CMAL
Caledonian Maritime Assets Ltd
Stòras Mara Cailleannach Eta

SMI Conference

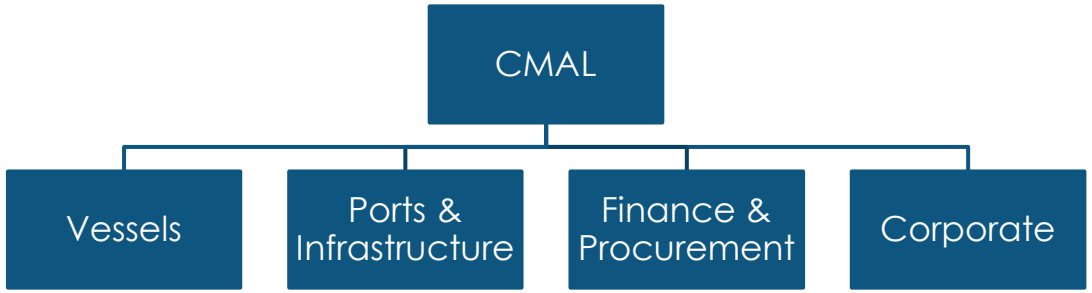
CMAL DECARBONISATION

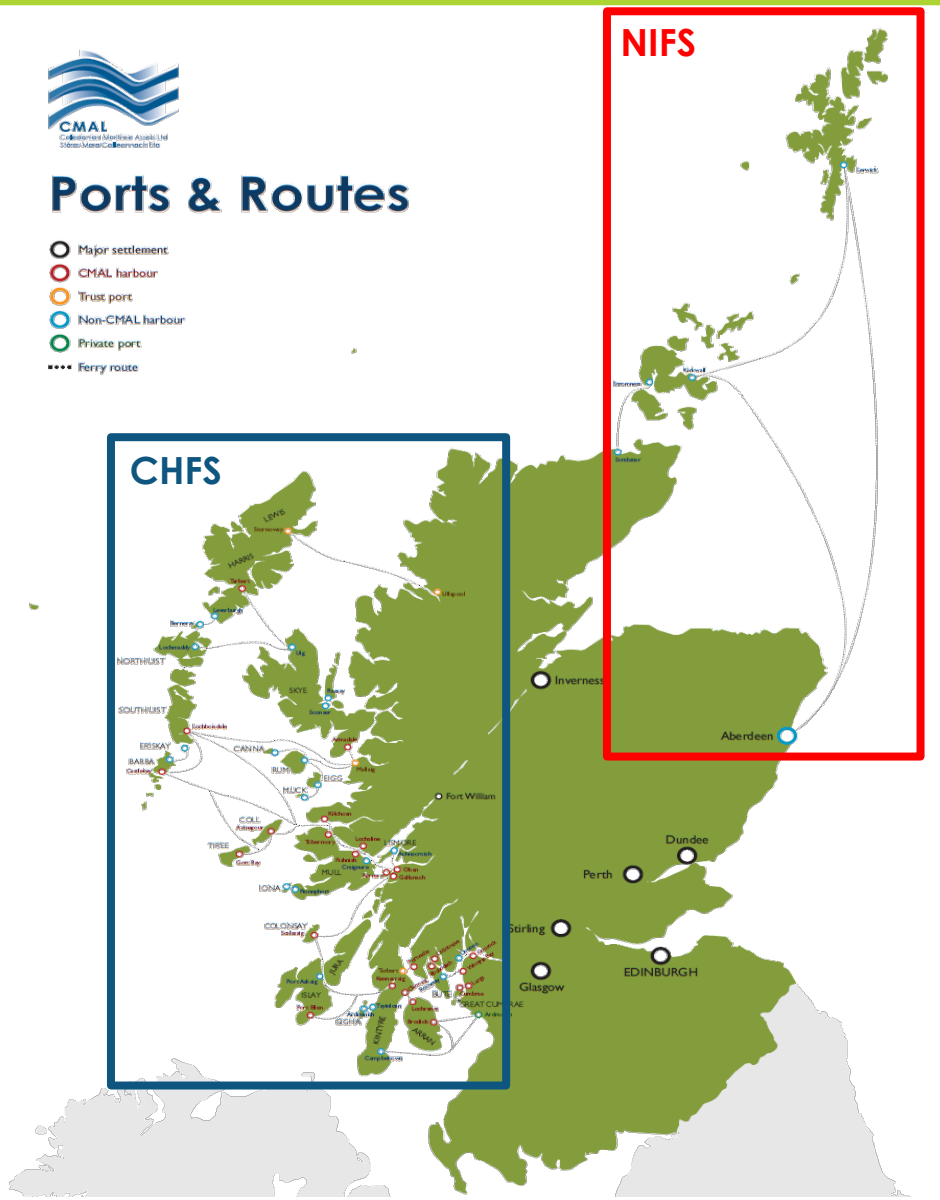
Kevin Hobbs, CMAL CEO

Wednesday 15th March 2023

About CMAL

- Based in Port Glasgow with 50 employees
- Owned by the Scottish Government
- CMAL own 37 ferries operating around Scotland
- CMAL own 26 port facilities which consists of ports, harbours and slipways
- Diverse geographical locations with a number of varying requirements
- Large range of stakeholders and communities





CMAL Fleet

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- 32 Vessels for West Coast (CHFS Contract operated by CalMac Ferries Ltd.)
  - Split into small, intermediate and major fleets

- 5 Vessels for North Coast(NIFS Contract operated by Serco/Northlink)
  - 3 Ro-PAX Vessels & 2 Freight Vessels

CHFS Vessels Projects

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MV Glen Sannox/ 802 LNG Infrastructure

FERGUSON marine
Kosan Crisplant

Detailed design & construction phase

New Vessels for Islay & Little Minch

naVvalue
Custom Ferry Design & Consultancy
CEMRE SHIPYARD
LMG MARIN

Detailed design and construction phase

Small Vessel Replacement Programme (SVRP)

naVvalue
Custom Ferry Design & Consultancy

Concept design phase

Passenger Vessels for Gourock Dunoon Kilcreggan

BMT

Concept design phase

New Vessel for Mallaig Lochboisdale

LMG MARIN

Concept design phase

New Vessel for Oban Craignure

Project initiation phase

NIFS and Other Vessels Projects

Northlink Ro-Ro Vessel Replacement

Concept design phase

HySeas III

Approval in principle for concept design

Decarbonisation of CMAL Fleet

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Major Fleet

Decarbonisation options currently available/ viable for major fleet:

- Dual Fuel (LNG-MGO)
  - 2 duel fuel vessels under construction
- Hybrid (Diesel-Batteries)
  - 4 hybrid vessels under construction

Future options (currently not available or viable for major fleet):

- Full Electric
- Hydrogen
- Methanol
- Ammonia

Small & Intermediate Fleet

Decarbonisation options currently available/ viable for the small/ intermediate fleet:

- Hybrid (Diesel-Batteries)
  - 3 small hybrid vessels in operation (first vessel now 10 years old)
- Full Electric (Batteries)
  - Concept design in progress for 7 small all electric vessels
- Hydrogen
  - Approval in principle (concept design) for a Hydrogen fuelled vessel

It is likely that full electric and hydrogen will be the best solution for the small/ intermediate fleet however, CMAL will investigate all options when developing their designs

New Vessels for Islay and Little Minch

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- **Vessel Summary:**
  - 4 major vessels currently in detailed design & build phase with Cemre Shipyard in Turkey
  - Vessel 1 Delivery (Islay): October 2024
  - Vessel 2 Delivery (Islay): February 2025
  - Vessel 3 Delivery (Little Minch): June 2025
  - Vessel 4 Delivery (Little Minch): October 2025

navalue Custom Ferry Design & Consultancy
CEMRE SHIPYARD
LMG MARIN

- **Towards Net Zero/ Decarbonisation :**
  - Hybrid diesel electric propulsion system with approximately 1 MWh of batteries (NMC chemistry)
    - Batteries to be used for peak shaving, in-port, manoeuvring, slow speed, using alongside during cargo operations
  - Low fuel consumption and emissions due to optimised hull form
    - 30% less fuel consumption and 30% emission reduction compared to the existing vessel on Islay route
    - All whilst achieving 40% increase in freight capacity
  - Low sulphur MGO (<0.1% sulphur content) used for the diesel generators
  - Selective Catalytic Reductors (SCR's) included to reduce NOx emissions
  - DC grid used to allow easy adaption of future technologies
  - Integrated premium efficiency propulsion motors used for the Voith Cycloidal Propulsors (eVSP 26)
  - Shore power used for hotel load when vessel is tied up overnight – no overnight pollution or noise

Small Vessel Replacement Programme (SVRP)

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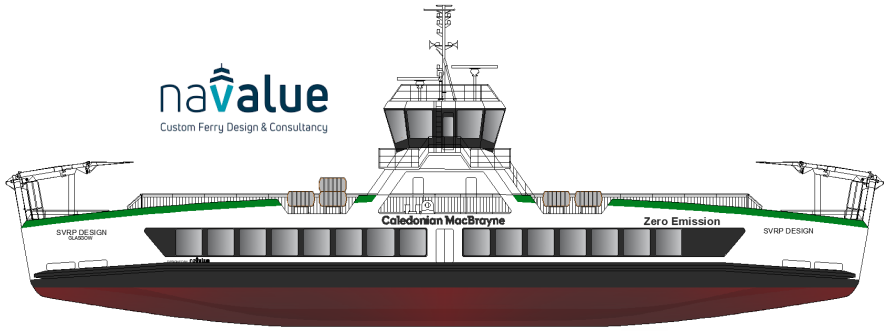
Our Goal for Phase 1:

- To provide up to 7 standardised, modern, state-of-the-art ferries with all electric zero emission operation on various routes along the West Coast of Scotland
- For Phase 2, additional 3 vessels with more route specific designs – will be investigated for zero emission operation

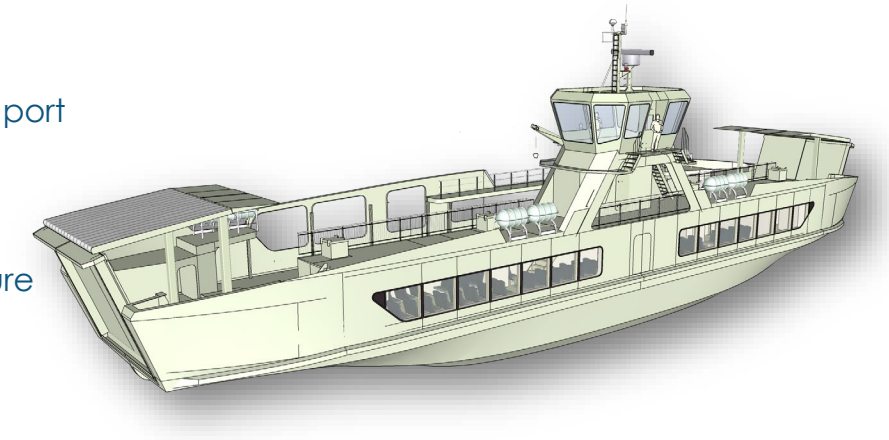
Project Summary:

- In development Stage for Phase 1 *(Concept Design & Feasibility Studies)*
- Procurement commence in 2023 with contract award in 2024
- Initiation stage for Phase 2



Towards Net Zero:

- Daily Zero Emission Operation utilising approximately 5MWh of batteries (chemistry TBC)
- The vessels will operate all day utilising batteries and will charge overnight when tied up in port using a shore charging device
- The battery capacity has been sized to cope with the longest possible sailing day
- A back-up diesel generator is included for use in case of emergencies (e.g. shore grid failure overnight) or for extending the vessel range (e.g. transit to and from dry-dock)
- Low sulphur MGO (<0.1% sulphur content) to be used for the back up diesel generator
- Premium efficiency propulsion motors to be used for the electric propulsors (final type TBC)



HySeas 3

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Project Summary:

- To achieve Approval in Principle (AiP) for a hydrogen fuelled vessel
- Route selected was Kirkwall-Shapinsay in Orkney which has a constrained wind resource
- Part of the EU's Horizon 2020 framework looking at lowering emissions in shipping
- 8 Consortium members including Ballard (Fuel Cell's) and Kongsberg (integration and string test)

Towards Net Zero:

- Daily Zero Emission Operation with 2 x 200kW fuel cells and two battery banks (750kWh total)
- The vessels will operate all day using the fuel cells with the batteries providing peak load shaving
- The batteries will provide the return to port facility in the event of a fault in the H2 system, no diesel generator required
- Shore power used for hotel load when vessel is tied up overnight – no overnight pollution or noise
- Batteries will be charged overnight when tied up in port using a shore charging device- from constrained wind energy on the island
- Compressed Hydrogen will be produced from a shoreside electrolyser utilising the constrained wind energy on the island. As such, the project will be using green hydrogen.

Other Vessel Projects

MV Glen Sannox/ 802
LNG Infrastructure

- Two vessels in detailed design and construction phase
- Vessels are dual fuel utilising LNG and low sulphur MGO
- LNG to be bunkered from a shore side tank of 150m3

Northlink RoRo Vessel Replacement

- In concept design phase
- Initial design to include dual fuel (LNG-MGO) engines
- Other alternative fuel options being investigated

Other Vessel Projects

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Gourock-Dunoon-Kilcreggan

BMT

- In concept design phase
- Likely to be fully electric/diesel electric hybrid vessels
- Will use tier 3 engines where required utilising low sulphur MGO
- Will Use shore power to charge batteries and for overnight hotel load

New Vessel for Mallaig Lochboisdale

LMG MARIN

- Concept design phase started in Q1 2023
- Various alternative fuel options to be investigated

CMAL's Ports

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- **Examples of measures taken regarding climate change when reconstructing ports:**
  - Increasing the overall pier and linkspan heights to account for increased sea levels
  - Energy absorbing rock armouring to protect marshalling areas
  - Locally sourced construction materials where possible

- **Examples of innovation combined with carbon reduction:**
  - Biomass boiler using locally sourced products from the islands
  - Solar panels on the upper elevations
  - Reed beds provide a low-cost, zero energy wastewater treatment system
  - Air source heating system at Ferry Terminals

Thank You For Listening

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Stay Up to Date

- If you would like to keep up to date on the progress of the SVRP please visit our project page at:
  - **Islay:** https://www.cmassets.co.uk/project/islay/
  - **Little Minch:** https://www.cmassets.co.uk/project/two-new-vessels-for-the-little-minch/
  - **SVRP:** https://www.cmassets.co.uk/project/svrp/
  - **Mallaig Lochboisdale:** https://www.cmassets.co.uk/project/mallaig-lochboisdale/
  - **HySeas III:** https://www.hyseas3.eu/

Contact Us

- If you have any further questions or feedback regarding our projects then please feel free to email us at:
  - **Islay:** islayvessel@cmassets.co.uk
  - **Little Minch:** nvlm@cmassets.co.uk
  - **SVRP:** svrp@cmassets.co.uk
  - **Mallaig Lochboisdale:** mlnv@cmassets.co.uk

Any Questions?