



On the Road to Net Zero

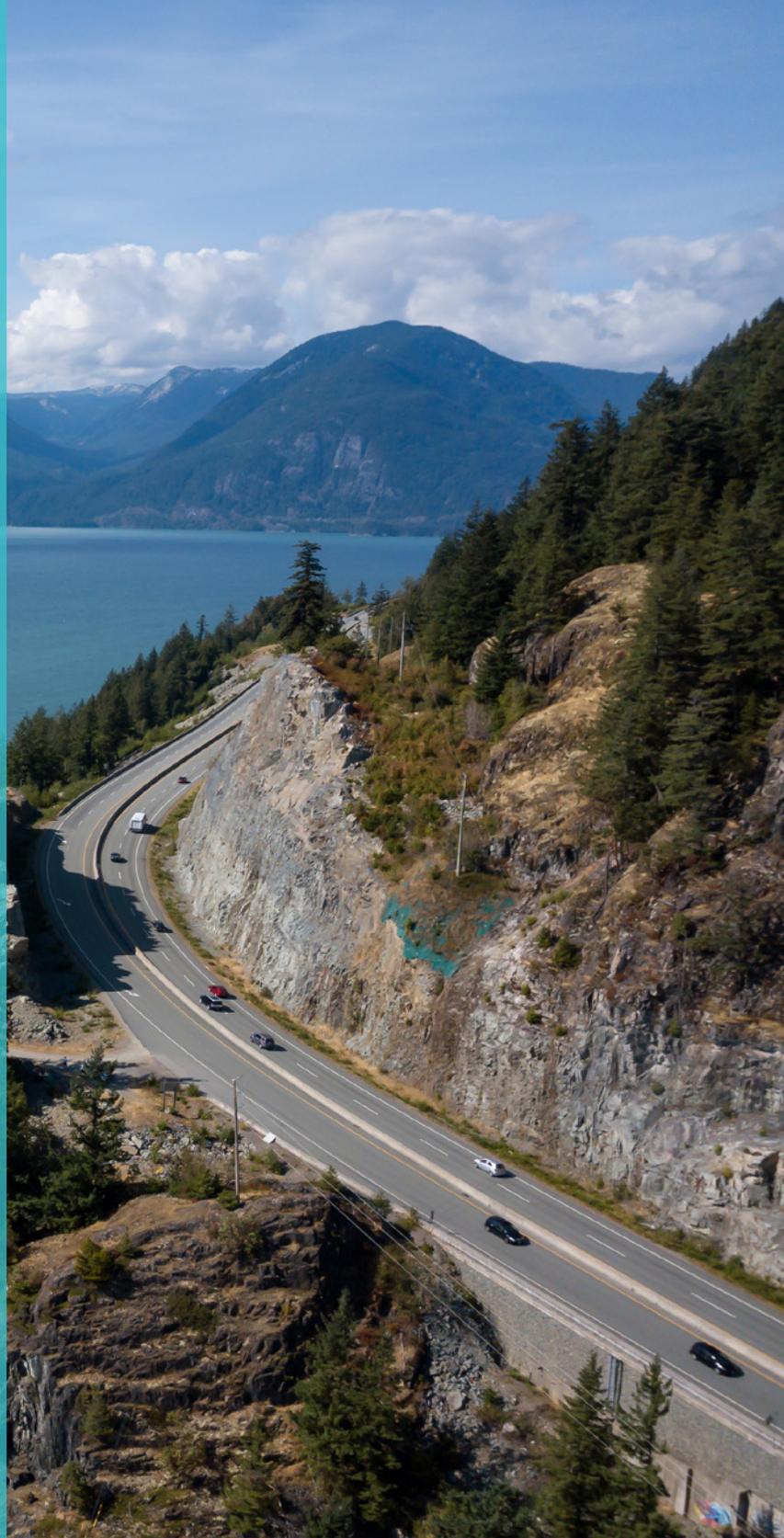
How B.C. can pave the way for zero-emission
commercial vehicles across Canada

 CLEAN ENERGY CANADA

JUNE 2023

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Cover photo: 7Gen

On the Road to Net Zero

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Photo credit: 7Gen

Executive summary

Not only is transportation the second-biggest source of pollution in Canada, it also has the fastest growing emissions of any sector.

Medium- and heavy-duty vehicles (MHDVs), a broad class of vehicles including everything from the local school bus to forklifts and long-haul trucks, may be small in number on Canada's roads, but they pack an emissions punch. **MHDVs represent only one out of every 10 vehicles on the road today, but they are responsible for over 6% of Canada's total national emissions**—not far behind the 11% from light-duty vehicles (LDVs).^{1,2} And their emissions are growing. Emissions from MHDVs have almost doubled since 1990 and are expected to surpass passenger vehicle emissions by 2031.³ **In B.C., carbon pollution from medium- and heavy-duty road transport is even higher, contributing 14% of the province's total emissions.**⁴

The cost of inaction is high, not only for the environment but for Canadians' health. Air pollution caused over 15,000 premature deaths in 2016, according to Health

Canada estimates, with an economic bill of around \$120 billion.⁵ Nearly 30% of Canadians live within 250 metres of a major roadway where traffic related air pollutants can be 40% to almost 300% higher.⁶ And diesel traffic has a demonstrable and disproportionate impact on air quality. The air in Metro Vancouver on a weekday has more than double the amount of nitrogen oxide emissions compared to weekends, largely because of the significant drop in MHDV traffic.⁶

While the sticker price for ZEMHDVs has not yet hit cost parity with traditional vehicles, avoiding the price at the pump can save money over time for MHDV drivers and fleets. Over the past few years, diesel prices have remained persistently high.⁷ In 2023, prices in Canada averaged \$1.72 per litre, with Metro Vancouver's prices even higher at \$1.88 per litre.

Despite the cost and emissions benefits, fleet owners and operators in North America have not yet embraced the shift to ZEMHDVs. Even with similar policy goals within federal and provincial governments for LDVs and MHDVs, ZEMHDV policies and adoption are still comparatively nascent. Barriers to uptake include cost, electricity and infrastructure, the sector's complexity, capacity and awareness, vehicle supply, technology, and data. Small fleets make up a disproportionate percentage of the Canadian landscape. **It's clear that decarbonizing MHDVs is imperative for Canada's role in tackling climate change.¹⁰ But it is no small task.**

It will require nothing short of a market transformation to change the way we move people and goods across Canada. The task ahead is imperative for Canada's role in reducing emissions, but it will be complex and require coordinated effort across multiple levels of government and industry.

While zero-emission technology may not yet be proven and cost-effective for some more difficult-to-decarbonize segments of the sector (ie. long-haul trucking), it is available and closer to sticker parity for others (e.g., short-haul trucking, last-mile delivery, and urban freight). Some successful leading jurisdictions, like California, have focused their policies on increasing uptake in these initial vehicle classes and use cases.

Accordingly, Clean Energy Canada convened experts from across the sector to determine the actions required to accelerate the adoption of zero-emission medium- and heavy-duty vehicles in metropolitan regions of B.C. and Canada.

COMPANY SPOTLIGHT 7Gen

Canadian company 7Gen provides full service EV and charger leasing for ZEMHDVs, consulting, software and fleet planning and implementation solutions.⁸ It conducted a real-world total cost of ownership calculation for ZEMHDVs in Canada.* It found that on a six-year cycle, when incorporating provincial and federal incentives, a class 6 battery electric box truck was \$26,000 cheaper in B.C. compared to its diesel equivalent.

On fuel and maintenance costs alone, the electric truck saved more than \$86,000 compared to its diesel equivalent in B.C.

* Total cost of ownership includes the purchase, fuel, maintenance, permit costs, and in some cases, costs associated with charging or fuelling infrastructure.

The following are four “no regrets” priority actions governments and other actors must take **in the next 18 months:**



1 | Make zero-emission trucks accessible

- ✔ Utilities and provincial governments should streamline processes and programs to make them more user-centric by creating a one-window portal for all MHDV programming, promoting ZEMHDV concierge services and issuing incentives at point-of-sale.
- ✔ Provincial and federal governments should ensure programming is structured to attract different fleet types by removing maximum vehicle caps, but targeting small and medium enterprise (SME) adopters by having tiered vehicle incentives based on fleet size and specified funding supports.
- ✔ Municipalities should work with the provincial government to offer non-financial incentives to give “perks” to improve driving experience, like priority access to not only parking space but time, curbside loading zones, and HOV lanes.
- ✔ Transport Canada should assess whether it is possible to prioritize ZEMHDV certifications over traditional vehicles and increase harmonization with U.S. safety regulations to speed up ZEMHDV federal truck certifications in Canada.



2 | Accelerate access to electricity and infrastructure

- ✓ Empower utilities to advance new investments where there is anticipated demand. In consultation with BC Hydro and the BC Utilities Commission (BCUC), the province should leverage the Clean Transportation Action Plan to shift from reactive to proactive service where there is anticipated demand. This may include directives to BCUC, changes to the BC Hydro Electricity Tariff, and the development of a more comprehensive long-term MHDV electrification strategy.
- ✓ Enable utilities to proactively review and refine processes to speed up access to power for projects once applications have been made.
- ✓ Re-balance the risk and cost burden of infrastructure development from SMEs and businesses and offset the costs of infrastructure upgrades for businesses looking to install charging infrastructure.
- ✓ Municipalities should begin planning for publicly accessible ZEMHDV charging on industrial or commercial land.



3 | Show and tell how vehicles work

- ✓ Commit to funding demonstration trials with different fleets to lease and “test out” ZEMHDVs for a specific time period.
- ✓ Regularly test charging systems and solutions. Create a charging demonstration site to test changing technologies.
- ✓ Fund regular biannual “demo days” for key geographies and demographics in partnership with industry associations, automakers, and think tanks where fleet owners/operators can test trucks, charging, and other tools.
- ✓ Ensure governments are funding three to four high-priority pilot projects that follow best practices, including projects that are scalable, data-driven, visible, and voluntary.*



4 | Make sure government policy is based on good data and strategically targets early adopters

- ✓ Apply the successful strategy of focusing on ZEMHDV deployment in waves through B.C.’s Clean Transportation Action Plan. The strategy should focus on targeted technology-ready market segments (e.g., last-mile, short-haul, public sector, refuse, some drayage) to help advance the technology and address market barriers for less technologically mature markets (e.g., long-haul). The strategy should also identify key geographic areas for early adoption in B.C.
- ✓ The provincial government should work in collaboration with the federal government, utilities, and key data-collecting organizations such as ICBC to produce and compile not only data but actionable insights to ground future planning and investment decisions.

* Pilot projects assess solutions in real-life conditions. They evaluate either a small-scale version of a project or a full-scale, replicable version. A demonstration project is a means of promoting innovations and capturing and disseminating best practice through the development and analysis of a live project. This can help build an evidence base to test and support industry improvements.



State of play

While ZEMHDVs have a similar emissions footprint as their light-duty cousins, both uptake and policy in Canada is not nearly as far advanced.

Passenger EV sales are soaring globally as a result of good policy in combination with high consumer demand, resulting in countries sailing past their EV sales goals. But the MHDV landscape is still stuck in neutral.

In Canada specifically, there is limited recent public data regarding the purchase, sale, or delivery of ZEMHDVs. While there have been a number of announcements and deliveries of such vehicles, the most recent information available from the International Council on Clean Transportation indicates that, in 2021, approximately 200 ZEMHDVs were sold in Canada, 68 of which were medium and heavy trucks and vans. In the broader North American market, ZEMHDVs made up less than 1% of sales in Canada and the U.S. in 2021.¹¹

Globally, the picture isn't much different with only 60,000 medium- and heavy-duty electric truck sales recorded worldwide—1.2% of the total—with the vast majority (87%) being sold in China.¹² In comparison, EVs represented almost more than 8% of LDVs sold in Canada in 2022, with B.C. reaching more than 16%.¹³

Despite this, Canada has set a target that 35% of MHDV sales be zero-emission by 2030 and 100% by 2040. B.C. recently released its draft ZEMHDV sales targets that would start in 2026 ranging from 10% to 13% depending on vehicle class, increasing annually to 30% to 50% in 2030 and finally 100% across all classes in 2036.¹⁴ Additionally, California recently announced the end of all combustion engine truck sales by 2036, while the U.S. Environmental Protection Agency announced its proposed light- and medium-duty vehicle tailpipe emissions standard, which will require an increased number of ZEMHDVs on the road (34% of EV sales by 2030 and 46% by 2032 across the U.S.).^{15,16} Canada has historically adopted U.S. tailpipe standards by reference.

South of the border, large corporate fleets used by companies like DHL, FedEx, PepsiCo/Frito-Lay, Sysco, and Comcast are leading the charge on MHDV fleet electrification, bringing hundreds to eventually thousands of EVs on the road in the next few years, citing both corporate social responsibility and cost savings.^{17,18}

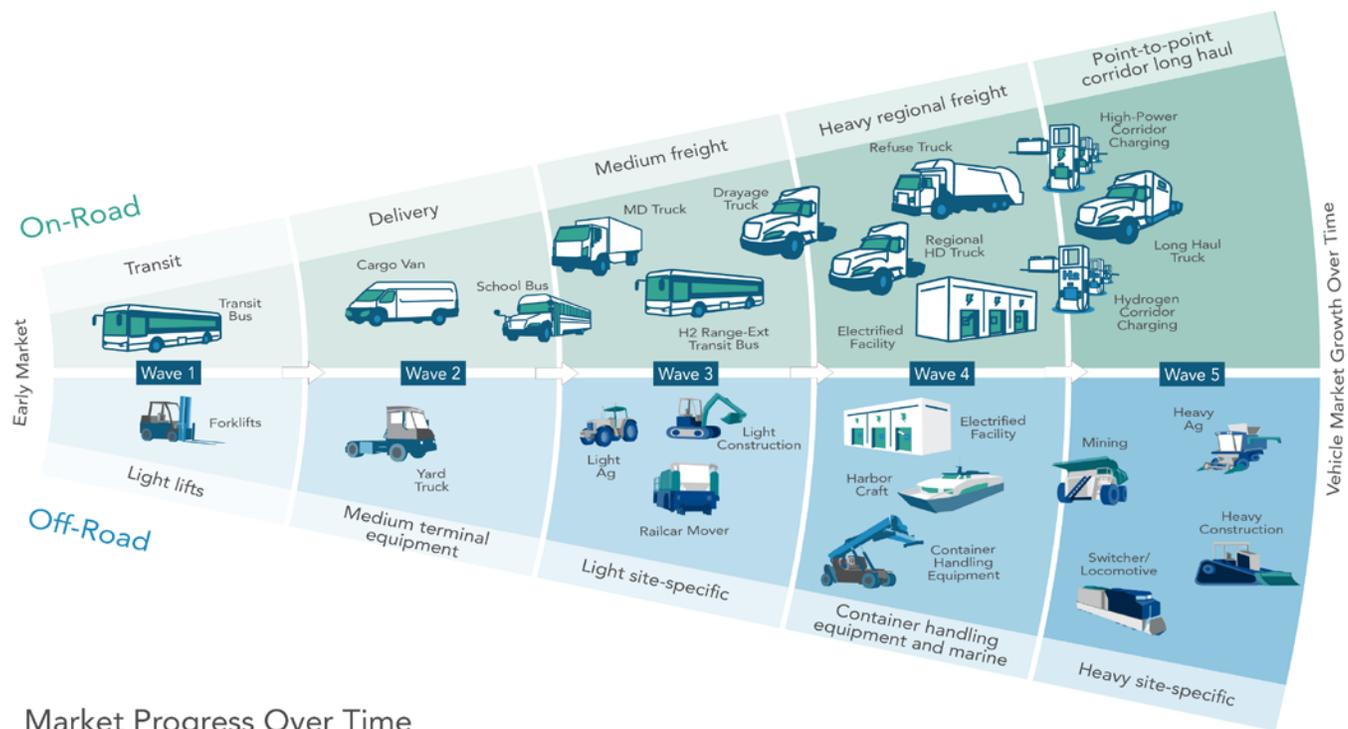
Collectively, commercial fleet operators have pre-ordered more than 100,000 ZEMHDVs and have begun deploying their first vehicles.¹⁹ The U.S. is moving with ambitious new tailpipe standards, and California has committed to ban the sale of diesel trucks by 2036. Here in Canada, Purolator aims to purchase 3,500 electric last-mile delivery vans across 60 terminals in B.C., Ontario, and Quebec.²⁰

But while there is demonstrable progress, interviewees pointed out the complexity of the MHDV sector as a challenge. With a variety of vehicle weight classes, business models, fleet types, distances driven, and operating conditions as well as much larger and complex energy and power needs for infrastructure, this sector has greater complexity than the generally more homogenous LDV industry. The MHDV space is also disproportionately represented by SMEs. More than 90% of carriers operate 10 or fewer trucks in Canada.¹⁰

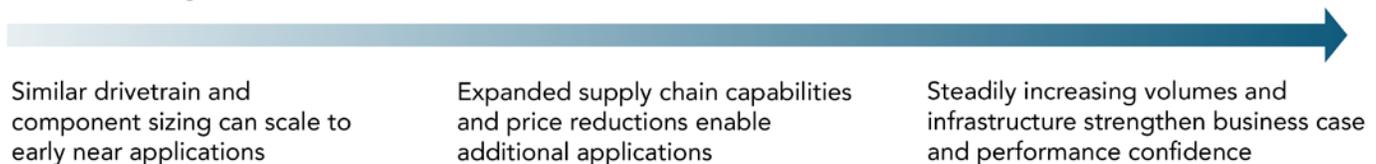
Due to the nature of the MHDV sector, one of the guiding principles of the accelerated deployment of ZEMHDVs has been the beachhead strategy.²¹

This was developed by the California Air Resources Board (CARB) along with the think tank CALSTART. The strategy focuses on successful deployment in waves, starting with targeted market segments (e.g., short-haul, last-mile delivery, urban freight) to help advance the technology for currently less technologically mature markets (e.g., long haul). The components of electric powertrains are the same across multiple platforms. Investing in market-ready applications, such as urban delivery trucks, helps drive the transfer of technology to more challenging ones, such as long-haul tractor trailers.

Canada now needs to move on its own policies and actions to get more ZEMHDVs on the road—and B.C., a Canadian leader in establishing the CleanBC plan and designing supportive ZEV policies and programs over the past six years, can serve as a great model.²² Not only that, but developing this expertise locally means that B.C. can then export this to other regions just starting to catalyze this transition.



Market Progress Over Time



Sources: CALSTART ([The Beachhead Strategy](#)) and California Air Resources Board



Photo credit: Lion Electric

Purpose and process

Clean Energy Canada convened a group of ZEMHDV experts to discuss key barriers and priorities and identify the policies and actions required to catalyze the mass deployment of zero-emission MHDVs in metropolitan areas across Canada, using B.C.'s Lower Mainland as a case study.

For this exercise, we excluded transit (e.g. passenger buses), long-haul vehicles (i.e. trucks travelling long distances inter-regionally or internationally), mode shift (i.e. displacing shipments from trucking to rail or ship), and technology solutions such as hydrogen fuel cells. We found that these topics warrant their own conversation and deep dive.

Experts and stakeholders met in person on April 19, 2023, at the Simon Fraser University Morris J. Wosk Centre for Dialogue in Vancouver and developed recommendations based on research, jurisdictional scans, and interviews conducted in advance by Clean Energy Canada.



Challenges

Experts felt it was critical that governments understand the challenges fleet owners/operators currently face so they can work to alleviate these pressures in order to accelerate the shift to ZEMHDVs.

Replacing a gasoline or diesel MHDV with an electric one is not as simple as moving the playing pieces on a chess board. It requires a complete system change—a whole new board game. Unlike the transition to electric LDVs, which involves relatively similar products with relatively similar consumers, a transition to ZEMHDVs requires depot and facility overhauls, a new operating model and software systems, new relationships with utilities, and the growth of staff expertise and capacity.

In addition, there is an inherent risk in new technology adoption for fleet operators as fleet vehicle utilization and uptime is a key driver for many fleet operators, impacting their bottom line. Finally, the large proportion of SMEs within the industry owning small fleets and with few employees means they will likely not be “first movers” in the space.

Experts identified six themes they believed were **standing in the way** of greater ZEMHDV uptake:

1 Cost

Experts agree that capital costs can be a significant barrier to going electric for MHDV owners/operators. Identified cost-related barriers included:

> Hard costs

This includes the purchase cost of the vehicle and charging infrastructure (including installation). With the rapid development of battery technologies, some studies indicate total cost of ownership (TCO) parity in North America will happen sooner than we think.²³ Depending on the vehicle class and use case, this has been projected to be as early as 2026, with all battery-electric MHDVs across all segments reaching TCO parity by or shortly after 2030. And while charging infrastructure costs can be significant and add about \$25,000 to \$75,000 per truck to the lifetime operating cost in each application, this does not significantly impact the expected timeline to reach overall cost-competitiveness.²⁴ Careful planning and coordination for charging infrastructure by assessing real charging needs can help optimize these costs (e.g. overnight level 2 charging at a depot versus a fast charger). Despite the potential cost savings, participants noted that the “capital-focused” budgeting that most fleet owners/operators take did not allow them to account for the longer-term savings of using a zero-emission powertrain.

Programs such as the Specialty-Use Vehicle Incentive require proof of receipt of the vehicle prior to issuing the rebate.²⁵ This results in the EV operator/project developer taking on a large financial risk by paying all vehicle costs upfront before receiving the rebate. The delivery of ZEMHDVs is determined by a number of factors generally outside of the control of applicants (market contingencies, supply chain bottlenecks, production, etc.). While B.C.’s LDV rebate program is also post-purchase, in an MHDV context this is particularly challenging. With a relatively larger upfront price difference between ZEMHDVs and their fossil fuel equivalents, applicants could be waiting many months before they can offset these capital costs. In addition, infrastructure programs such as Go Electric Fleets require the completion of installation and associated proof of payment to be eligible for the rebate.²⁶ Similarly, BC Hydro’s infrastructure program is also only available post-purchase.²⁷



> Soft costs

While there was general agreement that overall government funding would need to increase to enable market transformation, soft costs, including human and financial capital, were highlighted as a more immediate barrier. Participants identified human capital—whether having adequate management time, finding construction project managers for charging infrastructure, or getting access to technician training and external consulting services—as key barriers.

Participants also noted risk and uncertainty around residual and battery second-life values, impacting both the direct cost to finance a vehicle and the overall risk of the acquisition. Challenges with access to financing were compounded by the “post-purchase” structure of existing rebate programs.

2 Electricity and infrastructure

Experts identified connection cost and predictability as interrelated challenges impacting adoption:

> Varying and unpredictable costs for the installation of charging infrastructure

Many utilities in Canada, including BC Hydro under the BC Electric Tariff, have billing structures that operate under the principle of cost causation (i.e., the costs of new or upgraded infrastructure are allocated to those who first initiate them).²⁸ In practice, this means that fleet owners/operators seeking to install charging infrastructure may be asked to pay not only for their service connection to the distribution system, but possibly for the extension required to connect



The opportunities of vehicle-to-grid and bidirectional charging in ZEMHDVs

Vehicle-to-grid and bidirectional charging opportunities offer not only revenue generating opportunities for businesses, but can help address growing electrification needs in a net-zero world via distributed energy resources such as ZEMHDVs.

Vehicle-to-grid services provide electricity back to the grid while EVs are not in use. This is particularly important during times of peak demand, where vehicle-to-grid services can offset electricity needs by delivering stored electricity from its batteries back to the grid. The IEA predicts that by 2030, vehicle-to-grid services in major EV markets globally could avoid 390 terawatt-hours of new electricity generation, or the equivalent of electricity consumed in Italy in 2018.³² One study showed vehicle-to-grid revenue from one electric bus in Massachusetts generated \$23,000 of additional revenue during two summers.³³

them with the closest point of the distribution system that will serve their required load, or even overall upstream system improvements, regardless of who else may ultimately benefit from that extension. While the B.C. tariff has a “pioneer clause” that partially addresses this issue by enabling the first customer to recoup costs as others connect, it still leaves the immediate challenge of upfront installation costs entirely on the initial customer. BC Hydro recognizes that while any request could in principle trigger an upgrade, this is more likely for larger loads and will only be billed to the ratepayer when the request is larger than 500 kVA, which can be triggered by as few as two trucks.^{29,30} In practice, owners/operators note that this results in highly variable and unpredictable costs that are difficult to factor into their cost calculations.

⤷ Significant delays in installation

Currently, advance planning for transport electrification is limited. The majority of MHDV programming is on a project-by-project basis, with limited ability for comprehensive or proactive investments by the utility.³¹ Roundtable participants noted that individual ratepayers found that connecting their new charging infrastructure to the distribution system could take many months or more depending on the size of the project. One participant stated it will take them an estimated eight months to install charging infrastructure for their pilot project largely due to the timeline for project installations (hardware equipment arrival delays, such as switchgear and cabling, plus delays in either reaching land use agreements from landlords or securing construction providers to do electrical cabling and conduit). Programming and rebates offered by BC Hydro are an initial step toward fleet planning more comprehensively, but it requires fleet owners/operators to apply.²⁷ Considering the significant electrification scale up required, a more proactive approach to planning would be needed.

⤷ Electricity supply and load challenges

While BC Hydro has stated in its 2021 Integrated Resource Plan that it expects to have sufficient energy and capacity until the early 2030s, many participants say they had been warned about insufficient capacity, both existing and planned, as well as inadequate distribution networks to meet increasing electricity demand and support high-voltage charging. There are clear challenges with transmission sufficiency and distribution capacity at the local level, particularly in areas of high potential growth for ZEMHDVs. Some roundtable experts question the sufficiency of overall regional supply if ZEMHDVs as well as other new electric end users (such as electric heat pumps) hit mass market mobilization on the timelines identified by B.C. and Canadian governments. In contrast, other participants noted the opportunity distributed energy resources such as ZEMHDVs could provide utilities in meeting peak energy needs through vehicle-to-grid and power management technologies.

3 Complexity, capacity, and awareness

➤ Difficulty navigating application processes

Fleet owners/operators emphasized the challenges of navigating the various programs offered by governments and Crown corporations such as BC Hydro. Multiple experts noted that they were dealing with multiple levels of government, varying program requirements, complex rules governing the utility, and misaligned municipal zoning and permitting policies. A lack of a central authority or impartial guidance for those early adopters was seen as a challenge. Even within a single government, participants noted there was often no one view on technology pathways or a clear prioritization in transportation policy.

This complexity was identified as a particular challenge for SMEs. Participants noted that just navigating the various program offerings required a level of expertise. In the words of one participant, “You would need to be a magician to understand how to apply.” While currently some ministries enable data-sharing between programs, the process is optional and does not help ensure applicants are aware of various program offers or their potential eligibility.

➤ Fleet capacity constraints

This was identified as a root cause of many fleets’ hesitancy around adopting more ZEMHDVs. The ability of businesses to take on a new technology, particularly when fleet utilization and operation impacts the bottom line, acts as a large risk. Capacity constraints identified included: the ability of SMEs to take on risk, the complexity of the trucking industry, the availability of trained technicians, and sufficient awareness of the state of technology to assess real versus perceived risks.

4 Vehicle Supply

Many experts also highlighted B.C. and Canada as having challenges in attracting supply due to a smaller market size compared to California and the U.S. One participant noted, “Automakers build for California and the U.S., not for Canada.” However, as Transport Canada requires all vehicles entering the country to meet specific manufacturing standards (which can vary compared to the U.S.), this creates additional delay and challenge to attract vehicle supply. Ongoing supply chain delays for all ZEVs, including ZEMHDVs, and related charging infrastructure compounds this challenge, adding friction to an already underserved market in B.C. and Canada. Recently, B.C. released a consultation paper on the development of a ZEMHDV sales regulation and associated fleet requirements that aims to alleviate some of these challenges.³⁴

5 Technological

While technology will continue to progress, there remain some technology challenges and limitations of ZEMHDVs in relation to some use cases, particularly very long-range, high-power applications. There is, however, clearly uneven access to information, causing the perception of risk to be higher than actually merited based on the current state of technology.

Participants also noted insufficient technical guidance on how to integrate chassis with body parts for ZEMHDVs as a further barrier to adoption. Depending on the vehicle class, the chassis and body come from two different manufacturers and would require the integration of components that now have batteries in them.

6 Data

This was identified as a cross-cutting theme impacting every challenge identified, including:

➤ Costs and financing

Lack of data on residual values, demonstration projects to inform financing, battery values during their second life.

➤ Electricity and infrastructure

Lack of distribution-level data, load growth in different areas, heat maps to show planned or excess capacity, load management, grid integration.

➤ Complexity, capacity, and awareness

Lack of data on the trucking industry, complexity, and use cases. Lack of access to telematics data (on vehicles, fleets, charging use cases, charge time and range capability, daily driving distances and routes, on-board electrical performance), tools for cost parity calculations for different vehicle classes and jurisdictions, and use case studies.

➤ Technological

Knowledge that can be acquired from demonstration/pilots on use cases, technical guidance on chassis and body integration.



COMPANY SPOTLIGHT

Westcoast Sightseeing

Westcoast Sightseeing found they **saved more than \$1.26 million** on Total Cost of Ownership for 8 buses over 16 years.⁹ The company has also been trialing electric trucks based on the same theory of combining “people, planet, profit.”

Solutions

Experts were clear: for the transition to ZEMHDVs to be successful, further action is needed now.

While the transition will not happen overnight, there are key actions that, if taken in the next 18 months, can accelerate the deployment of ZEMHDVs in metropolitan regions of B.C. and Canada. Focusing on these potential early adopters and regions can help lead to mass deployment in more difficult classes and regions.

The group of experts assembled identified the following four “no-regrets” initial actions B.C. and Canada must take as priorities in the next 18 months.



1 | Make zero-emission trucks accessible

Streamline processes and programs to make them user-centric.



RECOMMENDED ACTIONS

➤ Streamline existing programming

In the words of one participant, to accelerate adoption, governments need to “make it so simple to apply, it would be impossible not to participate.” Specific recommendations to improve existing processes include:

- **Create a one-window portal through which applicants can seek funding for vehicles, charging and associated infrastructure, fleet and charging infrastructure assessments, and EV advisory services.** Applicants should not have to navigate through different programs (CVP, SUVI, Go Electric Fleets, BC Hydro) and their different requirements to see which are applicable to them. A one-window portal that allowed back-end information sharing between provincial, federal, and utility programming (or at the very least between provincial and utility programming) would help potential participants see the full suite of government support potentially available in their circumstances and limit the administrative burden of application. An example is the creation of the Joint Office of Energy Transportation to coordinate and leverage expertise across the U.S. Department of Energy and Department of Transport, including a landing page for federal funding announcements.³⁵
- **Promote effective EV advisory services to support SMEs identifying the best approach to transition to zero-emission vehicles.** While CleanBC’s Go Electric Fleets (via ZEV Fleet Advisors) and BC Hydro’s EV Ready Fleet Plan provide and promote EV advisory services including fleet and charging infrastructure

assessment at various events, these services are currently underutilized.* Participants were of the view that this was largely due to a lack of awareness among fleets of existing services. Additional financial support to help these advisory services use proactive marketing and communications to approach large fleets, industry associations, and relevant truck shows would help with awareness. As well, outreach should engage underserved and diverse communities that are becoming increasingly prominent in the MHDV sector’s owner-operator models. In the words of one participant, programs need to “go to where the people are” to make sure potential adopters are aware of available assistance to help navigate the technical complexity of this shift. EV advisory services should also be expanded to guide project applicants through funding offerings by reviewing and recommending eligible provincial and federal programs for vehicles, infrastructure, and hardware. In addition, all fleet and charging assessments within the advisory services should analyze energy use profiles, GHG emissions, and TCO calculations. The application process for these services should be included in the one-window portal and include grant application assistance.

- **Ensure financial incentives for vehicles are predictable and available at point of sale.** As opposed to the current structure of “post-purchase” rebates, other jurisdictions, such as California’s Hybrid and Zero Emission Truck and Bus Incentive Programme (HVIP), employ voucher programs. In these jurisdictions, ZEMHDV manufacturers apply for vouchers on a first-come-first-serve basis.³⁶

* ZEV fleet advisors provides: ZEV suitability assessments, support with applying for hardware rebates, identifying contractors for fleet and facility assessments, guidance in completing electrical modifications and service upgrades.

Vouchers are then redeemed like a coupon at the time of purchase. This type of program offers a simple design that can help get funding out the door. It streamlines the administrative process for owner/operators as governments work directly with manufacturers. In addition, as outlined in part ii) above, existing “EV concierge services” could help ensure purchasers understand their options and are only sold the solution that meets their needs.

➤ **Ensure provincial and federal government programming is structured to attract different fleet types, including both SMEs and large fleets**

- **Programs should remove maximum vehicle caps and instead structure incentives based on fleet sizes.** Adopting this approach can speed up adoption by maximizing the pool of potential applicants, noting larger fleets may often be earlier adopters of this technology, while still allowing programs to target smaller businesses. There are different possible policy approaches. California’s most recent update to the HVIP program creates a voucher base amount with increased or decreased incentive multipliers based on fleet sizes, and New Jersey awards a bonus to small businesses.*
- **Provide targeted, innovative funding to assist small fleets.** To help address SME-specific risk and financing barriers, governments should look at providing additional creative financing solutions. B.C. should consider a program modeled off California’s \$25 million Innovative Small e-Fleet Set-Aside.³⁸ Under the HVIP program, private sector actors focusing on micro-financing, micro loans, or “all-in-one” services can become “registered providers” of vehicle and charging infrastructure incentives. Providers can develop a proposal designed to offer small fleets monthly or per-mile costs for zero-emission trucks that are equivalent to comparable combustion vehicle operating costs. This proposal may take the form of a purchase, lease, rental, financing, or other service agreement.

In addition, California’s Medium and Heavy Duty fleet purchasing assistance program creates financial tools for operators.³⁹ Under the program, 75% of financing products are directed towards operators in underserved and diverse communities (largely small fleets).

To address financing challenges identified by small fleets, the federal government in collaboration with approved lenders should examine how to provide first-loss protection products to small fleets, (like California’s Truck Loan Assistance Program).^{40,41} These products decrease lender risk for a predefined financial loss related to specific risks like uncertain resale value or payment defaults. Loan loss protections are widely available for energy efficiency and renewable energy projects. By mitigating the impact of potential risks, these instruments encourage lenders to expand the pool of applicants, allowing smaller fleets that do not fit within traditional lending programs to access financial products.⁴² They can also allow lenders to offer preferential borrowing terms, such as lower interest rates, longer maturity, reduced collateral requirements, and grace periods.⁴³

➤ **Offer non-financial incentives**

As early adopters for ZEMHDVs will likely be in metropolitan areas of Canada, local municipal governments can provide “perks” to improve the driver’s and owner/operator’s experience. Municipalities in metropolitan Vancouver should consider implementing recommendations at the municipal level, including off-peak delivery hours for zero-emission trucks and giving zero-emission trucks priority or exclusive access to curbside loading zones, HOV lanes, or reduced or no parking fees in certain areas.

➤ **Harmonize with U.S. safety regulations where possible, to speed up ZEMHDV truck certifications in Canada, while maintaining safety standards**

Work with Transport Canada to prioritize ZEMHDV certifications before ICE equivalents.

* In California, small public or private fleets of 10 or fewer MHDVs receive +15% of the voucher base amount, whereas private fleets with more than 500 MHDVs receive -50% of the voucher base amount. New Jersey’s Zero Emission Incentive Program also offers vouchers to any size of business and awards an additional 25% bonus to SMEs.

California Hybrid and Zero Emission Truck and Bus Incentive Program (HVIP)

California’s HVIP was launched in 2009 and has funded over 11,000 clean vehicles within the state.³⁷ The program provides point-of-sale vehicle incentives including charging and fuelling infrastructure incentives in the form of vouchers to reduce the upfront purchase prices of ZEMHDVs. The HVIP has been one of the first programs in the U.S. and around the world to reduce upfront purchase prices for commercial vehicles.

The first-come-first-served program provides tiered incentives, with larger incentives provided to public or small private fleets located in disadvantaged communities. While the standard HVIP applies to all fleet types, targeted funding categories under the overall program have been created for transit, public school buses, drayage trucks and SMEs.



2 | Accelerate access to electricity and infrastructure

Governments, utilities, and regulators each have a role to enable faster connections with more predictable costs. All parties need the ability to proactively plan for ZEMHDV uptake.



RECOMMENDED ACTIONS

➤ Provide BCUC and BC Hydro with greater capacity and flexibility to advance new investments where there is anticipated demand

The provincial government needs to provide clear direction and better enable BC Hydro to begin installing strategic transmission and distribution infrastructure in advance of firm customer commitment. Instead of relying on the current threshold of certain demand, in consultation with BC Hydro and BCUC, the B.C. government should leverage the Clean Transportation Action Plan on how to facilitate a more proactive buildout of strategic transmission and distribution infrastructure.⁴⁴ This should include:

- The B.C. government consulting with and potentially issuing a directive to the regulator, BCUC, to provide greater flexibility in its rate review processes to allow for buildout prior to specific customer demand.
- Ensuring BC Hydro updates its electricity tariff. The electricity tariff is BC Hydro's "service agreement with customers, and it governs all aspects of using their services" including (but not limited to) the provision of electricity, metering, rates and charges, distribution extensions, load changes, and operations.²⁸ As outlined in Phase 2 of the BC Hydro review, distribution extensions need to be updated to explore models that better reflect the needs of electrification to enable faster connections with more predictable connection costs for fleet owners/operators.^{45,46*}

- Direct BC Hydro to develop a more comprehensive long-term MHDV electrification strategy. A comprehensive ZEMHDV strategy would assess the readiness of not only existing generation and transmission capacity but also look at forecasting demand growth geographically, including for charging hubs and concentration across the service area. While B.C.'s current Integrated Resource Plan does incorporate transport electrification to a certain degree, a far more detailed accounting of the electrification needs of the sector will be critical to achieve the electrification targets that have been set out by the province and should be incorporated into subsequent Integrated Resource Plans.** If additional funding and staff are needed, the province should consider additional funding to enable utilities to conduct this analysis.

➤ Enable utilities to proactively review and refine processes to speed up access to power for projects

- Enable BC Hydro to proactively review permitting processes that impact the timelines for bringing power/upgrades to projects once applications have been placed. In addition, utilities should seek opportunities to increase the workforce dedicated to permitting approvals to future-proof the increase of electrification projects expected in a net-zero province.

* In early 2023, BC Hydro will conduct jurisdictional analysis and public engagement to gather input on the updates being considered. BC Hydro plans to file an application to the BCUC in the summer of 2023.

** California's Assembly Bill 2700 requires California utilities (including publicly owned ones) to incorporate "fleet data" into their planning to ensure the distribution grid is ready for MHDV charging.

- The current design generator interconnection process enables independent power producers to connect to BC Hydro's distribution network, selling power to the utility.⁴⁷ Due to the larger power requirements for ZEMHDV projects, reviewing the current five-step process to increase efficiencies and bring more power online more quickly can be an effective way to meet accelerating electrical demand.
 - In addition, BC Hydro should formalize a process to consider demand-side management strategies, such as phased fleet charging projects that are able to leverage existing capacity at sites while building out infrastructure for future phases. This would allow companies to bring existing power to their site more quickly, as well as allow for infrastructure expenses to spread out over phases.
- **Re-balance the risk and cost burden of infrastructure development and offset the costs of infrastructure upgrades for businesses looking to install charging infrastructure**
- **B.C., along with BC Hydro, should use its current work on the Clean Transportation Action Plan to launch a formal review of the balance of risk and cost-sharing in the decarbonization of MHDVs.** Focus on how the investment risk and cost can be better shared by both the province and BC Hydro so that the decarbonization of MHDV cost burden does not unduly burden SMEs and companies. Consideration should be given to the approach California has used to offset all grid-to-site costs and ensure individual ratepayers seeking to install charging infrastructure for electric vehicles are only charged for on-site costs.
- **The creation of a separate funding mechanism, or dedicated fund, could allow utilities to make the necessary upgrades and installations without being dependent on the ratepayer.** Funding is needed to help support both individual consumer requests to cover grid upgrades and grid-to-site fees. In particular, this funding stream should target any disproportionate grid-to-site costs incurred by an individual ratepayer seeking to install charging infrastructure. But also, funds should be accessible to BC Hydro directly to invest in upgrades where regional planning processes have identified areas of expected load growth combined with insufficient infrastructure. This fund could help proactively cover some of the costs associated with grid upgrades to avoid having to use specific rate applications as a funding source.
- **Local governments should plan for publicly accessible MHDV charging on industrial/commercial land**
- While much of the charging for short-haul ZEMHDV in metropolitan areas will be done using privately-owned charging on fleet-owned property, catalyzing mass deployment will require some public charging infrastructure within a metropolitan area. Municipalities should plan for specific MHDV charging corridors to complement privately-owned charging infrastructure. Due to the size and the voltage of ZEMHDV projects, these facilities will likely need to be located on industrial or commercial land, and industrial lands are currently decreasing in favour of residential land in municipalities in metropolitan Vancouver.⁴⁸ Municipalities need to proactively consider how to site and solve for future public ZEMHDV charging needs in land use planning now.



Photo credit: Purolator

3 | Show and tell how the vehicles work

Pilots and demonstration projects will be an important means in the short term to provide proof of concept and technical guidance for more businesses, unlocking solutions to existing challenges. Ultimately, fleet owners/operators will be unlikely to adopt unless they see ZEMHDVs in action.



RECOMMENDED ACTIONS

➤ Focus on demonstration projects.

Demonstration projects are intended to spark the diffusion of verified technology by showcasing value and best practices to inexperienced users.

- **Commit to funding demonstration trials with different fleets to “test out” ZEVs for several weeks.** The opportunity for fleets to be able to “trial” different ZEVs for several weeks at a time can be a chance to see how their specific business and operating conditions apply to different models and vehicles without taking the financial risk of purchasing a ZEMHDV and the related charging infrastructure. Currently, BC Hydro offers funding for short-term trials of commercial battery-electric MHDVs.²⁷ This can be expanded in a concerted effort via outreach to fleets marketed toward early adoption and SMEs. In the U.S., companies such as First Student are allowing organizations to access electric buses without the need to purchase them. In Western Canada, companies such as Origin Logistics and Driving Force Rentals offer and rent zero-emission delivery routes without having to purchase ZEMHDVs.^{49,50}

- **Create biannual “demo days” in partnership with industry associations and automakers where fleet owners/operators can test trucks, charging, and other tools.** Before purchasing, fleet owners/operators need to see and touch real models across the spectrum of class 2b-8 vehicles. They also need to speak with training institutions and businesses that own or are testing these vehicles. These types of “demo days” are already happening around North America, including in B.C. CALSTART’s Ride n’ Drive, the Advanced Clean Transportation Expo’s Ride & Drive, and the B.C. Trucking Association’s Low and Zero Emission Vehicle Summit. These could be leveraged and extended across the province to reach more fleet owners/operators, particularly SMEs. Existing models for education and outreach already in B.C., such as Emotive B.C. for passenger vehicles, can be replicated for a MHDV context showcasing case studies, user experiences, frequently asked questions, total cost of ownership savings, and more.⁵¹

Providing additional funding and partnering with existing organizations to more regularly hold these demo days would be important to give consistent opportunities for fleet owners/operators to attend. In particular, using non-traditional communication channels such as social media, community-based outreach as small fleets can lack capacity to engage with emails or seek out information via newsletters or websites.

- **Regularly test charging systems and solutions.** Similar to the “Electric Island” in the U.S., a working demonstration site can be used to test charging patterns, new charging technologies, and provide data to utilities to better inform their planning and analysis.^{52*} This type of site can act as an opportunity to test different charger types and ensure compatibility with different vehicles. It would also help to test multiple charger types to remove redundancies and other technical compatibility issues. OEMs working with customers can then test compatibility before new technology is brought into the field, helping reduce friction points and improving user experience.

➤ **Ensure governments are funding multiple pilots that follow best practices.**

Governments should find and fund “high-priority” and strategic pilots, based on these best practices:

- Pilots should seek to verify value and reduce uncertainty through the discovery of best practices surrounding implementation and operation.
- Pilots should be prioritized in areas where data on fleets and use cases can be easily collected and accessed, followed by data in areas where data does not exist.

- Projects should be high-profile and visible to increase awareness.
- There should be marketing and education to potential users and rollout to only voluntary adopters.
- Projects should be scalable—i.e. they should solve problems for larger-scale projects addressing the full systems-level transition that is required for ZEMHDVs (including multiple vehicles, charging stations, even locations and depots with different routes).
- Projects should have a data collection requirement, with an information-sharing strategy for non-confidential insights.

Proposed pilot projects brought up during the convening included: the Port of Vancouver, South Fraser, municipal fleets, and refuse trucks.

* Electric Island is the result of a collaboration between Daimler AG, Portland General Electric, and Black & Veatch to meet the needs of a high-power charging infrastructure for electric trucks.



Photo credit: General Motors of Canada



4 | Make sure government policy is based on good data and strategically targets early adopters

Canada needs to address the data gap on ZEMHDVs to inform and design policy choices targeted in the next 18 months very clearly on the users and technology best suited to early adoption. Data is most useful to potential consumers when it is publicly held and used to generate actionable insights.



RECOMMENDED ACTIONS

- Use B.C.'s Clean Transportation Action Plan to develop a “beachhead” strategy that focuses on early waves of adoption and considers how to address key market transformation barriers.

The strategy should:

- **Build policy to target vehicle classes and fleets that are likely to be early adopters in an 18-month timeline.** CALSTART and the California Air Resources Board developed the beachhead strategy to prioritize action on ZEMHDVs.²¹ The beachhead strategy focuses on successful deployment in waves, starting with targeted market segments to help advance the technology for currently less technologically mature markets (e.g., long-haul). For example, the components of electric powertrains are the same across multiple platforms. Investing in market-ready applications, such as urban delivery trucks, helps drive the transfer of technology to more challenging ones, such as long-haul tractor trailers. Given the state of ZEMHDV adoption in the B.C. market, we recommend a focus on last-mile, short-haul delivery, medium freight, refuse, some drayage applications, and public fleets as the most immediate near-term priorities to achieve mass mobilization. It’s also important to identify key geographic areas for early adoption in B.C. (e.g., the Lower Mainland and Southern Vancouver Island were brought up by several participants).
- **Base a strategy on technology snapshots** that would inform priority areas of investment focus for pilots, demonstrations, and the commercialization of ZEMHDVs within a B.C. context. For example, California’s Long Term Heavy Duty Investment Strategy identified drayage trucks, small fleets, and transit as prime for commercialization and put together dedicated funding targeting commercialization.⁵³ This is in comparison to zero-emission heavier cargo handling equipment, which was identified to be at the demonstration stage and thus created dedicated funding accordingly.
- **Consider how policy can address key market transformation barriers** such as addressing the specific needs of SMEs and providing training and certifications. California’s Long Term Heavy Duty Investment Strategy prioritized addressing the unique barriers faced by SMEs, and as a result, California implemented the Innovative Small E-Fleets program to provide additional and supplemental funding to support this objective.

➤ The province in collaboration with utilities and the federal government and key data collecting organizations such as Insurance Corporation of British Columbia should produce and compile not only data but actionable insights to ground future planning and investment decisions.

- **Public data on customer and market segmentation, vehicle use cases, different fleet sizes, fleet types, duty cycles, vehicle telematics data, and charging use cases** can inform the investment strategy by identifying the “high-priority” areas in the B.C. context. The National Renewable Energy Laboratory’s Fleet DNA project is one example of an online, interactive tool for vehicle use cases.⁵⁴
- **Data on drive cycles, customer segmentation locations, and route information** would help to identify the best places for public chargers, while customer segmentation locations would help to identify likely demand growth at depots and warehouses for private charging and enable utilities to plan appropriately.
- **Be transparent on financial data that enables fleets to accurately calculate their cost savings by switching to electric, such as Low Carbon Fuel Standard (LCFS) credit prices.** Currently public access to credit prices for the LCFS is limited. Creating transparency around those credit prices and how they can help to improve the business case for fleets is important for communicating the cost benefits of the transition. An example is the California utility PG&E’s total cost of ownership tool incorporating the California LCFS price, regularly updated based on CARB’s credit transfer report on credit prices.^{55,56}

Looking forward

B.C. has great programs to build from and has the chance to be a Canadian leader in the mass deployment of ZEMHDVs

But simplifying and prioritizing actions and making sure fleets have the information and resources they require is the only way to achieve B.C.’s and Canada’s targets for zero-emission commercial vehicles. Making the switch can save businesses money and improve their competitiveness on the triple bottom line of “people, profits and planet.”

The priority actions identified in this report are among the most important and immediate things that provincial, federal, and municipal governments, as well as utilities and fleets, can do to secure B.C.’s leadership. **We look forward to working with these actors as they build and design how to make this future a reality.**



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