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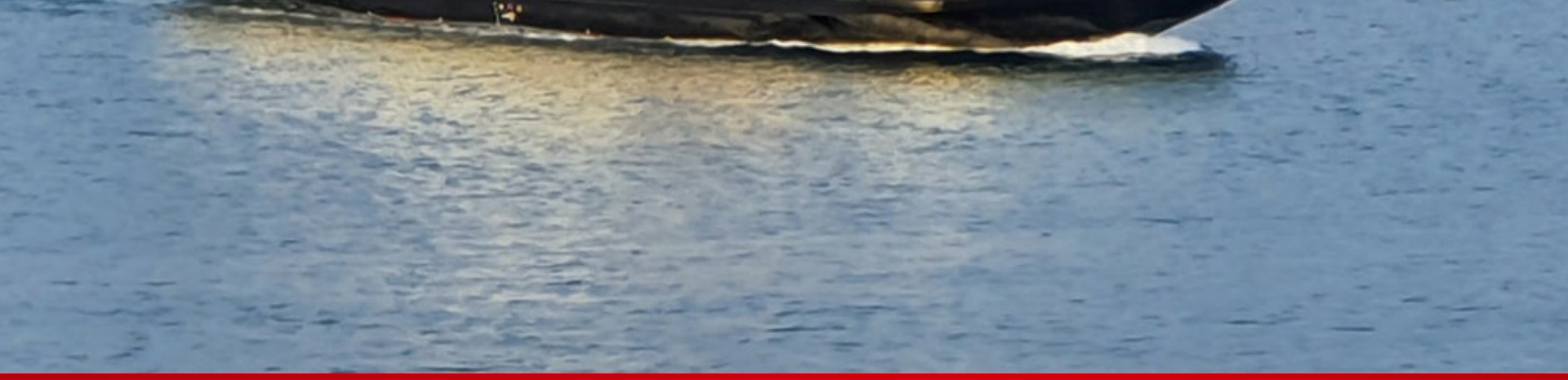
Danfoss

Case story | VACON® NXP Grid Converter

Where smart ferry charging begins with a **smart grid**

7000

tonnes per year less CO_2 emission after transition to electric-driven ferries



The situation

NORWAY: The Hareid-Sulesund ferry route has reduced CO_2 emissions by 7000 tonnes annually with the introduction of electric vessels. In transitioning ferries from diesel to pure electric power, powerful onshore support is essential, in the form of reliable infrastructure for rapid charging capacity and stable grid supply. The systems on board and on shore act as a single sophisticated and competitive system developed by Norwegian Electric Systems (NES) using Danfoss technology.

The challenge

Calculations at both ferry terminals showed that the existing power grid required extra power to achieve the necessary charging power to rapidly charge the vessel in the 6 minutes turnaround time available. NES strengthened the power grid on both sides, and retrofitted vessels with batteries and the newest converter and power control technology, for the optimal electric-powered solution.

11200 MWh*

electric power transferred each year

The solution

Håvard Wolden from Danfoss explains: “The electric ferry charges 350 kWh of power in just 6 minutes. This scale of charging places stringent demands upon the smart grid onshore in Hareid and Sulesund, which supports reliable power supply for the electric vessel rapid charging system.

NES supplemented the onshore power supply with battery storage systems powered by Danfoss grid converters, to ensure adequate charging capacity and speed. The electricity used to supply the system is supplied from renewable sources, to minimize losses and optimize operating costs."

During charging, the vessel accumulates 5 MW power, comprising 3 MW from the local AC grid and 2 MW from the combined power of onshore batteries.

"The charging system reduces peak power consumption by drawing on shore battery power instead of energy from the grid, for short intervals of time, for example when the electricity price is high."

Torbjørn Haugland, Vice-President of Energy Design at Norwegian Electric Systems

The outcome

When the ferry approaches the charging station, information about the energy consumed on the trip is communicated to the shore station. The charging system is designed to minimize voltage disturbances, feeding reactive power back to the grid during charging to maintain stable grid voltage. This in turn enables the local grid to deliver even more energy during charging of the vessel.

By actively controlling, monitoring, and supporting the grid from local batteries on shore side, the system supplies the high peak power crucial to rapid charging, with no need to scale up grid infrastructure. Instead of extra capital investment, the system relies on peak shaving functionality.

In total, the charging stations on this ferry route perform about 32,000 charging operations and transfer approximately 11200 MWh of electric power per year.

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