Opportunities for Hydrogen in light marine electrification

Fuel Cell Showcase
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Jeremy Bowman B.Sc CEng MIET

HYPERMOTIVE

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Wiring Systems

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Electric Vehicle Systems

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Fuel Cell Systems

Light marine application overview – vessel types

- Motorboats – 82,000 registered in UK
  - May or may not be habitable ‘cabin cruisers’
  - Used on inshore and inland waterways
  - 20-50kW power requirement

- Narrowboats – 38,000 in UK
  - Typically are habitable
  - Used on inland waterways (not seaworthy)
  - Typical 12-20kW power requirement

+ inshore tenders, ribs, etc.

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Light marine application overview – traditional powerplant

Light marine application overview – fuel cell powerplant

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Project HyMARINE

- NVN Funded Project for Concept Feasibility awarded
- Runs from now until April 2020
- Supported by key members of the UK supply chain

- UK/EU Market Study
  - Customer Engagement
- Technology Study
  - Supplier Engagement
- Technical Requirements Capture
- Specification and Sizing
  - System Modelling
- Commercial Study
  - BOM Costing
  - Operating Costs
  - TCO Calculations

UK/EU Market Study

Clean Maritime Plan – the UK government expects that by…

2025

- All new vessels being ordered for use in UK waters are being designed with zero emission propulsion capability.
- Zero emission commercial vessels are in operation in UK waters.

2035

- The UK has built several clean maritime clusters. These combine infrastructure and innovation for the use of zero emission propulsion technologies.

2050

- Zero emission vessels are commonplace globally.

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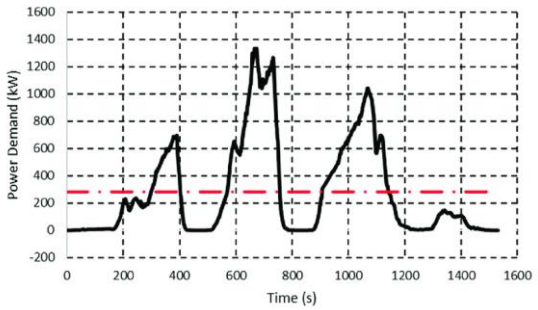
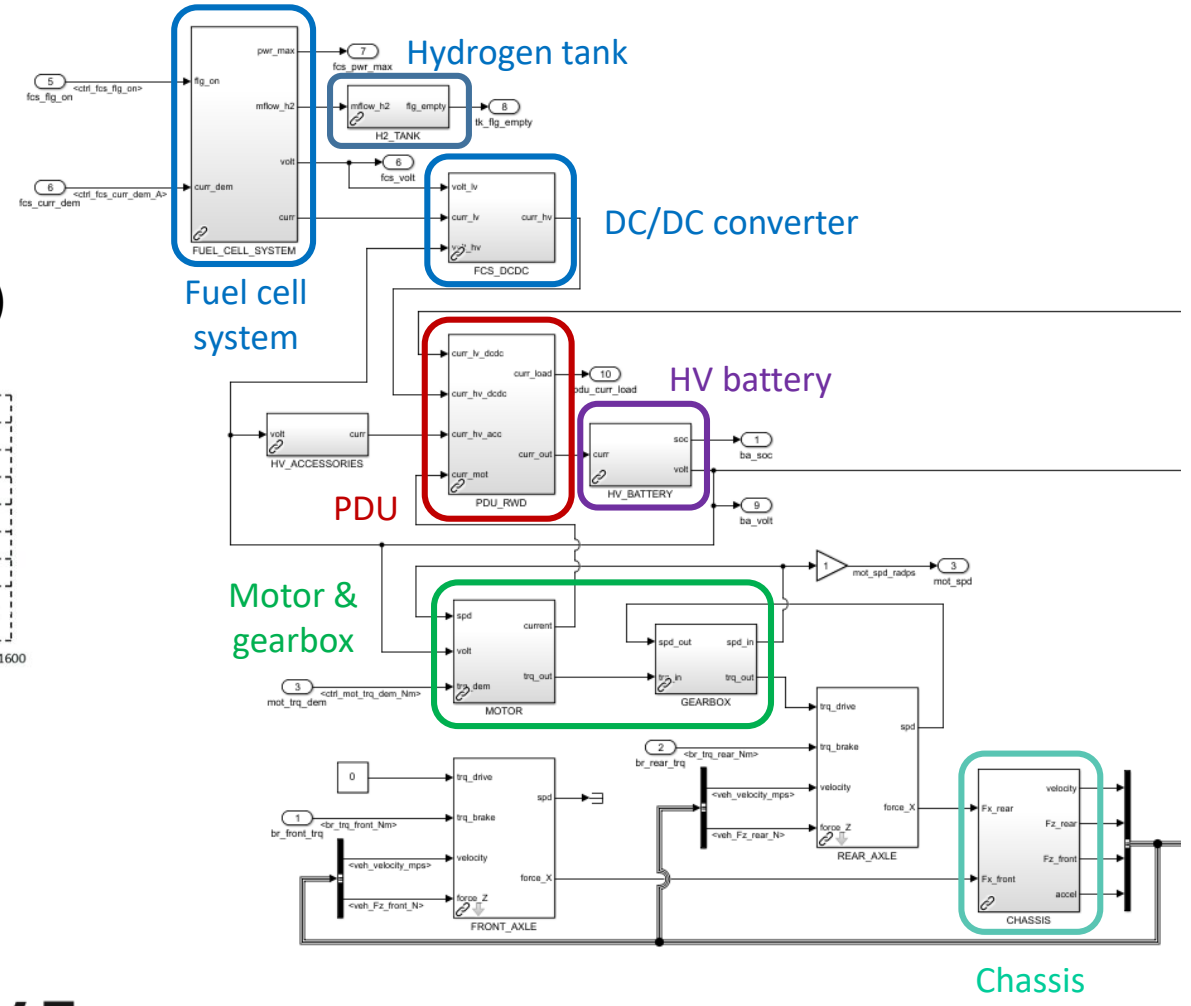
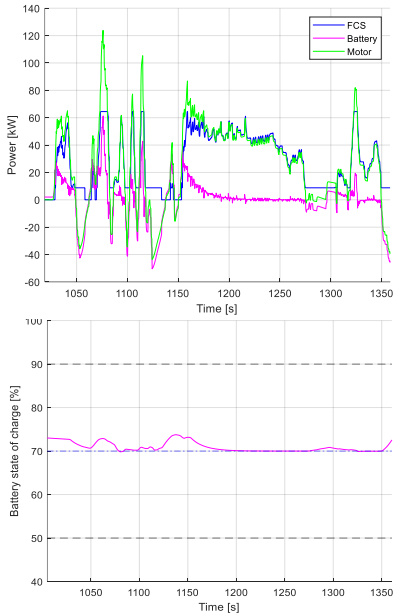
Technology Sizing and Selection

Define duty cycle → Modelling and Simulation → Results

- Peak power (kW)
- Average power (kW)
- Endurance (hours)
- Energy Required (kWh)







- Power
- Energy
- Endurance / Range
- Technology (battery, fuel cell)
  - Battery (NMC, LFP)
  - Fuel Cell (PEM, SOFC)
- Architecture

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Anticipated advantages and disadvantages

Advantages (for the owner / operator)

- Increased performance
- Quieter operation
- Quick re-fuelling
- Zero emission at point of use
- Multiple energy sources for all loads

Advantages (for the engineer)

- Availability of water cooling
- Simple packaging spaces
- Technically capable operators / owners

Disadvantages (for the owner / operator)

- Likely increased TCO compared to diesel

Disadvantages (for the engineer)

- Sealing all components to high IP rating
- Electrical safety in wet environment
- Salt-water environment corrosive effects
- Suitability of automotive components for marine environment

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VERSION: 1.0