

# New Corran Ferry Electric Vessel



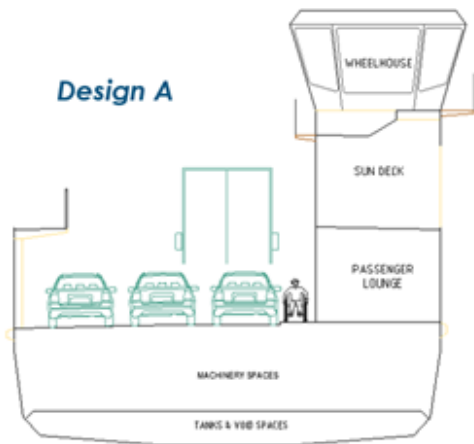
**CMAL**

Caledonian Maritime Assets Ltd  
Stòras Mara Cailleannach Eò

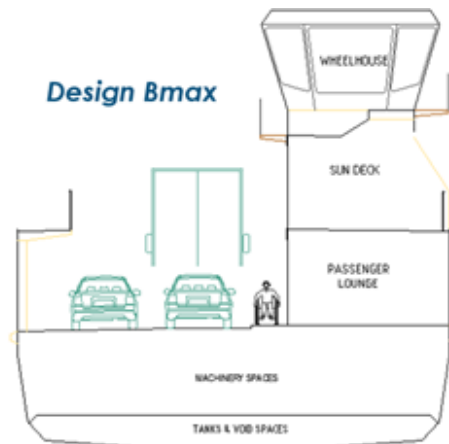


# Small Vessels Replacement Programme

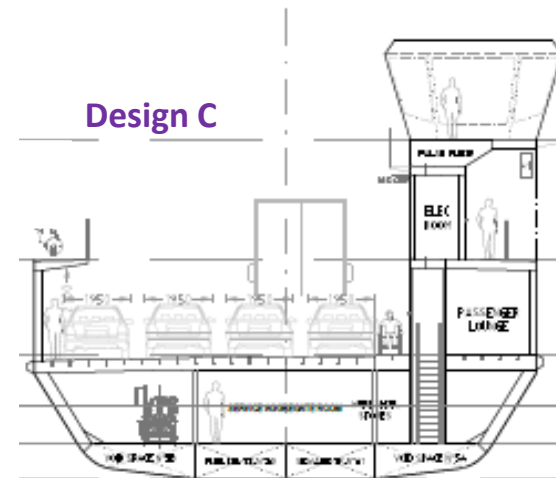
- The Highland Council has joined Caledonian Maritime Assets Limited (CMAL) [Small Vessels Replacement Programme](#) and continues to work together with CMAL beyond the design stage through to the procurement and ship building stage.
- CMAL's goal is to provide standardised, state-of-the-art ferries with all electric zero emission operation on various routes along the West Coast of Scotland which will contribute to the Scottish Government's climate change commitments.
- The three design variants are:



Design A (24 PCU) CMAL



Design Bmax (16 PCU) CMAL



Design C (32 PCU) Highland Council



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# Objective

- All-electric operation has been one of the key elements for the new Corran Ferry ship design, noting that the service across the Corran narrows is extremely busy, thus, daily energy demand is quite significant.
- During the concept design, it was also decided to equip the new design with a back-up diesel generator to provide a high level of resilience with the idea to utilize this only in exceptional cases such as malfunctions during overnight charging or for transfer voyages to drydock.

# Current Operating Profile

- The short ferry link across the Corran Narrows connects Ardgour with Nether Lochaber with a route length of 475 m.
- The ferry operation is highly impacted by the strong tidal currents through the Narrows which can reach up to 5 – 6 knots. This has a significant impact on ship handling, especially on the Nether Lochaber side where the streams run closely to the berthing / slipway area. In addition, strong north-easterly winds add to the navigational challenges.
- The service is operated all-year round 15 hours per day, from 6:30 a.m. to 9:30 p.m. During most times of the year the ferry is shuttling back and forth and up to 86 crossings (or 43 roundtrips) are operated during the busiest summer days.

# Future Operating Profile

- The proposed new Corran ferry will be operated from new 1:8 slipways (currently 1:10) which will be constructed at new locations. The new route will run through slacker waters on the Nether Lochaber side which should reduce the operational impact of the tidal streams in the future.
- The target for the new Corran ferry design is that it can still complete 43 roundtrips within 15 hours. Operations will be changed from quarter point to straight drive-through (Ro-Ro) loading in line with CalMac ferries.
- All design 'Round Trips' are based on worst conditions plus a 30% sea margin.

# Evaluated Batteries

- The operational endurance of 3 exemplary battery chemistries have been evaluated as below –

	<b>Battery type</b>	<b>Estimated operational endurance (Requirement 43 Round trips)</b>
1.	LFP - Lithium Iron Phosphate	64 roundtrips / 128 single crossings
2.	NMC - Nickel Manganese Cobalt	48 roundtrips / 96 single crossings
3.	LTO - Lithium Titrates Oxide	32 roundtrips / 64 single crossings

- Final battery type will be subject to the procurement process

# Battery Evaluation Conclusion

- The battery evaluation indicates that a full day of all-electric operation with 43 roundtrips will be achievable with both the proposed LFP and NMC battery systems.
- The proposed LTO system may become a workable solution when two ferries would be operated along a timetable with departures offered in 15-minute intervals, i.e. each ferry would need to operate only 30 roundtrips per day.
- The new Corran Ferry design all-electric propulsion set-up will provide very quick power availability all year round which will help to increase the efficiency during manoeuvring.

# New Corran Ferry Design

- A full Tender specification has been provided for the new Corran ferry (Design C) which will be used as the key document during the procurement and ship building stage (subject to funding approval) Estimated delivery date - 2028

Main Particulars & Capacities	New Corran Ferry	Maid of Glencoul (1975)	MV Corran (2000)
Length Overall	49.90m	32.00m	42.00m
Beam	14.96m	10.00m	13.40m
Draught (Max)	2.14m	1.2	1.80m
Design Speed	9.0 knots	8.0 knots	9.0 knots
PAX Capacity	150	116	150
PCU's	32	14	28
HGV's	2	0	2



New Corran Ferry - All Electric 32 car



# Zero Emission Propulsion Concept

## Lithium-Ion Batteries

- Approximately 7MWh of batteries split into 4 separate banks for redundancy
- Batteries have been sized to cover all operating days throughout the year

## Electric Propulsors

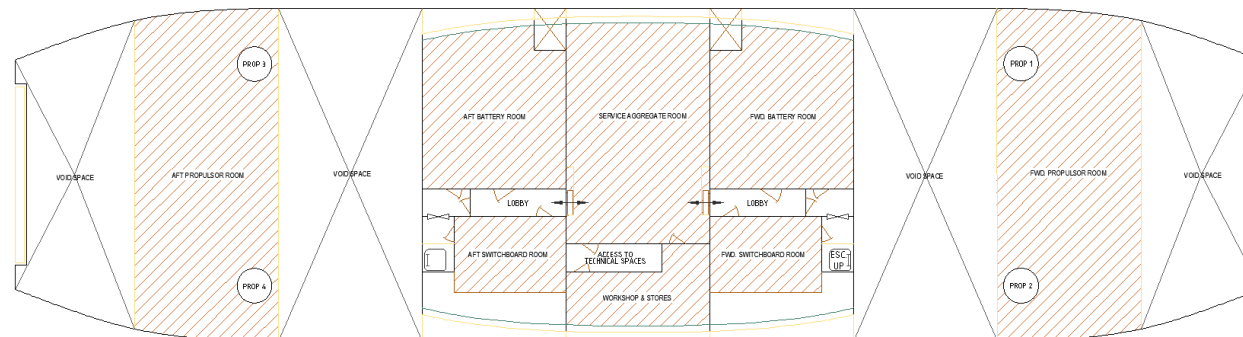
- 4 x 187kW propulsors (azimuth thrusters or cycloidal propellers) with premium efficiency propulsion motors
- Both offer high levels of manoeuvrability, high levels of reverse thrust and low response time from ahead to full astern
- 4 propulsors instead of 2 will improve course keeping and provide added redundancy

## Back Up Diesel Generator

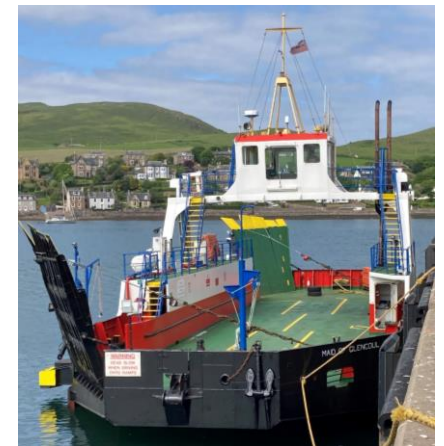
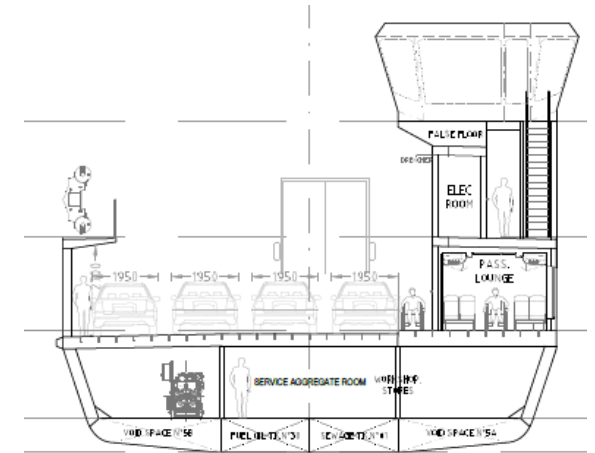
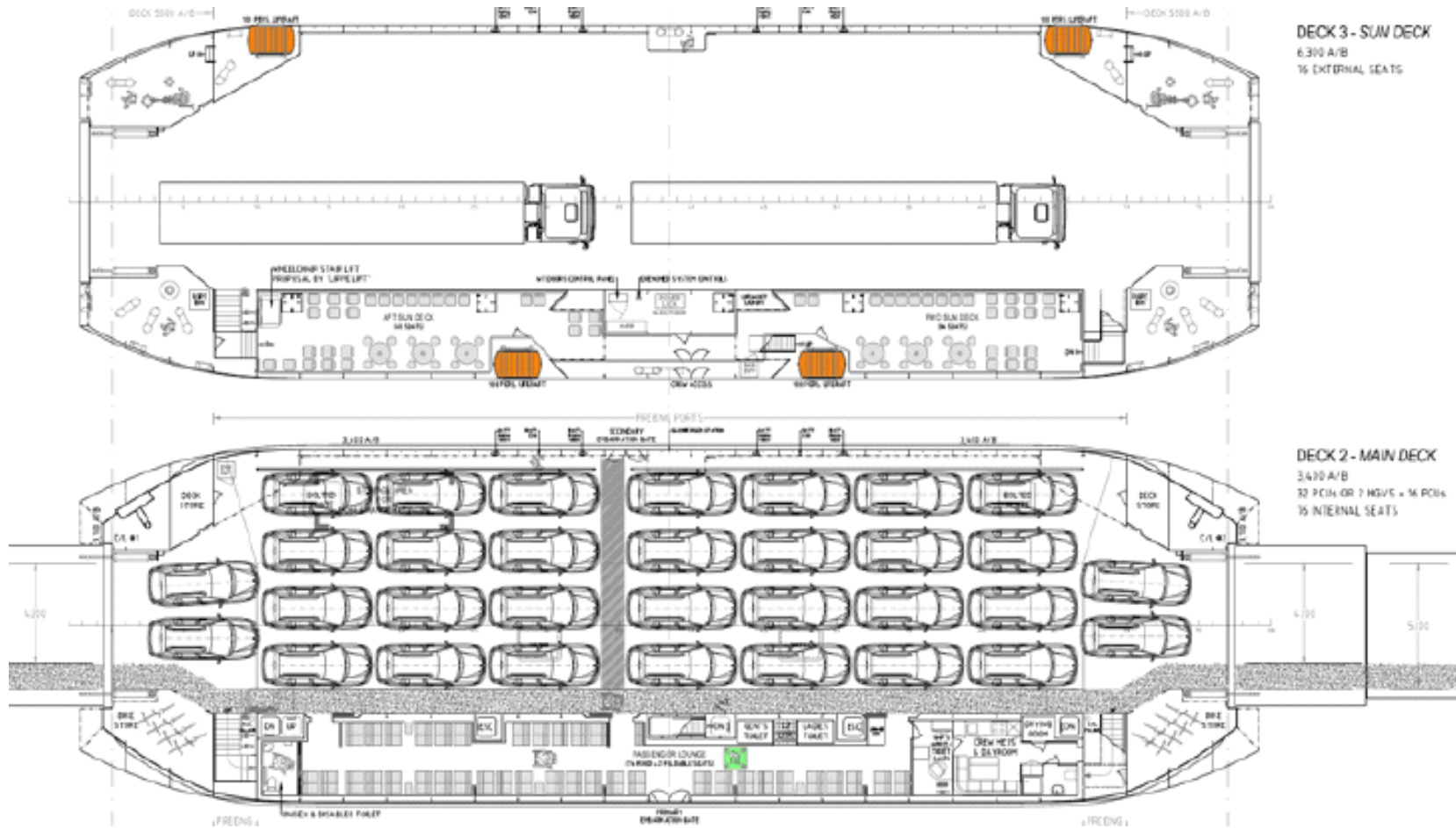
- 1 x 374kW Diesel Generator using low Sulphur Marine Gas Oil (<0.1%)
- Will only be used in the case of emergencies or for extending the vessels range (i.e., transit to and from dry-dock or extended sailing day)
- The back up diesel generator will be capable of lasting for the full timetable

## Shore Supply Connections

- 1000A (415V, 3 Phase, 50Hz) connections to allow vessel to plug in overnight and charge batteries
- Charging is planned during an 8-hour overnight window



# Ferry Design - Deck Layout



49-year-old - Maid of Glencoul (14 car)

# Shore Power Works

- It is essential that shore power is provided at the new overnight berth to charge the batteries onboard the vessel overnight.
- This will allow the vessel to achieve zero emission operation during the day for the full timetable
- A shore power supply of 1000A (720kVA, 415V, 3 phase) will be installed on the overnight berth at Ardgour to charge the batteries onboard the vessel overnight.
- Feasibility studies have already been carried out by the electricity suppliers to provide the required power at the overnight berth.

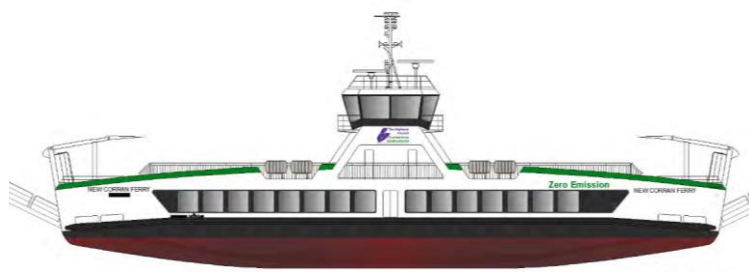


Examples of Shore Charging Devices

# Environment and Efficiency Benefits

- Full-electric machinery concepts offer (close to) **zero emissions operation**, not least thanks to very low grid emissions resulting from Scotland's high renewable energy share
- This new Corran vessel will align with the Highland Council's **net zero strategy** and Scotland's national legally binding target to become Net Zero by 2045.
- Full-electric propulsion will provide very quick power availability all year round which will help to increase the **efficiency** during manoeuvring
- **Energy efficiency** of the total electric system grid-to-propeller on the new vessel is more than twice as high as the efficiency of the MV Corran diesel ferry (tank-to-propeller)
- Operations will be changed from quarter loading to straight drive-through loading (Ro-Ro) which will enable **faster** loading with better ramp alignment for large commercial vehicles (HGV).

# Provisional Deployment Plan



New all electric Ferry (32 car)



MV Corran (28 cars) - 23 years old



Maid of Glencoul (14 cars) - Diesel - 49 years old

- The target date for delivery of the new Corran Ferry (subject to funding approval) is 2028.
- The use of the existing 23-year-old MV Corran (28 car) will provide service resilience as a relief vessel, until such time that the Council can undertake to deliver a second electric ferry, or the longer-term crossing options are reviewed again.
- The older and smaller (49-years-old - 14 car) Maid of Glencoul will be sold.



**Thank you Mòran taining**



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