

SMART CLIMATE INVESTMENTS

FOR A CLEAN ECONOMY

The Climate Commitment Act (CCA) generates funding to invest in carbon reduction solutions while capping total carbon pollution in the state. Washington is a top-ranked state for Best Economy, Best States to Live In, and Top States for Business. With smart public policies and investments, our state can continue to lead the way in building a clean economy that outpaces other states. This *Smart Climate Investments for a Clean Economy* series highlights projects that achieve cost-effective benefits for Washington communities, including those most economically-stressed, pollution-impacted, and under-served.



FERRY SYSTEM ELECTRIFICATION

WHAT

The Washington State Ferry (WSF) system is one of the highest-use ferry systems in the world, supporting 24 million passengers, and is the largest state government fuel consumer at [19 million gallons of diesel per year](#). Ferries and ferry terminals are a long-lived infrastructure investment, with anticipated useful lives of 60 years for new vessels and at least 60 years for terminal infrastructure. With a long-term System Electrification Plan, WSF is planning to shift vessels throughout the system to hybrid-electric, run primarily on battery-electric power provided from shore power stations. This System Electrification Plan is anticipated to take course over a two decade period, starting with four central Puget Sound routes: Seattle-Bainbridge, Seattle-Bremerton, Edmonds-Kingston, and Clinton-Mukilteo. The transition on these central Puget Sound routes is forecast to take place through 2033, including three retrofits of the largest, Jumbo Mark II, vessels in the fleet (Tacoma, Wenatchee, and Puyallup) and eight newly built hybrid-electric Olympic Class ferries. The electrification plan further calls for five ferry terminal charging infrastructure projects: Seattle, Bainbridge, Bremerton, Kingston, and Mukilteo.

WHY

Long-lived vessels combined with the significant public health implications of reduced diesel consumption from large vessel engines means that WSF electrification has major short- and long-term implications for both carbon pollution and toxic emissions in communities around these ferry routes. Diesel engines for ferry boats, whether for existing vessels or new builds that must meet cleaner engine tiers, are among the more pollution-intensive mobile sources of toxic criteria pollutants today. Previous research has demonstrated that the public health benefits clearly outweigh the incremental costs of electrifying these ferry routes.¹ Combined with long-term fuel savings, these public health and climate benefits push the net benefits into positive values by 2034 - timing consistent with the final vessel electrification targets along these central Puget Sound routes.



COST

-\$90

per tCO₂e*

*Tempest, Kevin and Pinard, Zac. [Washington's Decisive Decade: An Emerging Roadmap for Transportation Decarbonization & Cleaner Air](#). 2022.

With shore power fully leveraged, fuel consumption along these routes will drop by 85% to 95%, equivalent to 11.5 million gallons of diesel avoided per year. This is the greenhouse gas equivalent of removing over 26,000 diesel F-150 trucks from the road.

Across the initial 11 vessels considered, the average public health benefits are \$280 for each metric ton of diesel GHG emissions reduced. This high local air pollution impact combined with the proximity of these ferry routes and terminals to population corridors puts many communities at high risk for environmental health disparities. Research has shown that 50% of damages from air pollution tend to be concentrated within 20 miles of the release point, and that relative proximity of population to pollution sources can result in much greater public health damages than the baseline assumed in this analysis.²

Compared to most cases of transportation electrification, the ferry system plan may be uniquely positioned for maximum return on investment. Because the ferries run fixed, multi-daily routes, the batteries can be designed to routinely use their full capacity and capability. Even with an accelerated battery replacement schedule compared to on-road vehicles (once every four years on most routes), ferries are able to deploy their battery capacity multiple times per day, whereas a typical vehicle uses a fraction of its battery capacity daily. This unlocks much greater fuel savings per unit of battery capacity than other uses.



HOW

WSF's System Electrification is currently funded at \$1.33 billion, with the newest and largest investment of \$1.03 billion coming from the 2022 Move Ahead Washington transportation package which largely relies on revenues from the Climate Commitment Act's emission allowance auctions. This funding is not yet enough to fully transition the four central Puget Sound routes, let alone the remaining routes in the system. However it provides funding for up to five Olympic Class hybrid-electric ferries, four vessel conversions of Jumbo Mark II ferries, and shore power charging infrastructure throughout the central Puget Sound system.³ An estimated \$2.37 billion is needed to fully fund the long-term System Electrification Plan. However only a portion of this is incremental to costs that would be incurred for new vessels and vessel maintenance in the first place. The 2022 Decisive Decade report estimated that within the first \$2.0 billion in System Electrification, the incremental costs of electrification would be about \$300 million or around a 15% increase. This means that most of the system costs will be incurred whether the fleet is electrified or not. Continuing to rely on diesel fuel is likely to cost more over the long run than converting to a primarily electric propulsion ferry system, even before the substantial public health benefits are factored in.

A unique question presented by the system rollout deals with right-timing shore power availability to the degree possible. With shore power availability, the reduction in diesel fuel consumption is at least five times greater than with no shore power. While not necessarily a major lifetime or long-term concern, the impacts in the initial years of the program are nonetheless considerable. Consideration should be given to designing a system that deploys shore power as close to in-tandem with new vessel deployment as possible.

Ferry Electrification is a Smart Climate Investment, and we applaud the Move Ahead WA funding for pushing this process out of the dock. State and Federal investments should be secured to keep the System Electrification process going smoothly and expeditiously through the four central Puget Sound routes and, eventually, to the remaining routes in the system.

¹ Tempest, Kevin and Pinard, Zac. *Washington's Decisive Decade: An Emerging Roadmap for Transportation Decarbonization & Cleaner Air*. 2022.

² Goodkind, A. L., Tessum, C. W., Coggins, J. S., Hill, J. D., & Marshall, J. D. (2019). *Fine-scale damage estimates of particulate matter air pollution reveal opportunities for location-specific mitigation of emissions*. *Proceedings of the National Academy of Sciences*, 116(18), 8775-8780. [t.ly/6oHF](https://doi.org/10.1073/pnas.1901111116)

³ wsdot.wa.gov/construction-planning/major-projects/ferry-system-electrification