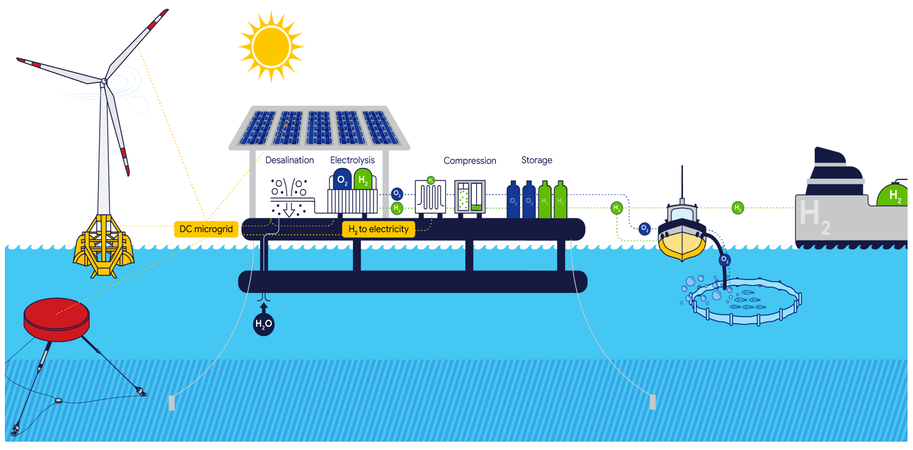
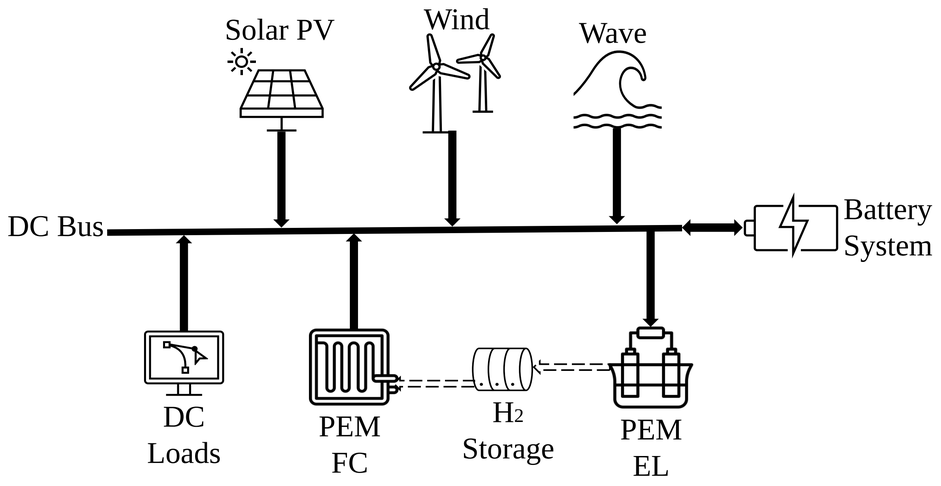
I undertook a PhD on this topic with the Blue Economy CRC because, I was already passionate and curious about electrical power and its capabilities. My ambition is to contribute to the development of innovative solutions using gained expertise in this field.

Following my PhD, initially, I wish to get more hands-on experience in real applications applied in the industry, by joining a related industry where I can apply my expertise firsthand.

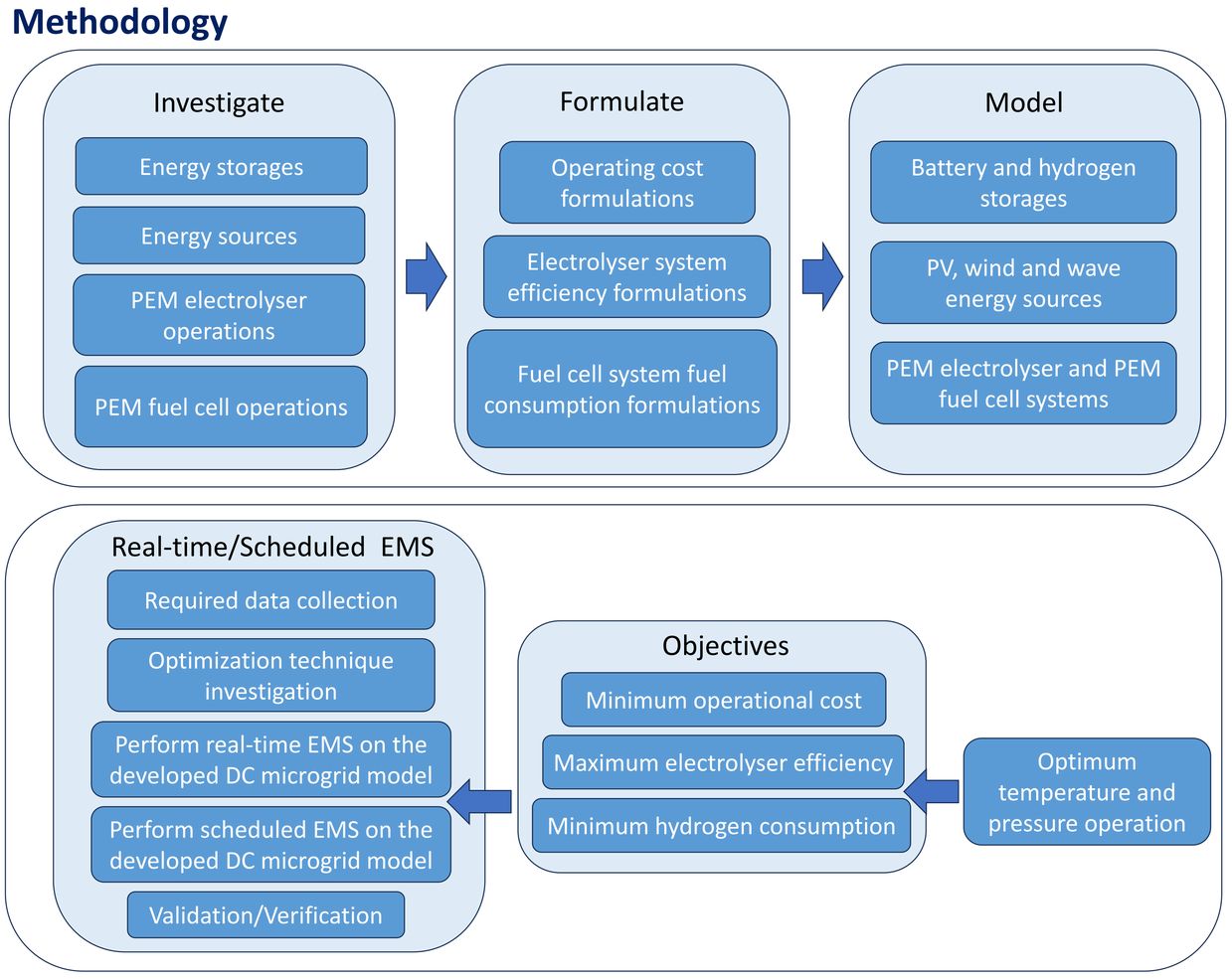




Objectives

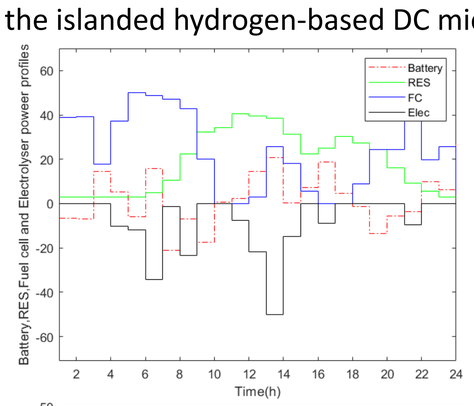
- To model an islanded DC microgrid with a Renewable Energy Sources(RES) mix of solar PV, wind, wave, Proton Exchange Membrane(PEM) electrolyser system, hydrogen storage, PEM fuel cell system, battery storage system and DC loads.
- To achieve optimal operation of the developed islanded hydrogen-based DC microgrid, relating operation cost, PEM electrolyser system efficiency and PEM fuel cell system hydrogen utilization.
- To integrate a real-time Energy Management System(EMS) for the developed microgrid and investigate the impact of temperature and pressure sensitivity of PEM fuel cell and electrolyser systems to the developed real-time EMS.

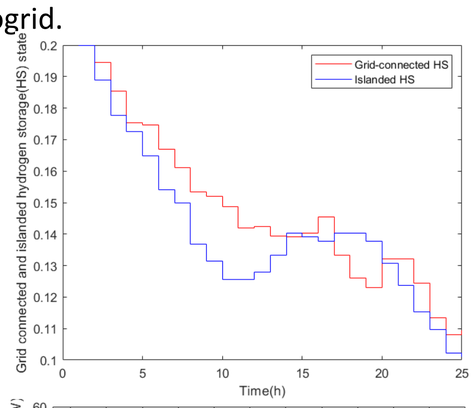
Methodology

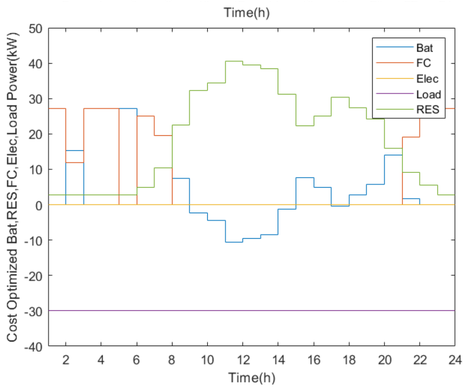


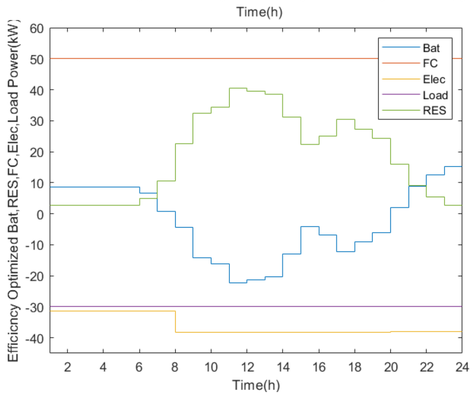
Progress and Results

- Developing a cost minimization-based EMS strategy for the developed islanded hydrogen-based DC microgrid.
- Comparison of hydrogen production capability of cost optimized, grid connected and islanded DC microgrid scenarios.
- Developing a PEM electrolyser system efficiency maximization-based EMS strategy for the islanded hydrogen-based DC microgrid.

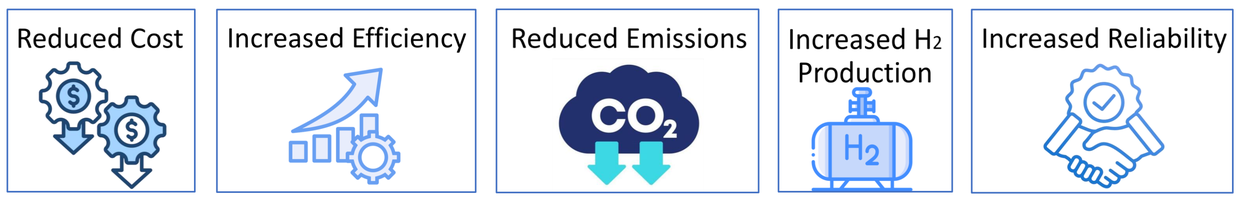








Potential Impacts



Positioning withing the Blue Economy

- Positioned in Research Program 3(RP3), offshore renewable energy systems.
- Aligned with the RP3 aim, it is aimed to provide technological readiness to integrate offshore renewables (wind, wave) to enhance their potential to decarbonize offshore industries (aquaculture, energy export), with the integration of an offshore hydrogen DC microgrid.