

Washington State Ferries – Hybrid-Electric Propulsion Conversion Project

Background

Washington State Ferries (WSF) has been exploring the feasibility of converting vessels to hybrid-electric propulsion system since 2012. Over the last few years, hybrid technology has developed rapidly, with ferry systems reducing their emissions by building hybrid and all-electric vessels. Prompted by the need to update the obsolete and unsupportable propulsion controls on its three Jumbo Mark II vessels, WSF revisited the idea in 2017. Rapid advancement in energy storage and charging technologies suggested that considerable cost savings could be realized through a conversion of these vessels.

WSF conducted two hybrid conversion studies ([study 1](#); [study 2](#)) and concluded a conversion of three Jumbo Mark II vessels would be fiscally, environmentally, and operationally advantageous. Subsequently, in 2018, the Legislature included \$600,000 for WSF to develop a request for proposal (RFP) to convert these vessels to hybrid-electric propulsion.

The Project

As WSDOT does with all its mega projects, WSF utilizes Practical Solutions when designing, building, operating, and maintaining its fleet, prioritizing performance-based, data-driven decision making in order to guide the development and delivery of ferry system investments. Among its goals are responsible asset management, targeted sustainability projects, and balanced investments into maintenance, preservation and improvements. With the potential for substantial reductions in fuel expenditure and an already scheduled window for propulsion system upgrades, hybridizing the Jumbo Mark II's will fit squarely into WSDOT's Practical Solutions model as a sustainable, cost-effective project that preserves and improves its existing infrastructure.

Why convert the Jumbo Mark II's?

WSF is the largest consumer of diesel fuel in the state (over 18 million gallons of diesel each year) and the largest generator of greenhouse gas emissions in state transportation (73% of annual greenhouse gas emissions)¹. WSF has identified its Jumbo Mark II's as ideal vessels for immediate conversion from diesel to hybrid-electric conversion, because:

- They are the three largest vessels in the 22 vessel fleet and account for 26% of total fuel consumption (5 million gallons of fuel/year)
- They are due for their 20-year propulsion system replacements, making for easy upgrades with minimal impacts on service
- They were constructed in the 1990s, meaning they have the potential for another 30-40 years of service
- These upgrades will reduce engine noise and vibration, giving our passengers and crew a quieter ride, with less impact on orcas and other marine life.
- These upgrades will improve engine reliability and save up to \$14 million a year on ferry operating costs.
- These upgrades could reduce WSF's total carbon emissions by approximately 25%. In fact, converting one ferry is equivalent to removing 20 diesel trucks from the road.

Timeline & Next Steps

Moving forward, WSF will actively pursue the conversion of its Jumbo Mark II's. WSF will develop preliminary cost and risk ranges in the summer of 2018. Battery purchase and construction could begin as early as July 2019, and will move forward on an accelerated schedule.



Assistant Secretary Amy Scarton and Director of Vessel Engineering and Maintenance Matt von Ruden with lithium ion battery banks. Twenty of these battery banks will be needed on each Jumbo Mark II vessels.

¹ [2016 WSDOT Greenhouse Gas Emissions](#)