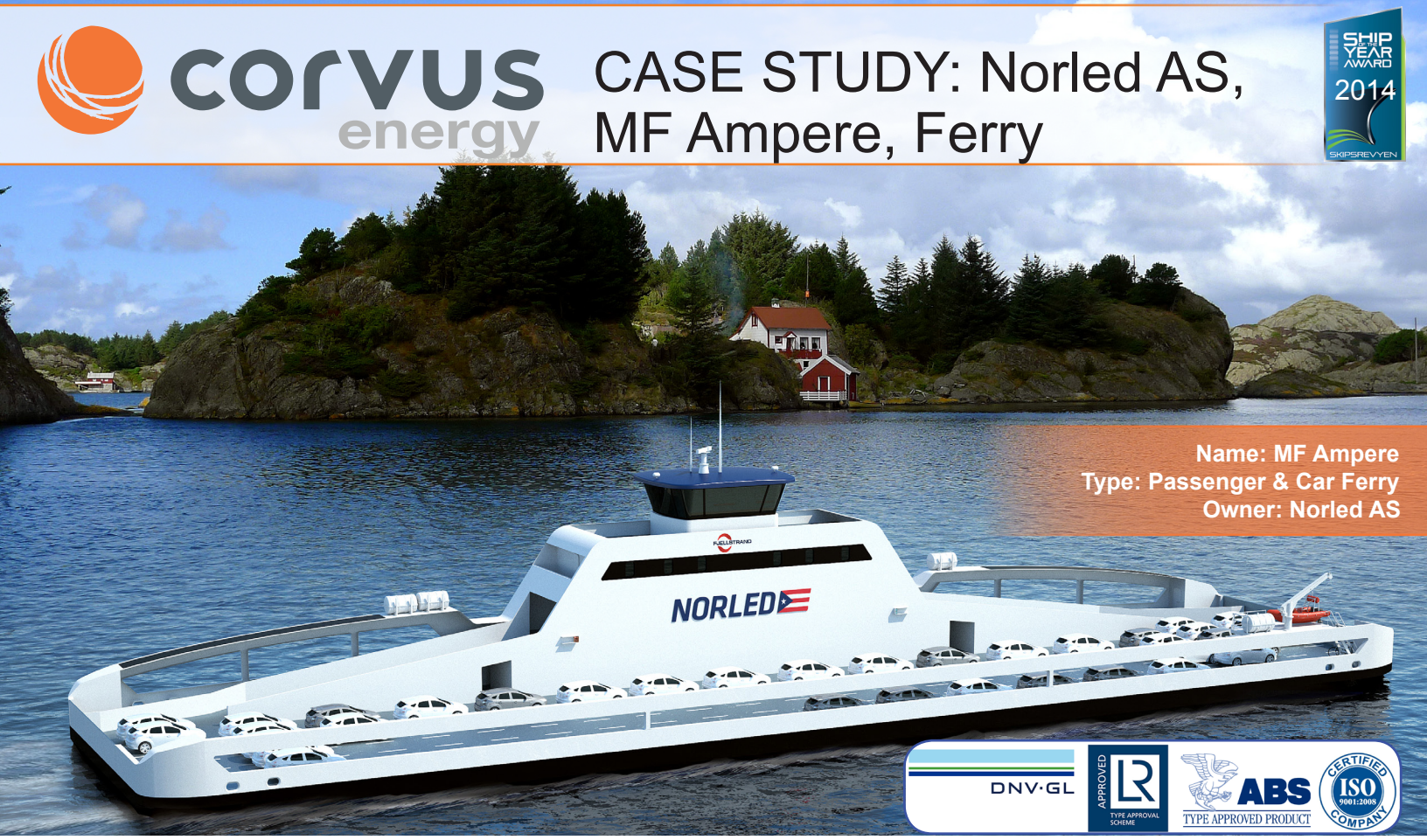
CASE STUDY: Norled AS, MF Ampere, Ferry



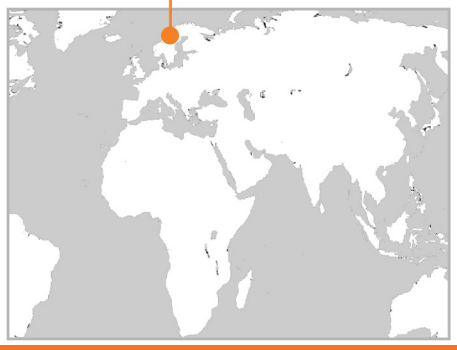
World's First All-Electric Car Ferry

Norwegian ferry company Norled AS, shipyard Fjellstrand and Siemens AS have jointly developed the world's first fully electric battery powered passenger and car ferry. MF Ampere operates between Lavik and Oppedal, Norway. This revolutionary vessel is powered by a lightweight Corvus Energy Storage System (ESS), weighing only 20 metric tons, which provides all power to the vessel while at sea. The project is also the first of its kind to incorporate high power shore charging using Corvus Energy's liquid-cooled ESS technology.

When compared to existing ferries serving this route, MF Ampere achieves the following savings:

- **1,000,000 litres of diesel / year**
- **2680 metric tons of CO2**
- **37 metric tons of NOx**

The first of many such vessels planned for Norway, the MF Ampere demonstrates that the robust Corvus ESS technology may be used to replace all traditional engines on ferries operating on short crossings. The project also validates the use of ESS shore charging stations where port electrical infrastructure is weak.

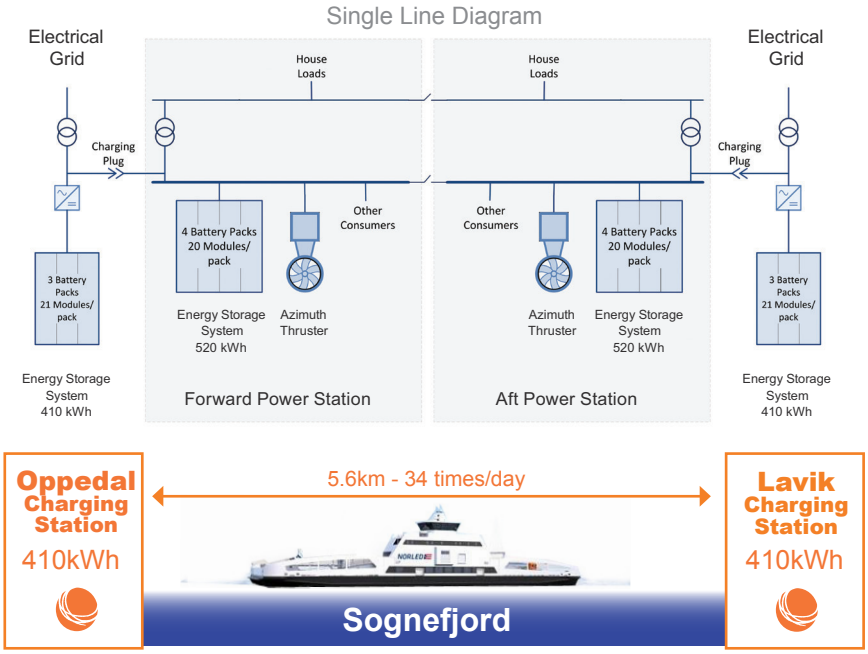


Corvus ESS Specifications

Name: MF Ampere Ferry
Type: Battery Electric Ferry
Duty: Passenger and Car Ferry
Vessel ESS: 1040kWh; 160 x Corvus AT6500 modules
Shore Charging Stations: Each shore 410 kWh; 63 x Corvus AT6500-LQ (Liquid-Cooled) modules
Bus Voltage: 1000VDC
Technology Partners: Norled AS, Fjellstrand Shipyard, Siemens AS, Corvus Energy

Emission Free by Design

The emission free MF Ampere is a new build, and has been designed in catamaran style with two efficient aluminum hulls to reduce resistance in water compared to a traditional hull design. The new vessel weighs half as much as other ferries operating the route.



Passengers, crew and residents of the picturesque villages of Lavik and Oppedal at either end of the crossing will appreciate the ferry's emissions-free and near-silent operation. Since the ferry is run entirely on battery power, it does not emit greenhouse gases or particulates. The vessel's batteries are recharged using hydroelectric power from the existing electric utility grid infrastructure in each village, further minimizing the impact of the ferry service.

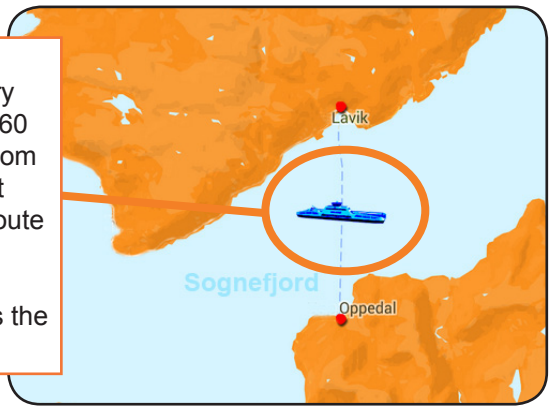
Shore Charging

Due to the innovative design offered by Siemens AS and Corvus Energy, the port electric grid infrastructure remains virtually unchanged. Rather than installing additional electrical capacity to the ports, an onshore Corvus Energy 410kWh ESS comprised of 63 AT6500 Liquid-Cooled modules was installed on both sides of the route, each providing near instantaneous transfer of power to the vessel ESS.

Benefits

- Eliminate onboard fuel consumption
- Zero emissions
- Low noise
- Reduced maintenance
- Rapid return on investment
- Improved redundancy
- Reduced port infrastructure costs for the project

The 80-meter vessel can carry 120 cars and 360 passengers. From 2015 onward, it will serve the route between Lavik and Oppedal, Norway, across the Sognefjord.



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Corvus Energy manufactures the world's most durable Energy Storage Systems (ESS). Designed for heavy industrial applications, a Corvus ESS will reduce fuel consumption, maintenance, emissions & increase reliability. Contact us today to learn how Corvus energy storage can improve your bottom line:

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