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Battery Electric Ferry: The *Ampere* in Norway



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The *Ampere*, the world's first electric battery powered car and passenger ferry, entered operation with Norled in January 2015 in Norway. The nearly 250-foot long electric catamaran was designed as part of a competition launched by Norway's Ministry of Transport and Communications in 2011 to develop an environmentally friendly ferry serving in the region. Norled, a shipping and ferry company in Norway, won the competition with their design.

A recent study by DNV GL Maritime Advisory, on behalf of the Ministry of Climate and Environment, showed that reducing CO_2 emissions in 2040 to below 2015 levels using green fuels will require the use of zero-emission options such as electricity and biofuels. With the goal of reducing national CO_2 emissions, Norway has led the way for implementation of mature electric technologies in the maritime sector.

Built by the Fjellstrand shipyard, the *Ampere* carries 120 cars and 350 passengers and uses 150 kWh of electricity per route. The vessel makes 34 twenty minute trips per day across the Sognefjord, 365 days a year. The ferry is equipped with a 1MWh lithium ion battery system that weighs 10 tons.

Lighter weight than a traditional ferry, the *Ampere's* hulls are made out of aluminum rather than steel in order to maximize efficiencies with the electric motors. In addition, LED lighting, solar panels and a heating, ventilation and air conditioning system with a waste heat recovery system are featured onboard for low-energy consumption.

Power availability was a hurdle which was overcome with the addition of electric charging stations along with 260 kWh battery capacity, located at both ends of the 3.5 mile crossing. This allowed the onboard batteries to be quick charged after each trip by onshore battery power in 10 minutes, which in turn are powered continuously by the grid at a more optimal time. In the evenings, during non-operating hours for the ferry, the vessel's batteries are recharged directly from the grid. The batteries consume approximately two million kWh per year. Electricity in the area is generated exclusively with hydroelectric power, making it even more environmentally friendly.

Benefits

The *Ampere* eliminates the annual use of 264,000 gallons of diesel that would be consumed by a traditional ferry on this route, saving the company an estimated 60% in fuel costs. Emissions reductions are another important benefit, with almost 630 tons of carbon dioxide and 16 tons of NOx saved each year by using electricity instead of diesel. Further cost savings are realized through the reduction in maintenance costs associated with electric equipment.

Finally, noise and vibration is decreased with the electric system, making for a quieter, more pleasant ride.

Implementation Strategy

Several factors contributed towards a successful implementation of this battery electric operation. Below are components suggested for optimal utilization of battery electric operation within a maritime vessels.

- Given today's battery and recharging technologies, a route 30 minutes maximum in duration
- Routes that utilize 200 kWh or less
- Vessel size limited to 120 Passenger Car Units
- Availability of sufficient infrastructure for distribution of electric power at one or both ends of the route.
- Flexibility within the route timetable to allow for additional time for charging, and for reduced cruising speeds.
- Weight and hull shape optimization to allow for less resistance.

Status and Future Plans

Project partner Siemens, who was responsible for the electric propulsion system on the vessel as well as the charging stations, believes that 50 ferry routes in Norway alone could be profitably operated using battery electric vessels.

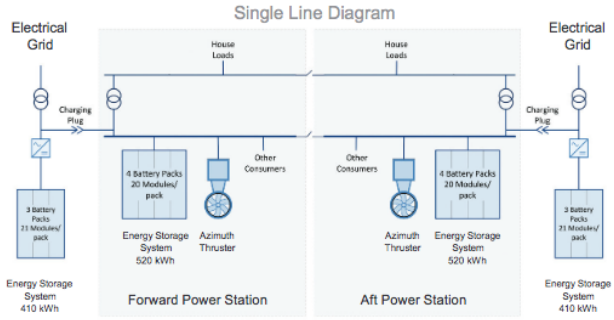


Figure 1: Single Line Diagram of the battery system for the Ampere

Contact Information

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 (askepri@epri.com).

Andra Rogers, Sr. Project Manager, Electric Transportation, EPRI, arogers@epri.com



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Electric Power Research Institute
3420 Hillview Avenue, Palo Alto, California 94304-1338 • PO Box 10412, Palo Alto, California 94303-0813 USA
800.313.3774 • 650.855.2121 • askepri@epri.com • www.epri.com

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