CALIBRATE 2024 PARTICIPANTS WORKSHOP

BLUE ECONOMY COOPERATIVE RESEARCH CENTRE

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

AUT NEW ZEALAND · MACQUARIE University SYDNEY·AUSTRALIA · UTS UNIVERSITY OF TECHNOLOGY SYDNEY · OPTIMAL

System Level Modelling to Improve the Performance of Offshore Sustainable Power
WP2 – Fault Protection and Control Mechanism of LVDC Microgrid

Avy Sheina, Auckland University of Technology

Ramon Zamora, Auckland University of Technology; Amanullah Maung Than Oo, Macquarie University; Kosala Gunawardane, University of Technology Sydney; Gary White, Optimal Group

I undertook a PhD on this topic with the Blue Economy CRC because I can contribute to improving renewable energy integration in offshore application while also gaining my expertise in electrical technology.

Following my PhD, I wish to sharpen my skills by working in the industry and contributing more to electrical research and development.

By providing power at sea and replacing the dependency on diesel, ocean renewable energy (ORE) is expected to reduce the environmental impact of offshore aquaculture operations and other offshore industries. To integrate several renewable energy sources (RES) like solar, wind, waves, and tides, microgrids are advantageous. Compared to AC counterpart, DC microgrid offers more benefits including ease of integrating energy storage systems (ESS) and eliminate imbalance voltage, harmonic currents, and frequency deviation. However, DC microgrid is a relatively new research area which also means lack of standards, research, and expertise, especially in the protection system. This poster provides a summary of the proposed methods to overcome the challenges in the protection system of DC microgrid and its *IMPACT* to the blue economy industries.

Why AI-based Protection System?

Integration of several RES and ESS in microgrid

↓

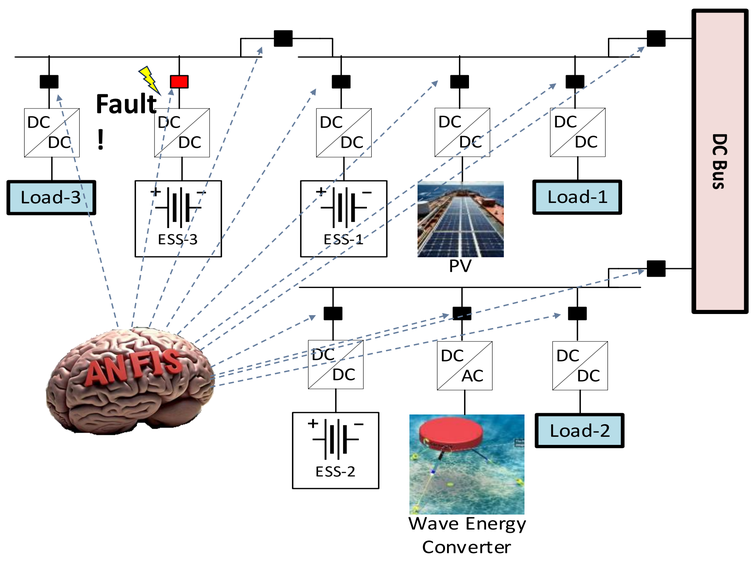
Various fault level, topologies, and operation schemes

↓

Needs for an **adaptive** protection system to detect, locate, and isolate in DC microgrid

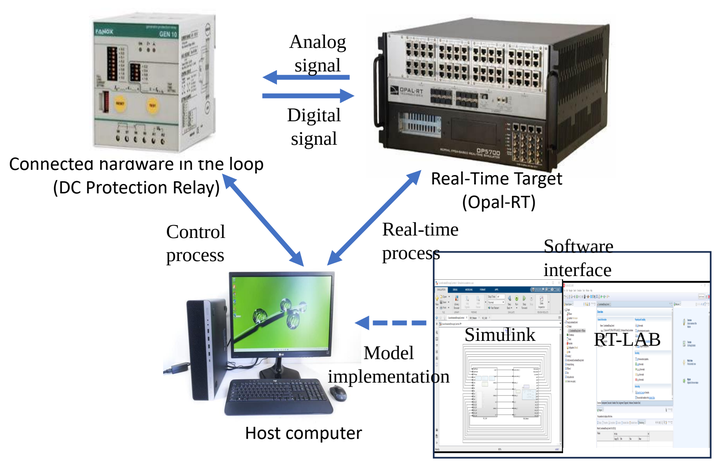
↓

Proposed solution: ANFIS (Adaptive-Network-based Fuzzy Inference System)

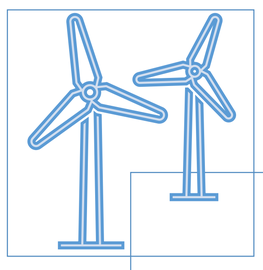


Optimization and HIL Implementation

The ANFIS algorithm will be optimized to achieve the fastest response to clear any faults and the best topology configuration. It will also be tested in a hardware-in-the-loop (HIL) testbed using Opal-RT real time simulator.



How it Fits within the Bigger Picture of Blue Economy?



RP3 – Offshore Renewable Energy Systems

Aims:

- Delivering offshore production systems for energy and aquaculture in a sustainable way.
- Demonstration of ORE powering offshore industry (aquaculture and other).

What is the Impact for Blue Economy Industries?

- Improved power quality
- Reduced fuel consumption
- Optimized loading on RES and ESS
- Lower maintenance cost
- Lower Emission