

Finland's First Electric Ferry

Dream to Reality

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Dream to Reality

Challenge #1

System Reliability

Challenge #2

Process & Usability of System

Challenge #3

Fast Charging





Challenge #1: System Reliability

- A 24/7 workhorse
- Peak hours 4X / hour, overnight 1X/ hour
- Vital trade link: 600,000 - 800,000 Vehicles crossing a year including heavy goods trucks

160 Lithium-ion Batteries – 1MWh

A speed of 11 knots can be achieved

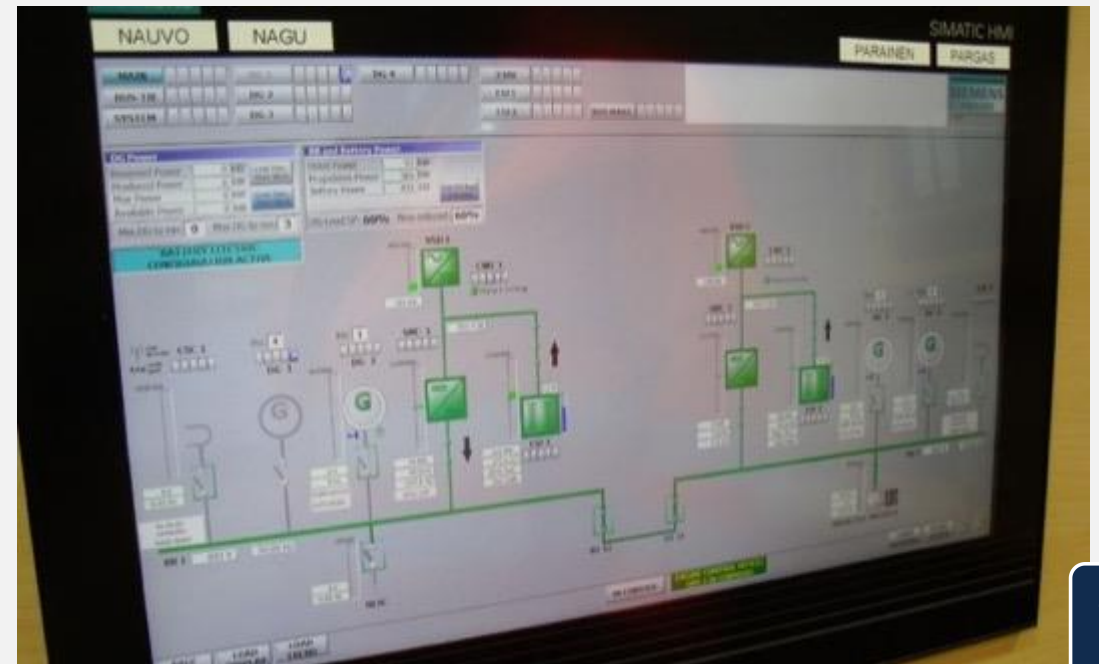


X 160



Two Battery Banks

Captain can see the level of charge from the bridge. Alarms sound if there is not enough capacity to complete the trip. Diesel generators will start automatically if required.



Sizing the System



Each trip uses ~15% of battery capacity, easily replaced during each brief port call

A quick connection to shore power is required

Battery size designed to provide enough capacity for daily use and rapid charging

Continuing the Green Credentials



Additional electrical power comes from banks of solar panels onboard. During summer they run air conditioning and other variable hotel loads.



Challenge #3

Process & Usability of System

During frigid winter temperatures in Finland the ship must cope with the heavy ice that forms.

System Flexibility

3 power modes: pure battery, diesel-battery hybrid, and diesel-electric



Pure battery:

- Intended mode for the ship.



Diesel-battery hybrid:

- Used during operations in ice or when the ship's speed might be affected, reducing the time available to recharge.



Diesel electric:

- Called into action if the shore power should fail.

System Flexibility

3 Diesel generators – between two engine rooms

Generators automatically start if there is insufficient battery power.

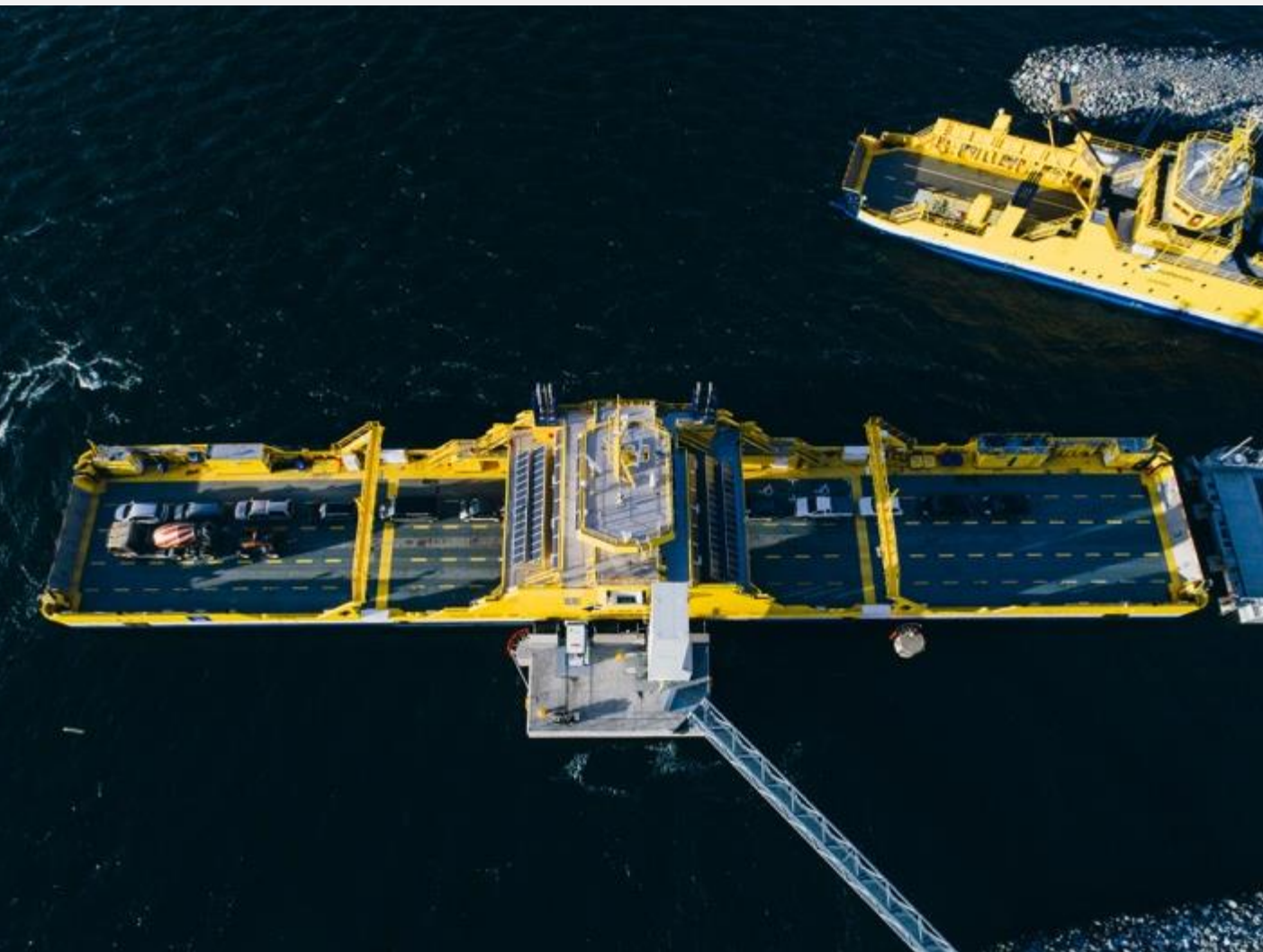


System Flexibility

A crew of three

Possible because of the high level of automation.





Challenge #2: Fast Charging

The fast-turnaround pattern has its downside; it only leaves a minimal, five minutes at the quay for recharging.

Fast Charging



To stay on schedule Elektra has **5 mins 30 seconds to replenish its batteries** at each end of its short route so speed is vital.



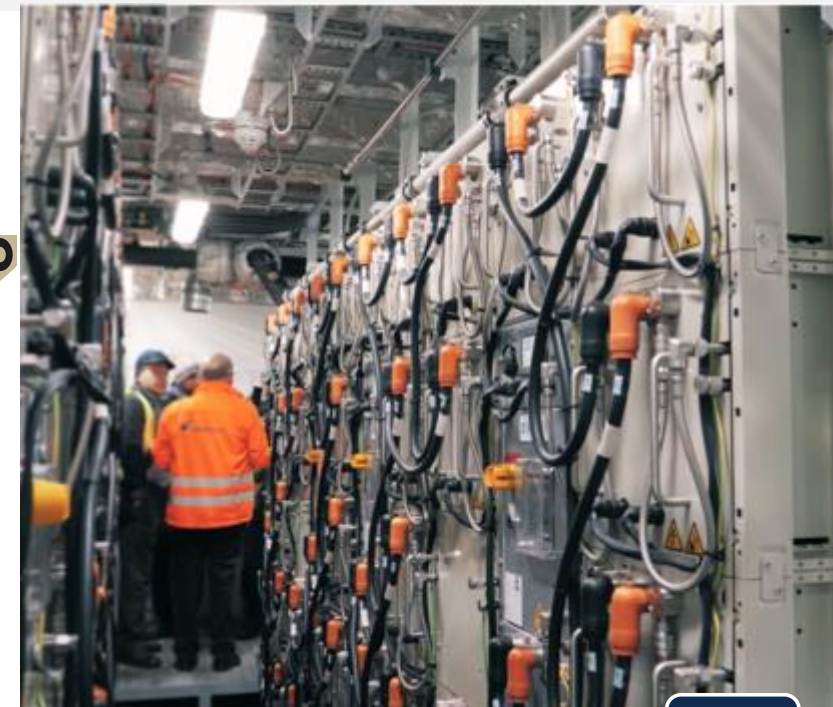
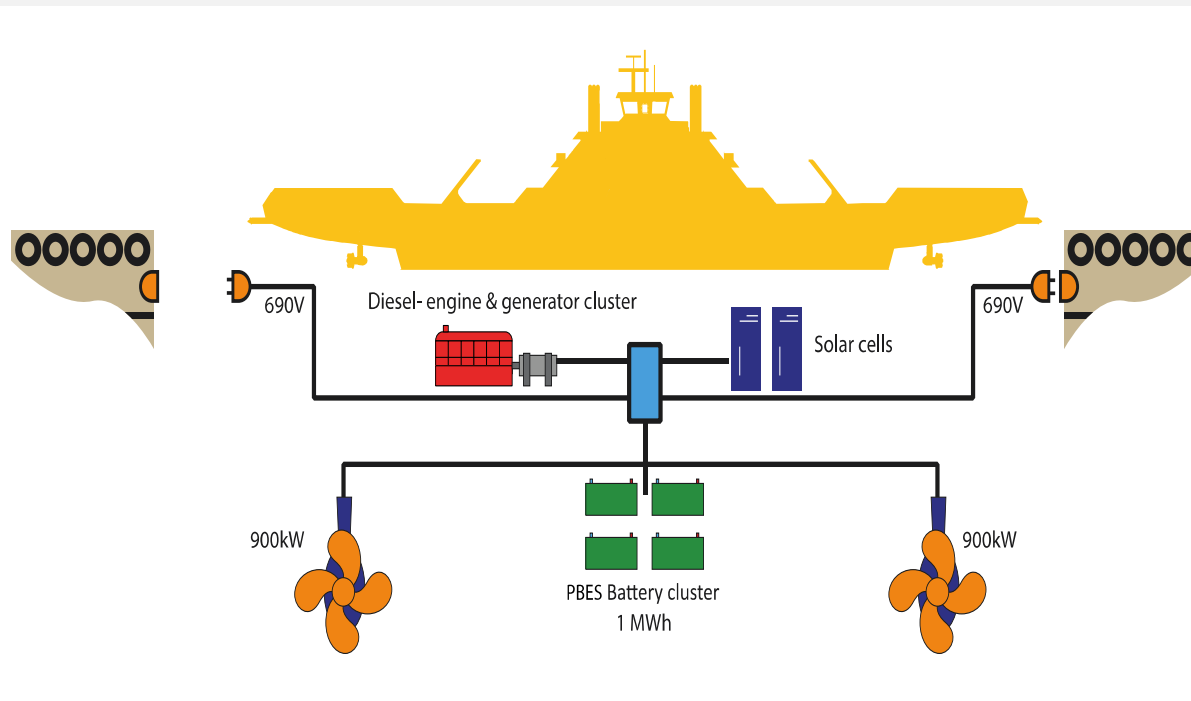
Cavotec Charging

A laser sensor guides the connector that opens from the side of the vessel where it connects to the ship's battery to begin charging.

Vacuum-powered MoorMaster automatic mooring equipment and its Automatic Plug-in System (APS) can moor the ship and connect the power in 30 seconds.

Fast Charging

Fast Charging – Imperative to optimise battery pack design and thereby vessel weight and operational costs.

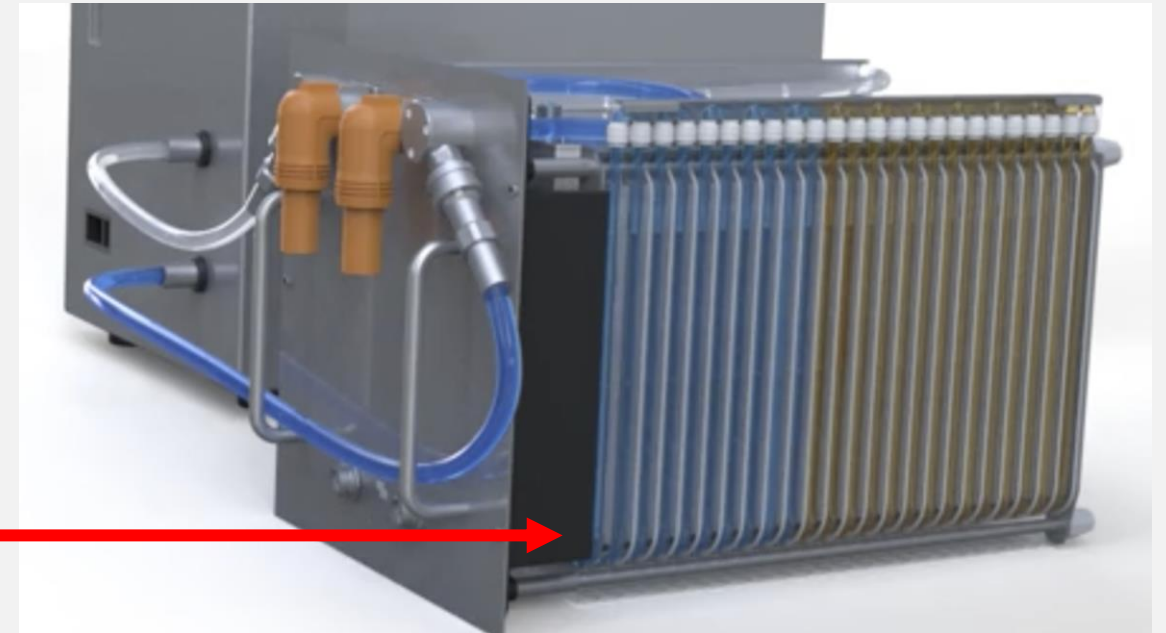


Fast Charging with Liquid Cooling

The fast-turnaround pattern limits the types of batteries that can be used.

Air cooled batteries cannot safely support this level of intense charging.

A liquid cooling system is employed to allow the vessel to safely recharge batteries at speed.



World's First

First electric ship to recharge its batteries at each end of its run directly from the domestic power grid.

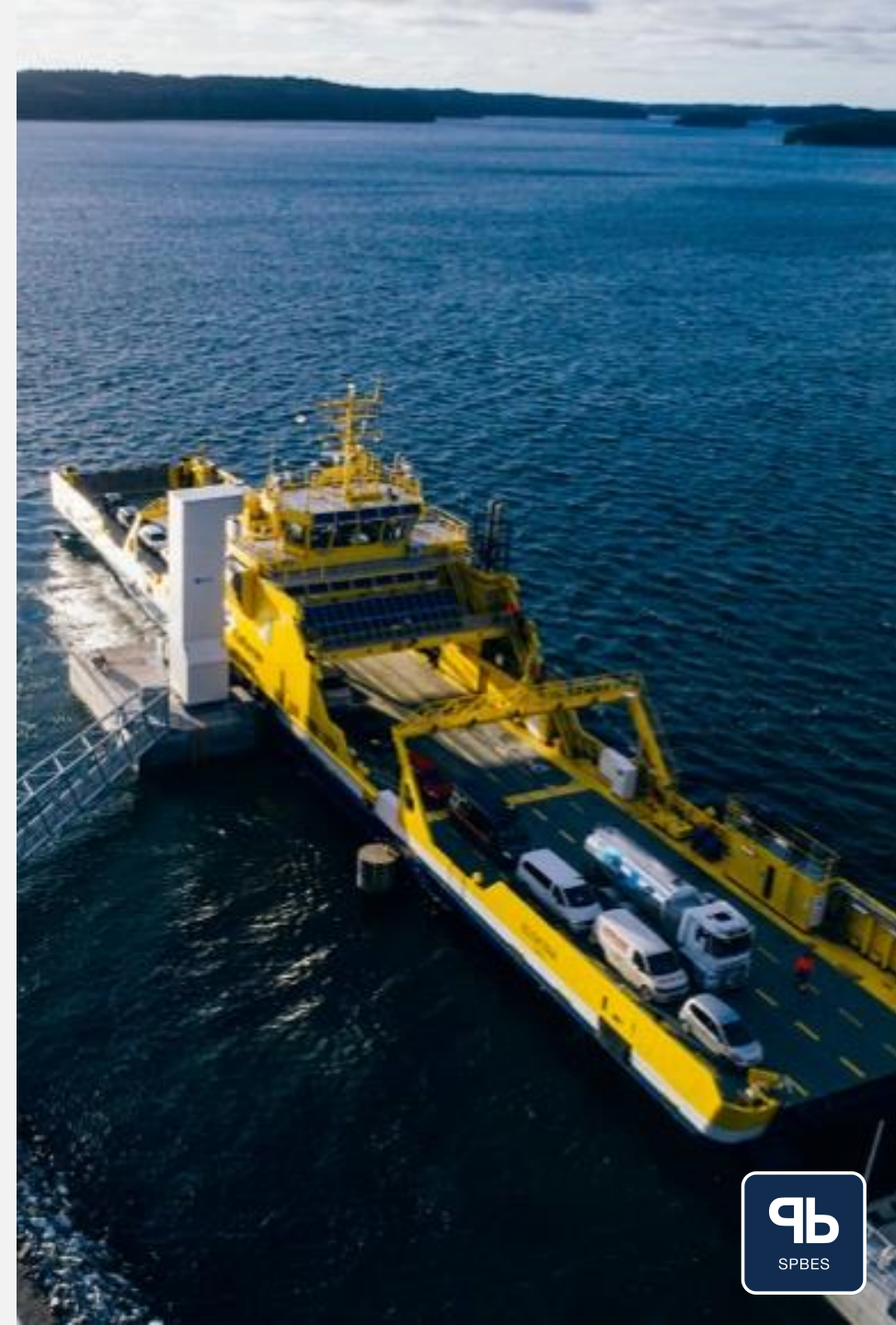


Project Results

Compared with the previous ship on the route, Elektra:

- Carries 40% more vehicles with 60% less emissions
- Costs €5 (US\$6) of electricity per crossing*

*http://www.passengership.info/news/view,finferries-starts-a-quiet-revolution_50424.htm





Thank You