The Treasury

Official Information Regarding KiwiRail's Purchase of New Ferries Information Release

October 2021

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https://www.treasury.govt.nz/publications/information-release/official-information-regarding-kiwirails-purchase-new-ferries-information-release

No information is being withheld

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New Interislander ferries contribute to a zero-carbon future

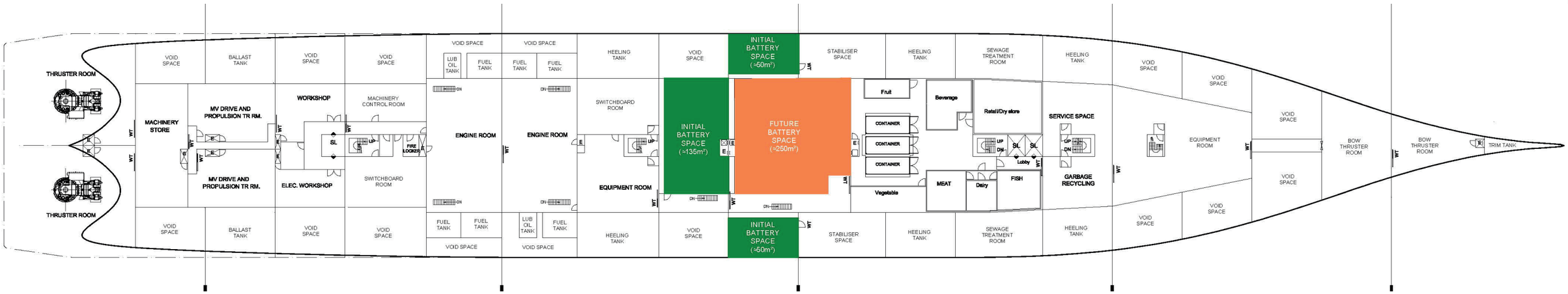
- KiwiRail has established a net-zero carbon target by 2050, in line with the Government objective
- The Interislander ferries are an essential component of this objective, reducing overall fleet emissions by 40 per cent and supporting mode shift to rail
- Hybrid technology will run these ferries, with electrical propulsion from generators fuelled by diesel and electrical shore power
- The ferries' design and engines allow for low-carbon fuel sources to replace diesel and the capacity of the batteries can increase
- **Diesel is on the way out – this procurement does not lock KiwiRail in, it starts our transition away.**

40%

reduced emissions

- **17 kg CO_2 per mt of cargo in 2021**
- **to 12kg CO_2 per mt of cargo in 2027**
- **dropping to zero kg CO_2 per mt of cargo when fully electric**
- **from a 40% emissions reduction in 2027 to a 100% reduction by 2050**

Energy improvements



Existing battery space
Future battery space

The ships have a further 250 sq meters of reserved space for additional battery cells over time, nearly doubling initial capacity

INCREASING BATTERY CAPACITY

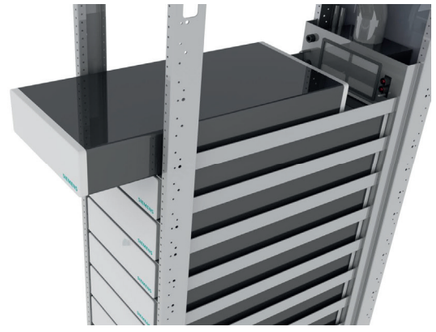
- The ferries include 485m2 of deck space reserved for batteries
- 50% of battery deck space utilised for Day 1 operations, storing up to 8400-kilowatt hours
- Battery capacity will be progressively increased to 100% as technology and prices improve
- 30% of the three-hour journey, including time in port, powered by batteries
- Batteries charged by shore energy and fuel engines
- This will result in journey's being almost fully electric in time.

CONVERTIBLE FUEL PROPULSION

- Diesel-electric/battery hybrid propulsion provides a future-proofed platform for increasing battery use, or alternative fuel use
- Diesel will be used initially as main fuel, however the design allows for full convertibility when a low carbon fuel alternative becomes available
- Different types of alternative fuels will require different levels of engineering modification
- Alternative fuel options are outlined on the following page.

GREEN DESIGN

- Hull design is optimised for fuel efficiency (less drag in water means less power needed)
- Surplus energy produced by the generators during sailing can be battery stored
- 100% emission-free operations using battery and shore power when in port
- Low fuel consumption generator set engines
- Additional energy-saving systems including:
  - Waste heat recovery systems take excess heat generated from the engine, battery cooling systems and other machinery and reuses it in the ship's accommodation and public areas and for water heating.
- Heat Accumulation Tanks take heat from the engine and battery cooling systems, and can be stored and reused
- Variable Frequency Drives (VFD) on all major electrical components which adjust a motor's speed to match actual demand
- LED lighting throughout the vessel.



Battery packs are relatively light and easy to install in modular units within the ferries.

Alternative fuel sources

ALTERNATIVE FUELS

Alternatives that are already in use and remain options as supply chains and technology improve:

Bio Diesel

- Can be used as fuel in the new vessels without any significant alterations
- Ship would have same CO_2 emission as if it was sailing on normal diesel
- Considered by some as carbon neutral - as the CO_2 emitted is equal to the CO_2 absorbed from the atmosphere from the production of the bio diesel.

Methanol/Bio Methanol

- Methanol as fuel would reduce CO_2 emission by 20-25%
- Bio Methanol may be considered a carbon neutral fuel
- Methanol can also be used as a mixture in normal diesel
- Would require changes to the engines and significant changes to fuel tank arrangements
- Methanol was considered as an alternative fuel to diesel for the new ships but discounted on the basis that it is produced from natural gas, which is a fossil fuel, and there are no dual fuel methanol engines suitable for the new ships.

LNG/LBG

- Liquefied Natural Gas (LNG) as fuel would reduce CO_2 emission by 20-25%
- Liquefied Bio-Gas (LBG) may be considered a carbon neutral fuel
- Both LNG and LBG would require changes to the engines and significant changes to fuel tank arrangements
- LNG was considered as an alternative fuel to diesel for the new ships but discounted on the basis that it is produced from natural gas, a fossil fuel, and there is no production/supply chain in New Zealand.

Ammonia

- Ammonia can be produced by renewable energy sources, and as such may be considered as a carbon neutral fuel
- Implementing ammonia in the new vessels would require changes to the engines and significant changes to fuel tank arrangements.

Hydrogen

- Can be used as fuel in a combustion engine or in fuel cells
- The latter is the predominant approach in marine application, since the energy efficiency of a fuel cell is approximately twice that of a corresponding combustion engine
- Using hydrogen fuel cells would require modifications to both engines and fuel storage
- For hydrogen as a fuel, there is no established large-scale production/supply chain in New Zealand yet and new port-based infrastructure would be required.

ENERGY SAVING ADD-ONS

There are examples of wind and solar power sources installed on ships, these sources are not suitable or well developed for ships of this size. Our preference is to future-proof to tap into the New Zealand's renewable power generation sources.

Wind Energy

- The use of wind rotors to utilise wind energy is the most common method to gain energy from external source
- Wind rotors could be installed directly – but would significantly impact stability
- These were investigated but were found to be costly and only make a marginal contribution to the overall energy efficiency.

Solar Energy

- Standard solar cells would have a power output of approximately 200W on a sunny day
- If the vessel was fully covered by solar cells on all possible horizontal surfaces (2,000 m2) this would only provide 400 kW, which is not a material contribution to energy requirements for the cost involved
- Considering weather conditions, day/night etc. the average output could be around 100-150 kW.