Blog post--"Decarbonization can only be achieved by working together" -Wartsilla General Manager Egil Hystad

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I spent the last four days traveling from Haugesund to Bergen to Oslo to Trondheim meeting with leaders of Norway's zero emission vessel ecosystem at each stop along the way. Our delegation of ferry professionals from San Franisco, British Columbia and Alaska met with regulators, battery manufacturers, ship builders, marine architects, charger manufacturers, engine manufacturers and more. Each node in this network of marine expertise is extraordinary in its own right, but I've been most struck by the overarching theme of collaboration shared by all the speakers I met.

"Just making an ammonia engine does not lift anything," said Egil Hystad, Wartsila's General Manager for Market Innovation, "you have to have the whole value chain." He was speaking in reference to Wartsila's recent efforts to develop engines that can burn ammonia (NH3) just as well as diesel. So called "green ammonia" is one of several carbon neutral fuels that can be synthesized using electricity from renewable resources and has sufficient energy density to serve most marine industries' needs. His point was that if Wartsila successfully releases a duel fuel engine with satisfactory NOx emissions, reliable operation and zero carbon emissions while burning ammonia, it will not do any good if ammonia is not available at ports or vessels do not have appropriate storage on board. This observation motivated Wartsila to create the Zero Emission Energy Distribution at Sea coalition—a group of companies developing system-wide solutions that achieve zero emission shipping.

In Oslo we heard from ENOVA (a government agency funding new technology development in marine industries), the Port of Oslo (a municipal port with fully decarbonized municipal owned infrastructure since 2018), DNV (the leading marine classification and advisory organization), and Norwegian Hydrogen (a business presently developing hydrogen infrastructure to supply ships in Norway's World Heritage fjords). All four speakers—a funder, a port owner, an international advisory company and an innovative start up shared space at the port's conference room and highlighted collaboration within and across their sectors. Enita Vosdal, a senior advisor at ENOVA framed it this way: "[All funders] are collaborating on deciding what types of funding opportunities are available…sometimes I speak more with Innovation Norway than with people in my own company because there is so much happening." As a result, no piece of Norway's marine industry is left out of the green shift. Renewable fuel startups, battery charger manufacturers, safety regulators, ship yards and others are all actively looking for pathways to decarbonization, supported with funding and open communication.

Does all this collaboration lead to more innovative industry? Absolutely. Networks of collaboration and open information sharing are widely acknowledged as central factors to

successful innovation hubs like Silicon Valley or Massachusetts's Route 128 [1], [2]. Remarkably, Norway has created a tech-like innovation structure within the age-old maritime industry. Now, the marine sector in Norway is experiencing an exponential growth in electrification that's reminiscent of growth in solar installations or computer hard drive capacity seen elsewhere: Norway has advanced from one electric ferry in 2015, to 60 in 2021, to nearly 80 in June 2022.

After a few days here, I certainly do not understand how Norway created this ecosystem of innovation but one factor might be the shared vision for the future I saw from every speaker (for a rigorous analysis, check out Sæther and Moe's article in the Journal of Energy Research and Social Science [3]). Each presenter seemed to envision a future where vessel emissions went to zero and Norway exported its expertise in low carbon marine operations. That shared sense of purpose dovetails with a commitment from the federal government to invest in marine innovation. In the great Norwegian paradox, the government is able to deliver on that commitment in part due to its profit from the fossil fuel industry. I was also struck by the trust that seemed to be shared between companies, regulators and government that allowed them to collaborate. Captain Jon Leon Ervik, a department head at the Norwegian Coastal Administration, had this to say about it: "Sometimes I am asked, 'do you trust each other'…I think, 'Yes, we're under the same king.'" It was a light-hearted comment, but it communicates a particularly Norwegian spirit of collaboration that was a joy to see. As was said several times in different ways over the last few days, Norway has been building ships for a thousand years and it will build the ships of the future.

[1] B. T. Asheim and M. S. Gertler, "The Geography of Innovation: Regional Innovation Systems," Oxford Handb. Innov., no. January 2009, 2009, doi: 10.1093/oxfordhb/9780199286805.003.0011.

[2] W. W. Powell, K. W. Koput, and L. Smith-Doerr, "Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology," Quarterly, vol. 41, no. 1, pp. 116–145, 1996.

[3] S. R. Sæther and E. Moe, "A green maritime shift: Lessons from the electrification of ferries in Norway," Energy Res. Soc. Sci., vol. 81, Nov. 2021, doi: 10.1016/J.ERSS.2021.102282.