



Ports & Maritime
Hydrogen Summit Series

**CHARTING A COURSE
FOR NET ZERO:**

Critical First Steps on a
Hydrogen Pathway

EXECUTIVE SUMMARY

Published October 2021

About the Authors

Oceans North is a Canadian charity that supports marine conservation in partnership with Indigenous and coastal communities. Having worked in the Arctic and North Atlantic for more than a decade, Oceans North recognizes that the health of the climate, the ocean and coastal communities are interconnected. Climate change and its effects on the ocean is a theme throughout all our work, from developing safe Arctic shipping corridors to helping address maritime sector emissions in all three of Canada's oceans. Brent Dancey and Erin Abou-Absi lead Oceans North's work on the maritime energy transition and are the lead authors on this report.

Zen Clean Energy Solutions is a boutique consulting firm with over 60 years of combined experience in the clean energy sector. Zen specializes in zero-emission transportation and electrification. Zen's team has deep technical expertise in both fuel-cell electric and battery electric powertrain technologies, as well as supporting hydrogen fuelling and electric charging infrastructure.

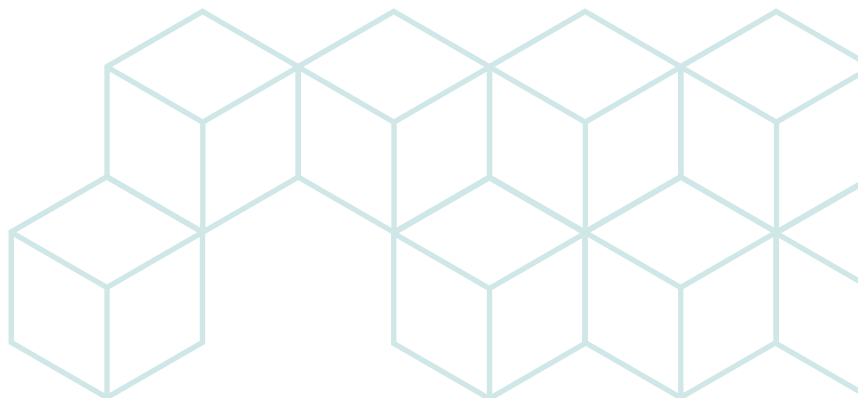
Zen was the lead author on the Government of Canada's *Hydrogen Strategy for Canada*, the *BC Hydrogen Study*, and the recently completed *Feasibility Study of Hydrogen Production, Storage, Distribution and Use in the Maritimes* on behalf of the Offshore Energy Research Association (OERA).

Ocean Conservancy is working to protect the ocean from today's greatest global challenges through science-based solutions for a healthy ocean and the wildlife and the communities that depend on it.

Acknowledgements

The authors are grateful to all of our panelists and participants who took the time to share their thoughts, experiences and expertise with us (a full list is available on p.9 and 10). We are hopeful that the connections forged during the Ports and Maritime Hydrogen Summit Series can form the basis for lasting cooperation across countries and sectors on reducing emissions and seizing the economic opportunity presented by decarbonization.

For more expert insights from our Summit Series, visit the [Summit Series YouTube channel](#), where you can watch the presentations.



Executive Summary

Heat waves, hurricanes, forest fires: the extreme weather that touched so many of our lives this past year gave us a visceral reminder of the urgent need to reduce carbon emissions and fight climate change. If we want to avoid the worst impacts, we need to act now, around the world and across all sectors of the economy.

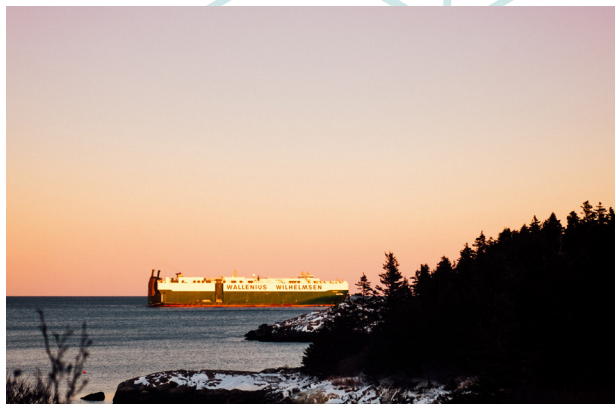
The global shipping industry—one of the world's largest emitters of greenhouse gases—has mostly remained on the periphery of discussions about reducing emissions, and the sector's current plans for decarbonization are not aligned with what is required to prevent the Earth's temperature from rising more than 1.5°C over pre-industrial levels.

Given the massive footprint of this sector, decarbonizing the shipping industry will not only lower global emissions, but also spur the development of zero-emission fuels like clean hydrogen for use in other industries. Hydrogen can be produced using only water and renewable electricity, and it emits no greenhouse gases when used to power ships and vehicles over long distances or to produce high-temperature heat for industrial use. It is estimated that hydrogen could make up 25 percent of the global energy mix by 2050.

In addition to being an environmental imperative, reducing shipping emissions is an economic opportunity. The Global Maritime Forum forecasts that **there is a \$1.9 trillion USD market opportunity** connected to decarbonizing the shipping industry, much of which will come from investments in clean fuel production and land-based infrastructure.

As a country that is both a major energy producer and is warming at twice the global average, Canada has a large stake in the outcome of the transition to clean fuels — in the shipping sector and beyond. If we can fully seize the opportunity to become a leader in the development and use of hydrogen, it could help reduce emissions and create **more than 350,000 jobs and direct revenues of over \$50 billion a year by 2050.**

In the spring of 2021, Oceans North, Zen Clean Energy Solutions, and Ocean Conservancy convened the Ports and Maritime Hydrogen Summit Series. This first-of-its-kind event brought together decision-makers, innovators, and industry leaders on the west and east coasts to create a dialogue around the role of clean hydrogen in reducing maritime sector emissions.



Panelists and participants converged on four major themes throughout the discussion. Despite the many challenges that were identified in creating economies for new fuels, panelists agreed that **the time to act is now** and that:

- 01.** Canadian seaports are ideal for hydrogen hub development;
- 02.** Fuel-cell technology is ready for wider uptake in port-side equipment;
- 03.** Hydrogen uptake in marine vessels starts with ferries and harbour craft;
- 04.** Canada is well positioned to serve the global demand for clean hydrogen.

*Following the summit series, Oceans North and Zen Clean Energy Solutions synthesized the dialogue and developed a set of **10 recommendations** tied to the major discussion themes. They are as follows:*

Supporting Ports as Hydrogen Hubs

- 01.** Seaports with multi-modal cargo handling operations and which serve domestic and international marine vessels should be prioritized for hydrogen hub development, with the goal of having **five hydrogen hub demonstration projects underway by 2025**. Special consideration should be given to the ports of Vancouver, Prince Rupert, Saint John, Halifax, and Montreal.
- 02.** **Seaports should have a zero-emission mandate** in line with Canada's 2030 and 2050 climate targets.

To ensure ports are tracking to meet the zero-emission mandate we recommend:

- I.** Mandatory annual reporting of carbon dioxide equivalent (CO₂e) emissions and fuel consumption.
 - II.** Requiring port operators to file zero-emission equipment transition plans by 2025.
 - III.** Requiring zero-emission fuels to make up 30 percent of all fuel used at seaports by 2030 and 50 percent by 2040.
 - IV.** Prohibiting all new gasoline and diesel internal combustion engine equipment purchases post-2030.
 - V.** Requiring all ocean-going vessels to be zero emission at berth by 2030.
- 03.** A dedicated **Hydrogen Port Infrastructure Fund** should be created to advance the deployment of on-site hydrogen production, compression, storage and dispensing equipment at seaports.

This funding should include an allocation for feasibility studies to assess the technical and commercial viability of new projects and should be stackable with the Clean Fuels Fund and other federal funding programs, to a maximum of 75 percent of project costs.

Special consideration should be given to renewable-energy-to-hydrogen production projects that support hydrogen hub development at Canada's major seaports.

Supporting Hydrogen Use in Port-Side Equipment

- 04.** A targeted **Zero-Emission Port-Side Equipment Demonstration Fund** should be created to support the uptake of zero-emission port-side handling equipment. This funding should include an allocation for feasibility studies to assess the technical and commercial viability of new projects.

Over the mid-term, this funding could transition from the design and development of new equipment to a first-come, first-serve voucher program like what exists in California for higher technology readiness level products. This approach will address the incremental capital costs of deploying zero-emission technologies.

- 05.** The government should provide **specialized manufacturing support** through tax incentives, rebates, or other public policy mechanisms to support and accelerate made-in-Canada equipment for targeted elements of the value chain for seaport or marine vessel equipment.

Supporting Hydrogen Uptake in Marine Vessels

06. The federal government should work with provinces, municipalities, and private operators to mandate **zero-emission ferry operations** in line with the country's 2030 and 2050 climate targets. The near-term focus should be on planning and pilot development.

To ensure ferry operators are tracking to meet the zero-emission mandate, we recommend:

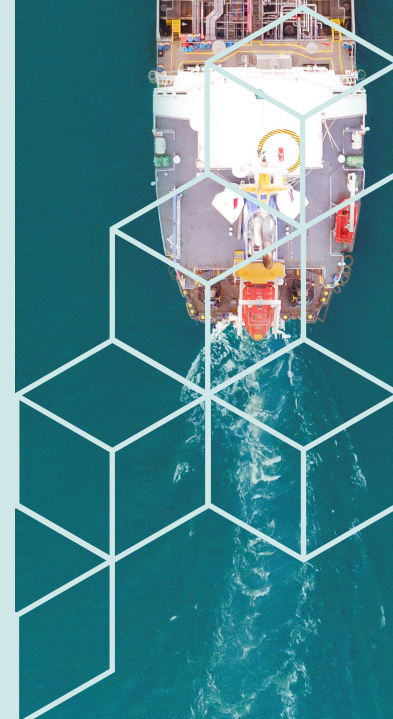
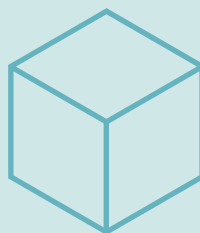
- I. Mandatory annual reporting of CO₂e emissions and fuel consumption.
 - II. Requiring ferry operators to file vessel transition plans to zero-emission operations by 2025.
 - III. Requiring 30 percent of fuel use in ferries to run on zero-emission fuels or electricity by 2030.
 - IV. Prohibiting new internal combustion engine equipment purchases post-2030.
07. A **Zero-Emission Marine Vessel Fund** should be created to advance hydrogen fuel-cell electric and battery electric technologies in ferries and harbour craft. The fund should include an allocation for feasibility studies to assess the technical and commercial viability of new projects as well as support the design, assembly, and operation of the equipment for a defined period.

Special consideration should be given to local shipyards and Canadian companies in the maritime supply chain as a way of building domestic capacity and expertise in the development and implementation of zero-emission fuels and technologies.

08. The **Clean Fuels Regulation should be amended to include marine vessels and shore power at berth** to fully unlock the potential of switching to zero-emission fuels like clean hydrogen and electricity in the maritime sector.
09. The government should **prioritize the procurement of zero-emissions vessels** when constructing all non-military federal vessels, including vessels owned or operated by Crown corporations.

Supporting Canada's Export Opportunity

10. Canadian Port Authorities should be empowered and supported to pursue **partnership agreements with international seaports** to facilitate the export of clean hydrogen and to develop green shipping corridors. These corridors must be compatible with the broader decarbonization targets that will prevent the Earth's temperature from rising more than 1.5°C. Partnership agreements would include vessel innovation, fuel bunkering, carbon intensity certification and fuel quality standardization to facilitate trade.





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