



SDTC SUCCESS STORY

COMPANY NAME: **CORVUS ENERGY**
PROJECT NAME: **DEMONSTRATION OF ELECTRIC FERRY USING BATTERY-HYBRID TECHNOLOGY**



SUSTAINABLE DEVELOPMENT
TECHNOLOGY CANADA™

Company Location: Richmond, British Columbia
Key Products/Services: Lithium-ion energy storage systems
Year founded: 2009
SDTC Support: 2011 to 2016
Mission: Energy provides purpose-built engineered energy storage solutions for marine, oil and gas, and port applications.
Consortia Partner: Wärtsilä Norway AS
SDTC funding: \$582,467
Leveraged funding: \$1,182,585
Total project value: \$1,765,052
More information: Corvusenergy.com

“SDTC played a crucial role in launching both Corvus and the entire maritime market for lithium-ion battery energy storage solutions. The credibility and funding that SDTC provided established the commercial viability and value proposition of our Canadian-based, advanced technology and manufacturing. We were able to execute as a true global player and integrate our solutions with locally developed technology to power the Folgefonn—one of the greenest, commercial maritime vessels operating today.”

Andrew Morden
President and CEO
Corvus Energy



CORVUS BATTERY-HYBRID ELECTRIC FERRY DEMONSTRATION: At a Glance

Corvus Energy (Corvus) and Wärtsilä Norway AS (Wärtsilä) proposed to retrofit an operating coastal ferry in Norway with a Corvus battery system coupled with a Wärtsilä energy management system and electric-motor drive train. The fully electric ferry will increase safety and reliability over incumbent technology while reducing maintenance costs of existing systems and generators. In addition, a reduction of 700,000 litres of marine diesel fuel per year will generate considerable environmental benefits.



At Sustainable Development Technology Canada (SDTC), we fund Canadian cleantech projects and coach the companies that lead them as they move their ground-breaking technologies to market.



SDTC builds Canada's economy by investing in its entrepreneurs and enabling the development of clean technologies. Our funding supports the development and pre-commercial demonstration of clean technology innovations.

Funded by the Government of Canada |

KEY FACTS

More than
TWO-THIRDS
of large commercial hybrid
vessels utilize a Corvus ESS.



Corvus ESSs have been installed on
more than 30 vessels and in over

50 MARINE
PROJECTS
WORLDWIDE.

The MF Prinsesse Benedikte—a Danish
ferry with a Corvus ESS—saved over

1M LITRES
OF FUEL

as a hybrid vessel in its first year of
operation. This equates to taking 800
medium-sized cars off the road for a year.



1M litres of
fuel saved



800 vehicles
off the road

Corvus ESSs will soon be used
in Canada—two new Seaspan
battery-hybrid LNG cargo ferries will
start operations between Vancouver
and Vancouver Island in late 2016.



The Opportunity

Battery-hybrid propulsion in marine vessels increases the energy efficiency of ships by optimizing the operation of their engines. Operating the engines at relatively constant and optimal power levels (i.e., load-levelling) allows for significant fuel savings and emissions reductions. While energy savings benefit all vessels, ships with frequently changing power loads and operational speeds have the most to gain through the adoption of hybrid technology.

Workboats—such as short-haul ferries or tugboats—spend a significant portion of their duty cycle maneuvering into position (relative to time spent operating at full power). Rather than sizing a diesel engine for peak power, hybrid systems allow for smaller, more economic engines. When full power is required, stored energy from batteries is used to provide additional power to the engines.

The use of hybrid systems in marine vessels addresses new emission regulations in Northern Europe and North America, reduces the need for fuel—lowering operating costs for operators—and correspondingly decreases GHG emissions and particulate matter. Moreover, changing consumer preferences for clean tech products are causing marine vessel operators to adopt cleaner and greener fuel alternatives. Corvus is filling a critical gap with the development of innovative hybrid and electric marine propulsion systems for large energy and power applications.

Project Overview

The Corvus electric ferry project sought to retrofit an operating coastal ferry into a fully electric vessel and demonstrate its performance under normal operating conditions for six months. Together with a Wärtsilä energy management system and electric-motor drive train, Corvus has successfully retrofitted an operational ferry in Norway—the Folgefonn—with a one-megawatt lithium-ion battery pack that replaces the main drive engines.

Corvus will demonstrate zero-emission technology for coastal vessels using renewable power (i.e., hydro and wind) to charge an on-shore battery system that will in turn charge the onboard battery array, which will power the propulsion system and vessel house loads. The electric ferry will save 700,000 litres of marine diesel fuel per year reducing emissions by ~ 40 tons of NO_x, 2,700 tons of CO₂ and 1.2 tons of SO_x yearly over incumbent technology; 2.7 tons of particulate matter emissions per year will also be nullified. The electric ferry is currently in operation for sea

Energy Storage Systems

Corvus lithium-polymer energy storage systems (ESSs) are capable of large amounts of sustained power output—comparable to a diesel engine. The ESSs provide a number of benefits over the incumbent diesel-fueled engines, including load-levelling of power, blackout prevention, maintenance-cost savings, and a significant reduction of greenhouse gases and other harmful emissions. The Corvus ESS improves safety and reliability of the entire vessel, and provides a rapid return on investment for operators—the system pays for itself in less than five years.

Corvus ESSs are easily scalable, and custom sized to fit on any number of large marine vessels. For onboard installations, batteries are stacked, racked and fitted with cooling and control systems to ensure proper voltage, current, temperature and communications links.



First-mover Advantage

With humble beginnings in Richmond, BC, Corvus has effectively created a new market for next-generation, battery-hybrid systems for large marine vessels. Corvus systems are operational in 33 vessels, ranging across the whole spectrum of workboats, including tug boats, offshore supply vessels for oil rigs, ferries and fully electric fishing boats. Corvus has even made the leap into adjacent markets, creating hybrid cranes for port operations (i.e., moving containers); Corvus has 21 crane installations in the Port of Shanghai—the largest installations of hybrid-electric port equipment in the world. Corvus technology is continuing to grow and expand—all from the same roots as the initial SDTC project.

Top Photo: AT6700 High Performance Energy Storage Module
Bottom Photo: Corvus Energy Storage System (ESS)



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