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# New Energy Markets in West Coast Shipping

## Towards a Clean Energy Value Chain

December, 2023



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### **Acknowledgments**

Thank you to all the participants for joining us in a productive first discussion. Oceans North is especially grateful to Juarya Veltkamp (C40 Cities Climate Leadership Group), Bryan Buggy (Vancouver Maritime Centre for Climate) and Andy Ralph (Arup) for partnering with us to host the event. We would also like to thank Laurence Cret (International Energy Agency), Ahila Karan (Lloyd's Register Marine Decarbonization Hub), Selena Elmer (The Aspen Institute), and Jeff Grant (HTEC) for helping to lead the discussion.

## Participants



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# 1



## Introduction

Work to transition the maritime sector away from fossil fuels has been delayed due to the hard-to-decarbonize nature of activities such as long-range shipping, but there are reasons to focus and fast-track maritime decarbonization. For example, ports play a critical role in connecting multiple industrial sectors, energy subsectors, and multiple modes of transport—including road, rail, and shipping—and action at ports can unlock decarbonization opportunities landside and seaside.

On November 3, Oceans North, the Vancouver Maritime Centre for Climate, C40 Cities Climate Leadership Group, and Arup convened a multi-stakeholder workshop on New Energy Markets in West Coast Shipping today to link clean energy projects with the marine value chain and figure out how energy export projects can be leveraged to decarbonize ports, shipping and marine transportation.

As hosts, we were pleased to have the participation of 34 senior representatives from across the shipping sector supply chain on the Pacific Northwest Coast join us for this conversation. Our table welcomed candid participation from new and incumbent energy producers, port operators, port authorities, shipping companies, cargo shippers, clean tech and innovation companies, a coastal Nation, and key provincial and federal government officials.

This report summarizes the discussion and outcomes identified by workshop participants during the event.

While the dialogue in the room took place under Chatham House Rules, individual presenters have agreed to have their introductory presentations appended to this report and to have their formal remarks attributed here. The formal agenda is also appended.

# Objectives and Key Takeaways

## Objectives

The starting point of this conversation was the [Canadian Green Shipping Corridors Preliminary Assessment](#) completed by Oceans North, Arup, and Lloyd's Register Maritime Decarbonisation Hub. For the first time in our experience, energy producers were brought into the room with other supply-chain actors to discuss solutions to zero-emission energy supply and offtake.

Our goals included putting the shipping sector on the radar of zero-emission energy producers and suppliers as they assess and plan to meet demand and to look for new offtakers and local-use cases; communicating the needs of the sector in advance of the next federal budget; supporting the Green Shipping Corridor Fund releases after our meeting took place; and building an ambitious catch-up agenda focused on both increasing demand and clean fuel and technology supply across this sector.

We also wanted to leave the conversation having formed some stronger relationships and new connections between participants, as well as having gained insights to bring back to our respective organizations.

The agenda was ambitious for a 2.5-hour discussion, but it was very successful. We look forward to hearing from you and staying in touch on what comes next.



## Key Takeaways from What We Heard

The major takeaways from the discussion were that:

- 1. The existing marine fuel supply chain is fragmented.** Despite a universal understanding the transition away from fossil fuels will require unparalleled cross-value collaboration, there is a disconnect between energy producers, maritime sector offtakers, cargo-owners, and mid-stream players like ports and technology providers. As the maritime sector accelerates its ambition to address climate change, it is important that there are fora where information can be shared freely and where new relationships can be forged up and down the marine fuel supply chain.
- 2. The cost of zero-emission fuels is too high for widespread adoption.** Upstream costs associated with the build-out of new infrastructure and renewable electricity are high and will require financing. Unlike a gas plant where inputs costs fluctuate with the market, the project costs for hydrogen production, for example, are fixed for the lifetime of the project. Industry, government, and the financial sector will need to work together to ensure first-generation zero-emission fuel projects are competitive and profitable.
- 3. The adoption of zero-emission marine fuels will require a systemic change in the way the fuel is procured.** Instead of purchasing fuel on the spot market, as is done today with traditional marine fuels, multi-year fuel offtake agreements are needed to provide certainty for fuel producers to invest in new energy projects, and for vessel owners and port-side fleet operators to invest in new technologies and equipment that will use the fuel.
- 4. Aggregating demand for fuels—and for electricity—is required** to support secure supply at scale and to support the multi-year offtake agreements.
- 5. Maritime offtake benefits fuel production projects.** There is an opportunity to leverage our energy production for export to expand Canada's role in new zero-emission fuel markets, including fuel bunkering at ports. The adoption of zero-emission fuel at ports and for international and domestic vessels supports Canada's parallel pursuits of energy export and the domestic energy transition.
- 6. The adoption of zero-emission fuels and technologies in the maritime sector will not happen without government support.** In the early stages of the adoption of zero-emission fuels and new technologies in the maritime sector, cost-for-difference contracts, tax incentives, and direct subsidies are needed to de-risk investments for fuel producers and vessel/fleet operators. Without this initial upfront support by government, Canada will be exposed to prices and policies determined elsewhere. Without leadership, we become a cost-taker and less competitive compared to other jurisdictions that moved quickly to develop new fuel supply chains.

# 2





# Shipping Sector Energy Outlooks and Assessing Demand

Laurence Cret, Transportation Analyst with the International Energy Agency (IEA), and Ahila Karan, Senior Decarbonisation Analyst in the Lloyd’s Register (LR) Maritime Decarbonisation Hub, presented their current work on getting to net-zero in the shipping sector. The focus was energy and fuel types, estimating fuel demand, and fuel competition with other sectors.

## What’s Needed to Reach Net-Zero Shipping by 2050

In September 2023, the IEA released their [Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach – 2023 Update](#). The report showed that current policies across economic sectors (such as the European Union’s FuelEU regulations on fossil fuel pricing and shore power) will not achieve net-zero emissions globally by 2050. As illustrated in Figure 1, this is particularly true for the shipping sector, with existing policies leading to a significant rise in emissions. The IEA results are consistent with other forecasts and underline why we must focus on enacting policies to decarbonize the shipping sector.

The IEA report includes a modelled net-zero by 2050 scenario that would require additional measures, including maximal operational efficiency and design as well as zero-emission fuels. Although the report does not prescribe policies to achieve net-zero by 2050, the analysis includes key details, including:

- Net-zero by 2050 requires an 85 percent reduction in fossil fuel use relative to 2022.
- Ammonia (almost 50 percent), biofuels (almost 20 percent), and hydrogen (almost 20 percent) are forecasted to supply the shipping sector’s energy needs by 2050, with methanol supplying a marginal quantity. This outlook may be contested, for example by fuel producers and shipping companies building, ordering, and investing in e-methanol technology and vessels.
- Hydrogen-based fuels are key to sector decarbonisation.
- According to the IEA’s cross-sector analysis, biofuel supply is significantly constrained by the availability of sustainable biomass.
- Finally, the deployment of clean technology is fundamental to decarbonization—mainly to support new zero-emission fuel engines and bunkering facilities.

IEA Licence: CC BY 4.0

### Ambitious policies are needed in the shipping sector

iea

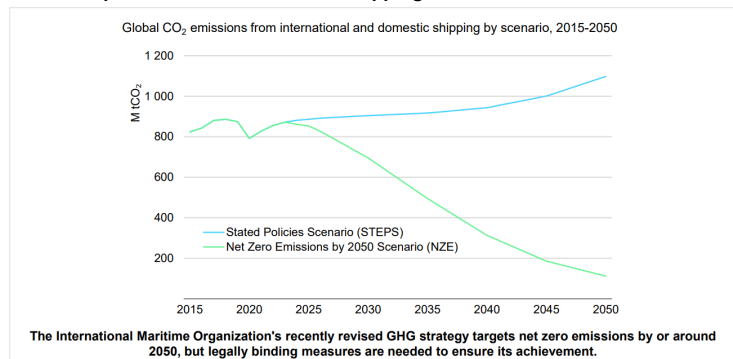


Figure 1: CO<sub>2</sub>e Emissions Scenarios from Shipping Sector

## Green Shipping Corridor Opportunities on the Pacific Coast

In 2023, Oceans North, Arup, VMCC, and Lloyd's Register Maritime Decarbonisation Hub (LR MDH) released the [Canadian Green Shipping Corridors Preliminary Assessment](#). The assessment included case studies for future shipping energy demand at the Ports of Vancouver and Prince Rupert:

- Using AIS data, LR MDH estimated future ship traffic and fuel bunkering demand for zero-emission fuels at each port, with example fuel typologies provided based on regional characteristics. Using LR MDH demand estimates, Arup then developed scenarios to supply the estimated demand based on regional characteristics such as the availability of land.
- The Port of Vancouver is projected to support stand-alone e-methanol fuel production and bunkering in the future. The analysis predicted a demand of approximately 1 kilotonne per annum of heavy fuel oil equivalent (ktpa HFOe) in 2030, equivalent in energy terms to 22ktpa of methanol.
- The Port of Prince Rupert is well positioned for multi-port coordination as an energy and fuel export location given the surrounding land availability. For example, there is potential for green shipping corridor connections based on regular routes from Okpo, South Korea, and Zhoushan, China.
- The potential to create a regional demand hub was discussed as a possible strategy to aggregate demand further across multiple ports that could scale further and send a strong and stable demand signal to investors of the necessary fuel supply infrastructure.
- As a next step, it would be possible to identify different sector / energy and fuel production / bunkering / shipping clusters and create a more accurate and broader demand case, including a fuel infrastructure case across marine and landside sectors.

### Quote

**The work from here not only needs the shipping stakeholders to be part of the process of refinement; various government bodies must be in the room, and other sectors as well. How can we aggregate with landside sectors and demand centres to create a much more compelling business case for fuel production and fuel infrastructure investment?**

**Ahila Karan, Senior Decarbonization Analyst,  
Lloyd's Register Maritime Decarbonisation Hub**

## Conclusion

To summarize, the Green Shipping Corridors Preliminary Assessment demonstrates clear opportunities for green shipping infrastructure development on the Pacific Coast of North America.



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# 3



# Aggregating Demand and Cross Value-Chain Collaboration for Zero-Emission Shipping

Addressing the challenge of identifying creative ways to aggregate energy and fuel demand across locations and geography, Selena Elmer, Senior Program Manager at the Shipping Decarbonization Initiative, presented on The Aspen Institute's Zero Emission Maritime Buyers Alliance. The conversation that followed largely focused on whether markets will support the cost, or "green premium," of the technologies and fuels necessary to achieve net-zero.

## The Zero-Emission Maritime Buyers Alliance (ZEMBA)

ZEMBA is a first-of-its-kind buyers group within the maritime sector designed to accelerate commercial deployment of zero-emission (ZE) shipping by aggregating demand among climate-leading cargo owner companies. Through ZEMBA, member companies can procure zero emission shipping services by negotiating large, multi-year market contracts that lower risk and help fund the "green premium" associated with zero-emissions fuels and technologies. For its first round of Request for Proposals (RFP) for ZE shipping services, ZEMBA has defined zero-emission fuels to have an emissions reduction potential equal to or greater than 90 percent compared to low-sulfur fuel oil on a lifecycle basis. Elmer explained that the decision to exclude LNG may be contentious for the industry, but that LNG does not meet this ZE fuel definition on a lifecycle basis. ZEMBA's objective, Elmer explained, is to avoid lock-in and test the market on the ultimate goal of true ZE solutions.

The current RFP is to procure zero-emission shipping with a three-year contract for 600,000 twenty-foot equivalent units (TEU) based on an LA-Shanghai benchmark distance (or 1.15 billion TEU-miles per year). For context, this is equivalent to approximately 7 percent of the Port of Vancouver's annual container capacity. The deadline to submit proposals to the ZEMBA RFP was November 2023, with contracts expected to be awarded Spring/Summer 2024, vessels hitting the water in 2025, and cargo owners receiving a certificate for their scope 3 emissions reduction. ZEMBA plans to issue additional RFPs in future years.

There were two initial responses from participants to the ZEMBA presentation:

- Wow! I wasn't aware of this initiative—it's practical and leverages market mechanisms. How do we scale it to greater volumes and to other types of shipping? For example, could we use this model for bulk shipping of commodities in Canada given the market share of bulk vs. container shipping?

### Quote

**ZEMBA (Zero Emission Maritime Buyers Alliance) is designed to try to address the chicken egg problem that in the zero-emission fuel market. If cargo owners can come together and make sufficiently large and multi-year advanced market commitments for zero-emission shipping, it ultimately will encourage ocean carriers to enter into zero-emission fuel offtake agreements, thereby stimulating fuel supply, and investments in more zero-emission capable vessels and really work across the value chain to ensure that the maritime supply chain is ready for business.**

**Selena Elmer, Senior Program Manager, Shipping Decarbonization Initiative**

- This is too small to shift energy use. The busiest container ports of Shanghai or Shenzhen, for example, handle over 65 million TEU annually. The ZEMBA RFP doesn't represent even 1 percent of that volume. It's an interesting and worthwhile initiative but given the current global market and regulatory context, demand for zero-emission shipping is inadequate to change upstream behaviors and fuels. The green premium—as it stands—is too high for companies procuring shipping. Customers will not, or cannot, absorb green premium costs.

**Quote**

Obviously it comes down to price. And this model from ZEMBA actually gives me some comfort and hope that people that are prepared to pay can aggregate enough demand and incent the investment that's going to be required.

**Participant**

## Bulk Shipping

Participants observed that on Canada's West Coast, bulk commodities make up the vast majority of maritime trade. Grains, coal, forestry, and wood were mentioned as main bulk commodity exports from British Columbia. It was also acknowledged, however, that container ship imports, and therefore container traffic, is also significant in the region. The Port of Vancouver represents market power potential through both container ships and bulk carriers. See figure 2.

A couple of participants mentioned new initiatives under development with bulk commodity producers to reduce emissions from shipping along the major ports of the Pacific Northwest. Ports highlighted included Seattle, Vancouver, and Prince Rupert, but there were no specific details available at this stage.

The conversation around bulk shipping was left more as a challenge to participants to pursue after the meeting, rather than a particular resolution emerging.

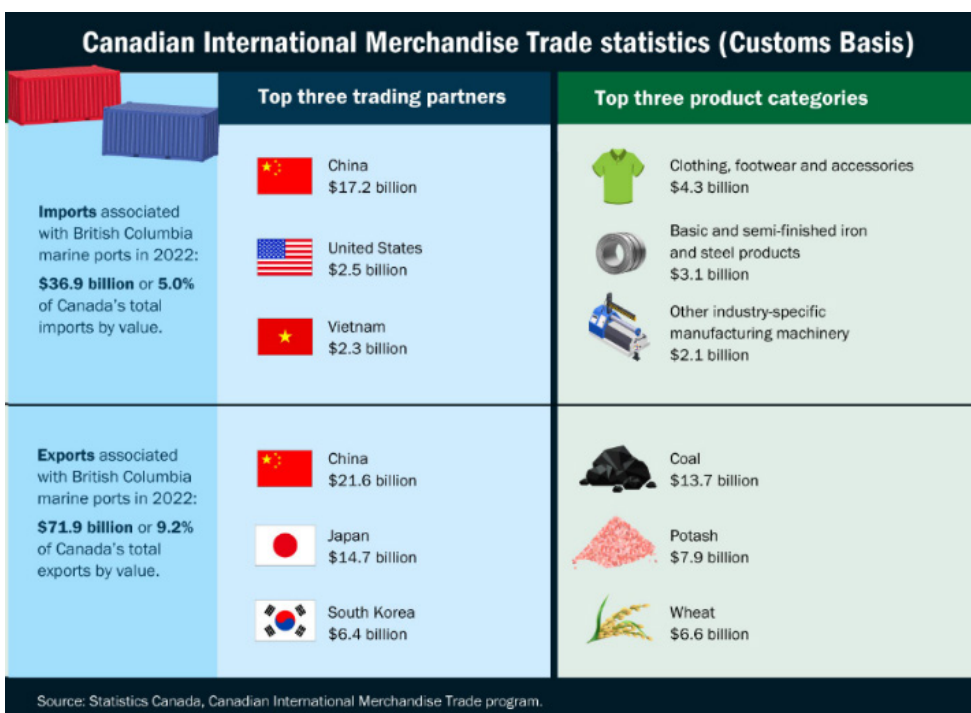


Figure 2 Imports and Exports and BC Marine Ports

## Nearshore Vessel Electrification

Some commercial fleets are also electrifying nearshore vessels. For example, [HaiSea Marine hybrid electric tug boats](#) hit the water this summer. [Teck, SAAM Towage, and Neptune Terminals](#) announced an agreement to build electric tugboats, and are currently in the final testing stage for the vessels.

## Who Pays the Green Premium

Who is willing to pay the “green premium”—the increased cost for adopting new fuels and technologies to achieve net-zero—and how much will it be in the context of shipping? The ZEMBA initiative will provide one response in the coming months by price seeking in the market for what shipping companies will charge for zero-emission shipping over three years (and whether they’ll be able to raise green capital to bid at a discount).

There was general agreement among participants that the shipping industry is not yet in a place to absorb or pass through premium costs from shipping companies to shareholders or cargo owners, or from cargo owners to consumers or bulk markets. There was also limited awareness of any significant carbon credits that would offset prices for zero-emitting fuels and technologies, and limited bankability of these credits to provide confidence to financial institutions to approve debt financing based on a value assessment of carbon credits.

## Role for Governments to Finance and De-Risk Zero-Emission Investments

Many people raised the unprecedented role of the United States Inflation Reduction Act in closing the green premium and spoke in support of a legitimate role for public financing to close the funding gap for zero-emission projects. Public finance is appropriate where there is confidence and assurance that developing, commercializing, and adopting new technologies and fuels will drive significant emissions reductions and drive down the costs of tech and fuels over time. The urgency of the transition to zero emission makes public financing reasonable at all tech-readiness levels, including for off-the-shelf tech that is not yet widely deployed or accessible. There was interest expressed, but no available funding streams were identified at the federal level in Canada to directly address the cost premium of zero-emission fuels. The possibility of including the marine sector in the Canadian and BC Fuel Standard was discussed as one way to monetize emissions reductions, but it was also stated that the financial sector is only starting to build out the bankability of carbon credits in Canada in terms of debt financing based on prospective credits.

### Quote

The vast majority of customers want the green services and are not willing to pay. They want it for the same price or they’re not going to consider it.

Participant

### Quote

There is a culture here in British Columbia that’s very supportive. The first carbon price was based here. And the culture will also shame you... in which case the green premium will come from your marketing budget.

Participant

### Quote

Fuel producers are saying, “We’ve got this green methanol, we’ve got this biogas.” But then you’ve also got a huge cost gap to overcome. Where do you see the role of governments or entities like Transport Canada? Where do you see their role from a financing perspective? We’re talking about infrastructure projects that need some sort of financing, such as through contracts for difference.

Participant

## Role for Industry to Lead the Transition

Participants noted that individual large shipping, fuel production, and technology companies have impressive research and development underway, but that there is also a need to accelerate and openly share lessons along the decarbonization s-curve. There was discussion about the role of cross-industry collaboration to de-risk or pool risk around certain investments and technologies. Participants generally agreed that industry will and must lead, but the limited time available for discussion limited participants' ability to identify defined pathways. Participants agreed that policy and jurisdictional consistency is essential to support competitiveness and prevent carbon displacement (leakage).

One proposal was to utilize the [RightShip](#) platform to develop technologies, and fuel aggregation or collaboratives. An organization such as RightShip could help provide safety training, including fire prevention and suppression with respect to new fuels and handling.

There was support for focusing efforts on particular geographic regions or corridors based on particular commodities, and also where regulations/requirements could be standardized to maintain competitiveness and avoid putting certain actors at a disadvantage.

## Conclusions

Collaboration on land and at sea, between shipping companies, fuel producers, and governments are needed to significantly reduce shipping sector emissions and put the sector on net-zero pathway.

Despite the significant barriers discussed, participants were optimistic that aggregating shipping fuel demand can be achieved in various ways, including geographically and by commodity type. Government support, a change in market/consumer willingness to pay, or some other financial mechanism will be needed to address the green premium associated with zero-emission fuels.

### Quote

#### Industry Priorities

1) Cost and risk of investing in the fuels and vessels.

The cost has to be reduced on some fashion. Green fuels could be produced for land locations. We can't do all of it on our own.

2) How do you get fuel to the coasts, to the ports, and then onto the vessels in a cost-effective way?

3) Standards and governance. Our vessels move in networks, so we need standards across various ports. Then when we make investments, we can use them in multiple places so the return on investment makes sense.

Participant

### Quote

There is an unprecedented amount of capital currently available from federal agencies for clean energy and technologies. For clean tech companies there has never been a better time. Venture Capital has carved out 15, 20, even 50% of funds to invest in technologies that address climate change. Investors that never thought about clean tech are thinking about it.

Participant





# 4



## Scaling Solutions: Ports as Energy Hubs

Jeff Grant, Vice President of Transportation at HTEC, led a conversation on shifting the role of ports to act as energy hubs for the shipping sector. Jeff has more than 20 years of experience working on hydrogen fuel, including authorship on the Hydrogen Strategy for Canada, the BC Hydrogen Strategy, and the Feasibility of Hydrogen in the Maritimes, all of which underscores the importance of ports in scaling hydrogen fuel solutions. The port authorities of Vancouver, Seattle, and Prince Rupert; global terminal operators; DP World; and GCT Terminals presented on their efforts to decarbonize global trade and transportation.

Pacific Northwest ports are strategically located for trade with the Asia-Pacific region and to generate regional and national economic benefits and jobs. Both the United States and Canada are signatories of the Clydebank Declaration—an international commitment to develop six green shipping corridors by 2030—and have published Green Shipping Corridor Frameworks with Paris-aligned emission reduction targets.

### Scaling Supply and Demand for Zero-Emission Fuels at Ports

Ports are strategically important for the adoption of zero-emission fuels, including hydrogen-based fuels, because they act as centrally located demand centres for heavy diesel users. Charging and fuelling infrastructure can be shared across users at ports and demand aggregated across a variety of road, rail, and marine vehicle types at ports. By matching supply and demand, economies of scale are established, which will reduce zero-emission costs and incentivize adoption across the entire value chain.

### Ports as Planners, Convenors, and Innovation Champions

Ports have stepped up to play the role of master planners and convenors, a dual function described as “creating a sandbox for innovation.” The port authorities of Vancouver, Seattle, Tacoma, and the Northwest Seaport Alliance, guided by the Northwest Ports Clean Air Strategy, have committed to phasing out emissions from port-related activities by 2050. The Port of Prince Rupert shares the same goal of carbon neutrality by 2050, with a 2030 target of reducing emissions by 30 percent.

Port authorities conceded that reaching climate targets will not be easy. Emissions at ports continue to increase on pace with growth in trade and economic activity. As mid-stream partners, ports are limited in directly reducing emissions and signing offtake agreements. Port authorities mainly act as landlords, holding few assets in the form of property and equipment. Most port emissions are from third parties: port terminal operators, transport companies, and ocean-going vessels at berth. For example, ocean-going vessels at berth are responsible for 50 percent of the Port of Vancouver’s total emissions, with road, rail, harbor craft, and cargo handling equipment making up the remaining 50 percent.

#### Quote

**Ports can’t do 90 percent of what people want us to do said one port authority.**

**Participant**

## Opportunities for Ports to Lead Technology Adoption

Port planning and investment to support shore power is a strong example of ports taking action to reduce scope three marine emissions (emissions produced indirectly along a port's supply chain, for example by suppliers and customers). Shore power eliminates shipping emissions from ocean-going vessels at berth by allowing them to turn off their auxiliary engines and draw energy from the local electricity grid. While Pacific Northwest ports have all invested in shore power and offer discounted berthing fees for vessels that utilize it, shore power must be scaled to all berths and vessel types to reduce emissions in line with the ports' climate commitments. To scale shore power infrastructure will require subsidies, utility grid upgrades, and regulations mandating shore power use by all vessels. Shore power regulations will ensure infrastructure investments achieve an appropriate return on investment for ports.

Support for pilot projects demonstrating battery-electric and fuel cell-electric cargo handling equipment is another important way in which ports are innovating to reduce emissions. Several participants highlighted pilot projects that have recently launched in BC, including the [BCH2](#) fuel cell-electric yard tractor and Class 8 truck demonstrator, as well as [DP World's hydrogen](#)-powered rubber tire gantry. The technological readiness of hydrogen-powered port-side cargo handling equipment is high and ready to be deployed at commercial scale.

Scaling early hydrogen-powered equipment demonstrations to a fleet level is key to making them financially viable. Financial institutions and government agencies mandated to support innovation and clean energy recognize the importance of scale for financial viability. Financial institutions and government agencies also understand the need to support technology developers and original equipment manufacturers in advancing projects through the final stages of commercialization, known as the "valley of death."

## Land Availability: A Barrier to Infrastructure Buildout

A major challenge in the context of scaling innovation and planning to accommodate the infrastructure buildout required for full port electrification and the bunkering of zero-emission marine fuels is the availability of land.

Ports on the Pacific West Coast are situated within dense urban populations where there is a limited supply of land for industrial development. Project developers feel ready to scale their projects to achieve considerable financial and environmental impact (in one case, a fleet of up to 175 hydrogen power trucks), but they are struggling to find land for the fuelling infrastructure and fleet of vehicles. One participant working in municipal planning noted that Vancouver is beginning a planning process to identify industrial lands to overcome this hurdle. Participants agreed that as new equipment and fuels are scaled, ports, municipal planning authorities, and communities must work together to identify new industrial lands, as well as repurpose brownfield sites.

### Quote

**The bottom line is: Seaport fuel cell applications are ready for prime time; we need to build the infrastructure.**

**Jeff Grant, VP of Transportation, HTEC**

Participants emphasized that engagement with Indigenous and coastal communities is critical, and that engagement must occur at the onset of projects. There was emphasis placed on the importance of traditional Indigenous ecological knowledge as well as Indigenous legal rights, jurisdiction, and long-term interest. We heard about the need to keep ecosystems intact and for early and inclusive engagement where Indigenous people both define and are part of the process.

## **Conclusion**

Ports are strategically important to decarbonize the maritime sector: they are both transportation hubs where heavy diesel users congregate and where supply and demand can be scaled together. By playing the role of planner and convener, port authorities can support innovation, aggregate demand, and ultimately create conditions to lower the cost premium for zero-emission fuels for tenants, shippers, and cargo owners calling at the port.



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# 5



## Leveraging Major Energy Projects to Decarbonize Ports and Shipping

Various participants noted that the transition from fossil fuels to zero-emission marine fuels will be complex and expensive. As highlighted in the IEA and LR presentations above, the shipping sector will need to accommodate a flexible, poly-fuel future rather than focusing on a single fuel or technology. Efforts to decarbonize the shipping sector require a multi-decade planning horizon.

Andy Ralph, North American Hydrogen Lead for Arup—a global sustainability firm—provided insight from his experience in wind-to-hydrogen project development. Andy guided participants through the question: How can Canada leverage its competitive advantage for producing and exporting zero-emission fuels to decarbonize ocean transportation and port activities?

### Canada's Competitive Advantage

Canada's has a globally competitive advantage for producing hydrogen fuel due to its vast supply of low-cost and low-carbon electricity, renewable energy resources, and world-class energy production expertise. Canada's federal hydrogen strategy presents hydrogen as both a means for Canada to become a global industrial leader in the supply of renewable fuels, and to achieve its 2050 net-zero emissions targets, with a goal of clean hydrogen providing 30 percent of end-use energy by 2050.

Maritime sector demand for zero-emission fuels not only supports Canada's parallel pursuit of export and domestic use of zero-emission fuel—a key dynamic that accelerates cost reductions through a faster production ramp-up—it also creates an opportunity for Canada to act as a key player in reducing international shipping emissions.

### High Fuel Production Costs Hamper Uptake

The current market for zero-emission shipping fuels is small, made up of short-term contracts for shippers willing to pay a cost premium to move a certain number of containers. As illustrated above, cargo owners are interested in green services to address scope three emissions but are unwilling to pay the premium.

The main cause of the green premium associated with zero-emission fuels is high upstream costs that fuel producers have limited ability to pass to customers. The cost of renewable electricity is the main project cost driver. Unlike a gas plant where input costs fluctuate with the markets, project costs for hydrogen production are fixed for the lifetime of the project. Energy producers agreed that for zero-emission fuel production projects to be profitable they must be large in scale, have demand certainty, and that value needs to be locked in through credits and government subsidies.

## Need for Offtake Agreements

Fuel producers raised fuel demand concerns, specifically around the state of technological readiness of end-use equipment and the ability to scale fleets to receive commercial fuel quantities. Despite pilot projects being underway for cargo handling equipment and long-haul trucks, these projects only represent a fraction what is required to make fuel production economically worthwhile.

Participants frequently mentioned offtake agreements between fuel producers and fuel users as an important tool for providing investment certainty for new energy projects, as well as for providing certainty to original equipment manufacturers and fleet operators to invest in new vessels and equipment.

Participants indicated methanol as a marine fuel example where companies with integrated chains of supply and demand—meaning they produce the fuel and own the ships that use it—are overcoming supply/demand coordination challenges.

Project timing was also raised as a major challenge for fuel production projects. Fuel producers noted that it can take more than a decade for project approval—a timeline that is incompatible with the ability to plan markets or to support investor confidence. The urgency of reducing marine emissions in line with net-zero by 2050 requires a smarter approach to infrastructure development, assessments, and approvals.

**Can't take for granted that if the demand is there then the supply will be there.**

**Andy Ralph, Hydrogen Lead for the Americas, Arup**

## Role of Government in Early Adoption of Zero-Emission Fuels

The role of governments cannot be understated in the early adoption phase of zero-emission fuels for transportation. Project developers noted that BC, Alberta, and Quebec are leading hydrogen hub development in Canada because of provincial policies and programs leveraging federal support. The network of hydrogen fuelling stations being developed in BC is supporting a growing fleet of fuel cell-electric light- and heavy-duty vehicles and is one of the most advanced hydrogen networks in the world. Targeted government support to develop maritime offtakers would unlock new opportunities to aggregate hydrogen demand across a variety of heavy diesel users in the port setting.

## Renewable Energy is the Foundation of the Maritime Energy Transition

Participants indicated that the availability of affordable renewable electricity on the Pacific West Coast is key to the maritime energy transition. Utilities assured participants that they are planning massive infrastructure upgrades from urban hubs to the edge of the system to support coastal and marine industries.

Utilities challenged participants to engage in electricity infrastructure planning. Innovators, port customers, and maritime industries must improve aggregate loads forecasts, and engage early and often to forecast emerging energy loads. Utilities need to know how much energy is needed and when to avoid rebuilding the system one project after the other.



## Conclusion

Today, zero-emission fuels are expensive. Energy producers are looking for investment certainty through offtake agreements and other financial mechanisms, and fleet operators and original equipment manufacturers need confidence that the supply of zero-emission fuels will be available at competitive costs. New supply chains are needed with collaboration between policymakers, ports, shipping companies, fuel producers, and cargo owners.



# 6



## Next Steps

It is well understood that the demand for zero-emissions marine fuels will grow rapidly over the next decade as international shippers respond to policy shifts driving full decarbonization by 2050. However, as we heard over the course of our workshop, several barriers to adoption remain.

Domestic uptake and scale are key to lowering zero-emission fuel costs and making fuel production projects financially viable. Meetings such as this are important opportunities to bring together participants across industries and sectors that are not always in dialogue, but which have to collaborate to ensure a successful transition.

Oceans North will set an agenda for future discussion and action based on the key takeaways from the event. We have already communicated with the federal government around priorities for Budget 2024 and the need to invest in decarbonization of the maritime sector, and we will convene conversations around bulk shipping, carbon markets and financing in the months ahead. With careful planning, ports along the Pacific Northwest can accelerate the global maritime energy transition by supporting Canada in its goal to provide low-cost, low-carbon energy products to markets around the world.

Stay up-to-date with future events, reports, and discussion at the [Ocean North website](#).



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