

# Optimal energy management for hybrid electric marine vessels

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## Project Overview

This MSc project seeks to build on the success of the collaborative R&D project between Babcock, WMG (the University of Warwick) and Potenza Technology Ltd.: Innovate UK funded APMS (Agile Power Management Systems) for marine vessels project (2016 – 2018). This is an exciting opportunity to work with Energy and Electrical Systems research group at WMG, University of Warwick, for pursuing the MSc study and potential extension to PhD study.

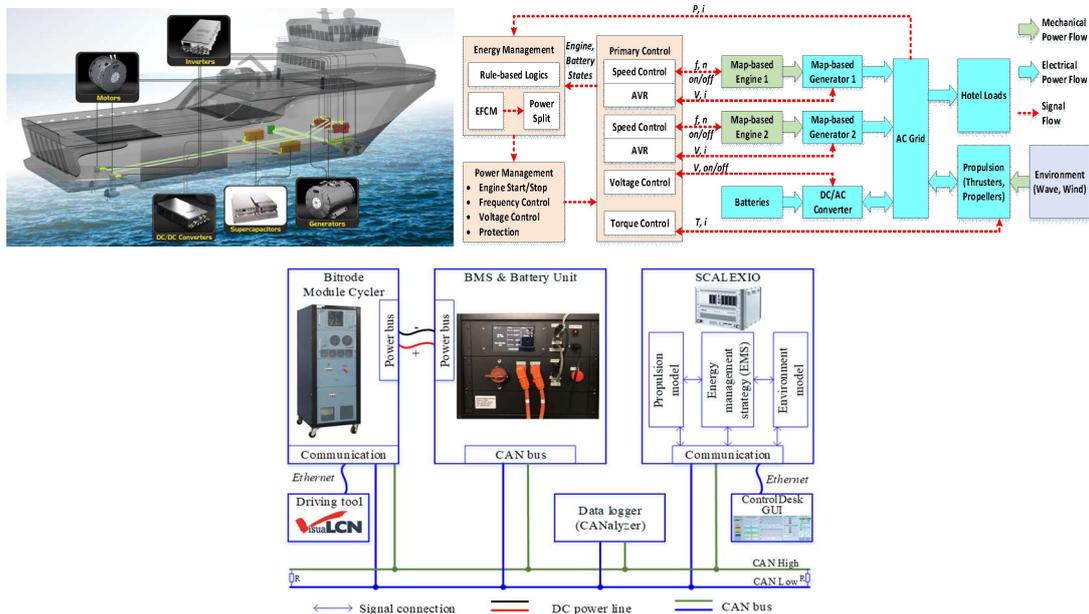
*Motivation* - Modern marine vessels are becoming increasingly reliant on electrical power generation for both auxiliaries and propulsion loads. The clear research challenge in both scientific research and business is to optimise efficiency in production whilst reducing cost and emissions.

*Aims* - The aim is to develop a new approach to specify and implement an advanced energy management strategy (EMS), incorporating global and/or local optimisation algorithms, to improve efficiency, adaptability and resilience of marine vessels while reducing fuel consumption, maintenance costs and environmental impacts.

*Main Objectives* – Using your mathematic background and the relevant work undertaken during the successful APMS project, you will deliver the following objectives through the MSc project: (1) To develop an optimisation algorithm for managing efficiently energy flows between power sources of a hybrid electric marine propulsion system; (2) To demonstrate the capability of the developed energy optimisation algorithm through numerical simulations using (marine vessel model will be provided).

*Research Strategy Alignment* - This project is strongly aligned with two themes of the ‘Energy’ GRP of Warwick: Low Carbon Transport and Energy Management.

*Management Strategy* – During your MSc project, your learning and research supervision will be supported with specialist expertise from the academic team in WMG, on a day-to-day basis, and regular input from Babcock.



Example of successful story through AMPS project

## Qualifications

The preferred candidate will have a passion for research with a strong background covering: mathematical analysis and programming skills (MATLAB will be preferred as the tool for this project).

## PhD Prospect

Continuation to PhD study, your project would be co-funded by Babcock International Group with the full access to the state-of-the-art facilities in WMG’s Energy Innovation Centre, in order to deliver the following objectives: (1) To develop a simulation tool-chain to design and rapidly prototype EMS algorithms for hybrid/electric drive vessels based on the work undertaken during the APMS project and MSc project; (2) To exploit the knowledge of energy storage applicable to the marine sector; (3) To disseminate the scientific outcomes through high-ranking journals and presentations at renowned international conferences/workshops; (4) To expand the capability of the IP already developed and potentially enable Babcock to exploit this in the market, either through licensing or subcontracting system build, integration and through-life support.