

Achieving a Zero-Emission Future for Light-Duty Vehicles



Canadian Vehicle Manufacturers' Association

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CVMA supports the objective of significantly reducing greenhouse gases (GHGs) from the vehicle fleet to help Canada meet its overall emissions reduction targets. To accomplish GHG reductions from light duty vehicles (LDV), Canada requires the following:

Consumer zero-emission vehicle (ZEV) adoption – Consumers will not purchase ZEVs at a sufficient rate without first addressing the well-documented barriers to adoption by delivering better government incentives, charging availability and education. Government can also accelerate adoption through scrappage incentives that help replace older on-road vehicles.

Technology – Change requires new ZEV and battery technology consumers can afford. This depends on ongoing research and development (R&D) only the private sector can deliver. The automotive industry is in a highly transformative stage, but more time is needed to make ZEV technology affordable. Automaker investments into electrification alone are estimated at USD \$515 billion over the next five to ten years¹.

Alignment – The steps above can only be achieved through the integrated North American market to achieve scale which depends on regulatory alignment. A more stringent LDV GHG performance standard, aligned with the near term and expected longer term U.S. federal vehicle GHG emission reduction standards, is the most effective tool that is already available to achieve emission reductions of the LDV fleet and the government's ZEV sales objectives.

Canada will fail to achieve its sales targets if it ignores the factors above. We oppose the introduction of a regulated ZEV sales mandate as it addresses a supply problem that no longer exists. Without first addressing consumer incentives, charging infrastructure, and education, regulation will not achieve higher ZEV adoption while punishing consumers by pricing them out of the market. If the Government's objective is simply to regulate to project action it should regulate annual government consumer incentive amounts and the rate of EV charging installation.

A stand-alone Canada ZEV sales mandate will take Canada out of regulatory alignment with the United States and the integrated North American market. This threatens automotive investment, jobs, and Canada's place in the emerging ZEV supply chain.

The following responses expand on this core advice to the Government of Canada.

¹ Reuters, Global carmakers now target \$515 billion for EVs, batteries, November 10, 2021, <https://www.reuters.com/business/autos-transportation/exclusive-global-carmakers-now-target-515-billion-evs-batteries-2021-11-10/>

Discussion Questions

Getting to 100% ZEV sales by 2035

What should be the approach to achieving 100% in 2035, including ZEV sales of at least 50% in 2030?

The CVMA recommends a multi-pronged approach to achieving Canada's emissions reductions targets and net zero goal by 2050. For LDVs, this must include ongoing alignment with U.S. LDV GHG and criteria emissions reduction standards, a vehicle scrappage program to accelerate the turnover of the older and higher GHG emitting vehicles from the on-road fleet and a holistic strategy to boost consumer demand for ZEVs.

A more stringent LDV GHG performance standard, aligned with the near term and expected longer term U.S. federal GHG emission reduction standards, is the most effective tool available to achieve emission reductions of the LDV fleet and the government's ZEV sales objectives. The EPA has announced its intention to develop GHG regulations through 2030 that encompass the Biden executive order targeting 50 per cent EVs by 2030.

Significant progress has been made in reducing GHG and criteria emissions from the light and heavy duty on-road vehicle fleets through technological advancements made by the automobile industry. Over the past two decades, the Government of Canada has mandated and strengthened several performance-based regulations to address motor vehicle emissions on a national basis. Aligned GHG vehicle emissions standards have helped Canada achieve a 26 per cent GHG emission reductions from new vehicles over the 2005 to 2018 model years².

The Government of Canada recently completed the Mid-Term Evaluation of the LDV GHG regulation (2017-2025 model years) that confirmed the importance of continued alignment and collaboration with the U.S. as the key to achieving GHG reductions and increased fleet electrification. This alignment and collaboration was reaffirmed in the *Roadmap for a Renewed U.S.-Canada Partnership* and *Joint Statement by the U.S. Environmental Protection Agency and Environment and Climate Change Canada on Environment and Climate Change*³⁴. A "mid-term" evaluation process will be essential going forward towards the 2035 goal to review the technology readiness and all the supports needed to achieve the stated goals, as well as consumer attitudes towards rapidly changing automotive technologies.

Canada has a long-standing policy of aligning transportation (light duty and heavy duty) emissions and vehicle safety standards with those of the federal U.S. that has maintained concurrent market sales of vehicles meeting increasingly stringent requirements. This alignment provides significant environmental and economic benefits to Canada, including minimizing costs to industry and

² 2005-2008 GHG values are based on the voluntary Corporate Average Fuel Consumption values published by Transport Canada. Transport Canada did not publish data for 2009 and 2010 model years. 2011-2017 GHG Performance values are based on ECCC's published data.

³ Roadmap for a Renewed U.S.-Canada Partnership, <https://pm.gc.ca/en/news/statements/2021/02/23/roadmap-renewed-us-canada-partnership>

⁴ Joint Statement by the U.S. Environmental Protection Agency and Environment and Climate Change Canada on Environment and Climate Change, <https://www.newswire.ca/news-releases/joint-statement-by-the-u-s-environmental-protection-agency-and-environment-and-climate-change-canada-on-environment-and-climate-change-871261327.html>

consumers, leveraging economies of scale across the North American market and enabling an integrated North American automotive sector that is globally competitive.

The existing Canadian and U.S. LDV GHG regulations have several flexibilities intended to accelerate the deployment of ZEVs and this should continue. Leveraging the existing GHG regulatory structure to further increase the OEM's vehicle electrification transition will continue to be effective with the added benefit of avoiding further regulatory burden and industry compliance complexity. This approach also allows for the flexibility to be periodically adjusted for potential changes in the ZEV market and to account for advancements in ZEV technology.

Consideration must be given to the Biden Administration's commitment to achieve 50% ZEV sales by 2030 and EPA's approach of using LDV GHG performance standards to meet this objective. More stringent LDV GHG performance standards, aligned with the near term and expected longer term (post 2026 model year) U.S. federal vehicle GHG emission reduction standards, will help Canada achieve its emissions reduction commitments and ZEV sales target. The U.S. EPA currently projects a minimum of 17% ZEVs by 2026 (a doubling of ZEVs from the proposed regulations). This projected ZEV sales level is expected to increase significantly as a result of the post 2026 MY LDV GHG regulation stringency to achieve the Biden Administration's target of 50% ZEV sales by 2030, with similar results expected for Canada⁵.

It is important that the Canadian government understand the post-2026 model year U.S. LDV GHG policy announcements/guidance/developments before initiating any regulatory amendments to future model years of the Canadian LDV GHG Regulation or introducing new policies that could unintentionally lead to regulatory misalignment such as a unique to Canada ZEV sales mandate.

Continued policy alignment and collaboration with the U.S. is a key enabler for Canada to achieve LDV GHG reductions as well as effectively complimenting and accelerating North American ZEV technology development and increasing consumer ZEV demand and uptake. Alignment of Canada-U.S. vehicle criteria and GHG emissions, as well as safety regulations, underpin the integrated market that has enabled automotive investment and job creation in Canada. Regulatory alignment is a key factor that allows manufacturers to produce vehicles in Canada to be readily exported to the U.S., generating significant economic benefits. The auto industry contributed \$12.5 billion to Canada's GDP in 2020 with motor vehicles being the second largest export good. Regulatory misalignment could cause manufacturers to reconsider their long-term investment in Canada, particularly given the higher cost of manufacturing ZEVs compared to internal combustion engine (ICE) vehicles.

This partnership approach is consistent with the recently announced Roadmap for a Renewed U.S.-Canada Partnership in which President Biden and Prime Minister Trudeau agreed to take aligned and accelerated policy actions to address climate change, including efforts to achieve a ZEV future.

It was also acknowledged in the U.S.-Canada high level Ministerial Dialogue on Climate Change released on February 25, 2021, that significant alignment that exists in approaches to addressing climate change, and the countries' various areas of economic integration that can be leveraged by "... expanding the use and production of clean electricity, and achieving a zero-emissions future,

⁵ President Biden Announces Steps to Drive American Leadership Forward on Clean Cars and Trucks, <https://www.whitehouse.gov/briefing-room/statements-releases/2021/08/05/fact-sheet-president-biden-announces-steps-to-drive-american-leadership-forward-on-clean-cars-and-trucks/>

including through ambitious vehicle standards to improve fuel efficiency and reduce greenhouse base emissions from the light-duty and heavy-duty vehicles”.

In addition to ZEV sales targets of at least 50% by 2030 and 100% by 2035, are additional interim targets needed to allow Canada to succeed? What should those targets be?

Interim sales targets are not required to achieve the 2030 and 2035 targets. The 2030 and 2035 targets are aligned with automaker commitments to electrification and those required as a result of aligned LDV GHG standards, sending a clear signal to consumers about the transition underway.

What is required are interim government targets on long term funding of the iZEV consumer incentive programs and commitments to support a dramatic expansion of ZEV charging infrastructure and the supporting power grid. Canada significantly lags leading ZEV jurisdictions on consumer ZEV purchase incentives and the number of chargers needed to support the government’s future ZEV targets.

California, a subnational jurisdiction of comparable size to Canada, has committed USD \$10 billion to achieving its ZEV objectives in the 2021 and 2022 state budgets. These commitments to consumer incentives and charging infrastructure significantly exceeds Canada’s recent commitments to electrification (\$1.5 billion for iZEV and \$700 million for charging infrastructure).

If Canada is serious about achieving its ZEV sales targets significant new spending is required, not interim sales targets. The federal government should set a clear target for consumer uptake of iZEV (only 100,000 Canadians and businesses have used the program to date) and deployment of chargers at a ratio to EVs on the road by region that support the 2030 and 2035 targets. These targets should be measured and assessed on an annual basis through public reports on the progress being made.

Additionally, the Biden administration has set a non-binding target of achieving 50% of ZEVs by 2030. By aligning with a non-binding target that reflects the U.S. performance-based approach, Canada can continue to demonstrate efforts towards supporting auto sector economics through harmonization while also remaining committed to a goal of 50% by 2030 absent redundant regulation.

The Government of Canada will be mandating the sale of ZEVs. How should this be designed and what should be considered to ensure its success? What are the mechanisms in other jurisdictions’ mandatory ZEV regulations that should be used or avoided?

Given the significant investments being made by automakers into electrification, the increasing number of ZEV models coming to market across the various segments, and increasing stringency of GHG emissions standards, the ZEV targets can be met within the existing regulatory structure.

ZEV supply is increasing steadily in Canada and will continue to do so in the coming years. In a new study commissioned by Transport Canada on ZEV supply, Dunsky Energy + Climate Advisors found that ZEV availability has increased significantly across Canada, growing by 81% between February 2020 and February 2021⁶. The report shows that all provinces in Canada have appropriate ZEV

⁶ Zero-Emission Vehicle (ZEV) Availability in Canada, Dunsky, https://www.dunsky.com/wp-content/uploads/2021/12/DunskyZEVAvailabilityReport_2021-04-1.pdf

inventories with 8 out of 10 provinces being over supplied and overall ZEV inventory levels are now in “optimal range”.

The report acknowledges that demand for ZEVs is directly linked to governmental financial support, charging infrastructure investments, and an increasingly diverse range of ZEV options on the market. Given these findings, Canada needs a comprehensive long-term plan to incentivize consumers to purchase EVs, build charging infrastructure and increase consumer awareness (more details provided below). Mandating ZEV sales without first addressing the real and perceived barriers consumers face will not increase consumer ZEV uptake but will put additional financial pressures on Canadians already faced with a rising cost of living.

The world’s leading ZEV jurisdictions (Norway, Iceland, the Netherlands, and Sweden⁷) have shown that the most effective policies to achieve leading levels of consumer ZEV adoption are substantive demand-side policy measures to boost consumer EV demand. None of these jurisdictions have used a ZEV mandate (ZEV supply side policies) to achieve their world-leading consumer ZEV adoption levels. Additionally, these jurisdictions are not major auto production jurisdictions. According to the International Energy Agency (IEA), the policies with “measures that reduce the purchase price of electric vehicles” are the main driver of the success of the Nordic countries’ EV programs⁸.

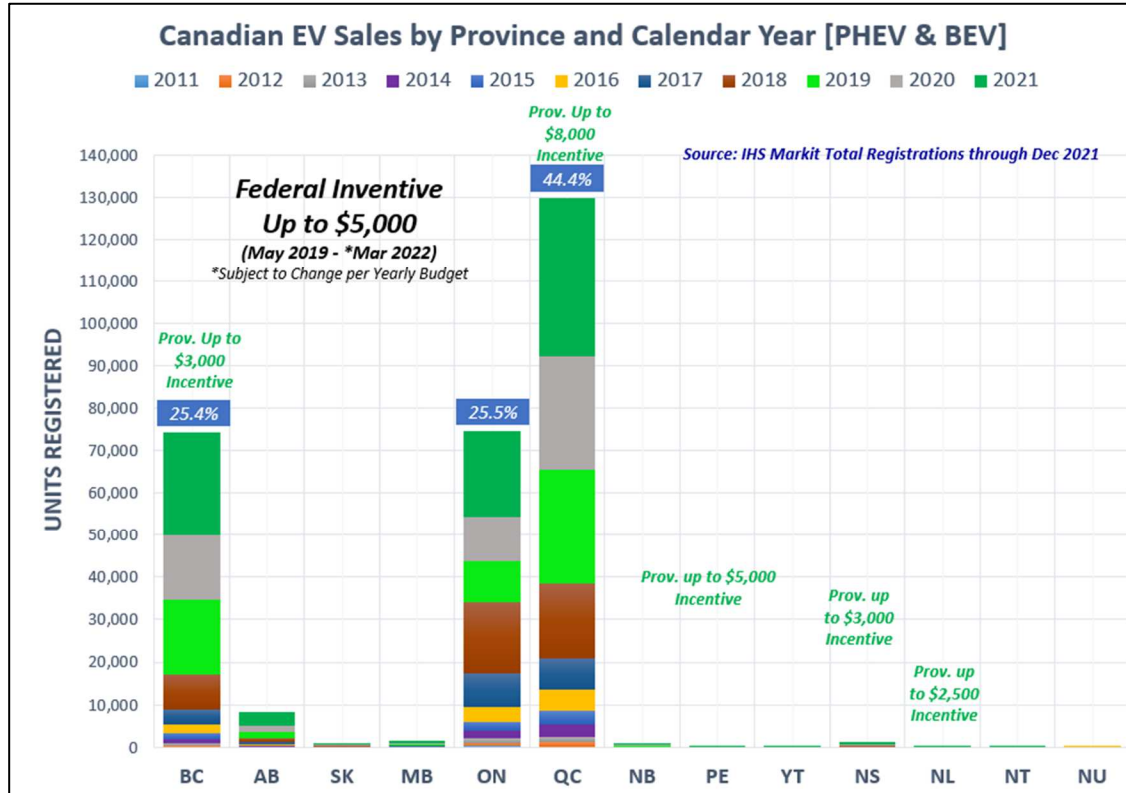
In Canada, B.C. and Quebec have implemented ZEV mandates. While both provinces lead the country in terms of ZEV sales (as shown on Chart A), the consumer ZEV uptake in these provinces existed long before the introduction of mandates thanks to long standing, and continuing consumer incentive programs, public and private charging infrastructure expansion, and consumer education.

Ontario saw a significant increase in ZEV consumer uptake when in 2016, the province introduced the highest ZEV incentive in North America. Ontario was poised to lead the country in ZEV adoption when the incentive was removed in the last half of 2018, causing sales to drop 55%. ZEV sales in Ontario picked up when the federal iZEV program was put in place in May 2019, but never to the level seen previously with the higher provincial incentive.

⁷ IEA, Electric car market share in selected countries, 2019, IEA, Paris <https://www.iea.org/data-and-statistics/charts/electric-car-market-share-in-selected-countries-2019>

⁸ Nordic EV Outlook 2018, <https://www.nordicenergy.org/wp-content/uploads/2018/05/NordicEVOutlook2018.pdf>

Chart A – Canadian Industry EV Sales by Province



For over a decade, the U.S. Northeast States with ZEV regulations have underperformed in ZEV sales compared to other non-ZEV mandate jurisdictions with ZEV demand policy focus⁹. Non-ZEV regulated jurisdictions have been successful with ZEV purchase incentives, expanded public charging infrastructures and other non-financial consumer ZEV incentives measures.

Before advancing any regulation, the government should consider how it would not only assess ZEV sales by jurisdiction but also more properly assess the local or regional availability of government funded and maintained ZEV charging as well as ZEV purchase incentives. Key questions include:

- How will a potential federal program ensure there are appropriate complimentary provincial ZEV programs in place to support OEMs having a reasonable chance to attain any federally mandated sales percentage level?
- Can we attain a ZEV sales requirement in a province/territory that has no or little purchase incentives or charging infrastructure?
- Will a federal program remove these provinces from the ZEV sales regulatory compliance numbers, or will the government force provinces to be ZEV ready and support the market?
- What is the federal government doing to engage energy suppliers and distributors throughout each province to ensure they are planning and prepared to support the transition?

⁹ Get Connected, Electric Vehicle Quarterly Report, Alliance for Automotive Innovation, <https://www.autosinnovate.org/resources/papers-reports/Get%20Connected%20Electric%20Vehicle%20Quarterly%20Report%20Q3%20Final.pdf>

Adding another layer of regulation to the industry, on top of the existing and highly effective LDV GHG emissions regulation, will take Canada out of alignment with the United States while doing nothing to address the barriers to consumer ZEV adoption. In addition, a uniquely Canadian ZEV regulation will damage Canada's already challenging business environment, threatening future automotive investment and employment in Canada, as well as risk Canada's place in the emerging ZEV supply chain¹⁰.

What issues impede adoption of ZEVs in Northern and remote communities and by low-income households?

Due to Canada's unique geography and climate, Northern, remote, and some rural communities face additional challenges due to longer travel distances, extreme cold weather, unique vehicle utility, and a lack of clean electricity generation. Mandating ZEV sales in these jurisdictions is unlikely to succeed before electric vehicle technology (particularly all-electric) advances to overcome the impediments to adoption.

Canada has 1.1 million kilometres of public, two-lane equivalent roads. In rural and remote communities, charging infrastructure will remain a serious challenge until battery technology evolves to the point where ranges are on par with a full tank of gasoline and a driver can be confident that fast-charging stations are convenient and readily available.

According to NRCan, there are approximately 200 remote communities and industrial sites across Canada that rely on diesel fuel for electricity generation and heat. It is important to highlight many of these communities are not connected to the continental grid.. While diesel generation is a well-known reliable source of energy in these communities, it comes with many environmental, social and economic disadvantages. Forcing increased electrical production from these types of power generation, as a result of mandated ZEV sales, may be a burden to an already tenuous power system and may not have a net reduction in emissions.

Plug-in hybrid electric vehicles (PHEVs) can help span the transition to all-electric as they are compatible with existing fuelling infrastructure and can support the deployment of electric chargers in a manner consistent with local needs and community support.

Awareness is another key challenge facing Northern, remote and some low-income communities. The remote and rural nature of many Canadian communities means not everyone has access to high-speed internet, cable, and other means of marketing communications. According to a recent Government of Canada survey on ZEV awareness, 53 per cent of respondents indicate they have not heard of the iZEV consumer rebate program. This underscores an increased need for consumer outreach and education.

For low-income households, the key barrier is the higher price of ZEVs compared to ICE vehicles (driven by battery size). Access to charging and the cost of installing a home charger are other major challenges.

How can Government address these issues?

Transitioning Canada's rural and remote communities toward secure, affordable and clean energy is a precondition for ZEV adoption. In addition, the iZEV program needs to be significantly expanded to include SUVs and pick up trucks, vehicles that are relied upon in Northern and remote communities. Extensive charging infrastructure will also be required. PHEVs have an important role

¹⁰ World Bank, Doing Business - <https://www.doingbusiness.org/en/rankings>

to play in Northern and remote communities where charging infrastructure, travel distances and cold weather pose challenges.

Substantial purchase incentives will need to be offered to facilitate the consumer purchase of a ZEV over its comparable ICE vehicle, particularly in the SUV and full size truck segments. Additionally, the government should consider the introduction of a consumer purchase incentive for used ZEVs to provide an affordable ZEV option for low-income households to make this personal transportation technology transition.

Consideration should also be given to costs associated with installing home chargers for ZEVs. Many low-income households are shared, meaning townhomes, row housing, condominiums, apartments, and other group subsidized models. There needs to be a plan laid out by the federal government on how to address the installation and associated costs for shared living situations, and/or low-income housing requiring ZEV charging stations.

ZEVs experience reduced range performance in colder climates, meaning that charging infrastructure must be even more visible and accessible in remote and rural regions to ensure consumers are able to charge the vehicle as required. Furthermore, due to the remoteness of many regions of Canada, drivers may be traveling longer distances and will require more frequently placed and available charging stations than in regions with more moderate climate conditions.

To address this, support programs for charging infrastructure for both rural highways and consumer homes is needed. Given the more challenging commercial situation for operation of rural public charging stations, there should be a higher percentage of government support for charging infrastructure projects in rural and Northern areas. Consideration should also be given to a consumer electricity rebate program for consumers in some rural regions to offset higher electricity costs they may face when making the decision to transition to a ZEV.

Aggressive education and marketing will be required in remote and rural communities where information about ZEVs may not be as readily available as urban areas. Consumers need to know that there are purchase incentive programs, understand the benefits of ZEV ownership and awareness of the availability of a wide variety of ZEVs (particularly in next few years), and how, where and when charging will be available in their homes and communities.

Given the multitude of challenges we recommend the federal government undertake a comprehensive review of all the risks and challenges associated with ZEV adoption in Northern, remote, and low-income communities. Such a review should examine:

- Existing variables and differences between electricity grids by jurisdiction.
- Robustness of each grid to support mass ZEV adoption, particularly in extreme temperatures.
- Costs associated with electricity transmission and distribution and lay out the responsible party for costs; and
- Upgrades to transformers where required and responsible party for upgrades and associated costs.

Note that these risks and challenges with power grids may also apply to highly populated areas where grids may already be stressed.

What role should PHEVs play in achieving the 100% ZEV sales target?

PHEVs have a role to play on the path to electrification, particularly given the limited charging infrastructure in some northern regions of Canada. While Canada works to build a reliable and secure charging infrastructure network, PHEVs can be a preferred choice for some consumers.

As a proportion of ZEV sales in Canada, full battery electric vehicles (BEVs) represented over 70 per cent of ZEV sales in Canada in 2020. Canadian consumer preference for BEVs over PHEVs is consistent with other global EV jurisdictions sales trends. Most current BEVs offer ranges of 300 to 500km on a single charge and this has played a key role in the EV consumer preference shifting to BEVs over PHEVs.

PHEVs should be compatible with higher level blend renewable fuels (E15) or lower carbon fuels and will compliment these federal GHG reduction activities.

Complementary Measures

In addition to the measures already implemented by the Government, are there other actions the Government should explore to complement the regulated sales mandate?

A regulated sales mandate is not required to achieve Canada's ZEV sales targets. We recommend the federal government significantly scale up efforts on incentives, infrastructure, and awareness as detailed below.

What is the role of other actors, including the private sector, to help complement the regulated sales mandate?

The automotive industry has a track record of delivering significant reductions in greenhouse gas (GHG) and criteria emissions from the light and heavy-duty on-road vehicle fleets through technological advancements. The industry is highly integrated with the U.S. and the harmonized vehicle emissions regulatory approach, which has been in place for many years in Canada, leverages North American economies of scale. This provides all Canadians with the greatest access to advanced vehicle technologies and their commensurate environmental benefits at the lowest technology costs to meet transportation needs.

The industry is going through a technological transformation with significant implications for transportation emissions in Canada. Automotive technology is advancing at an unprecedented pace, with cleaner, more fuel-efficient, and safer vehicles being brought to market in response to shifting consumer demand. Vehicle manufacturers are competing to introduce new and advanced vehicle technologies, with improvements in energy efficiency, fuel consumption, and powered alternative fuels, including ZEVs), for all sizes and classification of vehicles. This drive for technological advances and innovation has and will continue to lower GHGs and criteria air pollutants.

Material advancements in emissions reductions are also prevalent in newer conventional ICE vehicles. This is supported by industry's historic performance as seen in the annual Environment and Climate Change Canada's emissions report. Combined with recent public announcements made by Ford, General Motors, and Stellantis (FCA Canada Inc.) into electrification and the sector is poised to deliver more emissions reductions on the path to net-zero emissions by 2050.

Currently, there are more than 40 models of plug-in electric vehicles available with multiple drivetrain and package options (i.e., 2-wheel drive, all wheel drive, performance package, standard battery, extended range battery, etc.) totalling over 85 unique configurations. Manufacturers continue to bring new plug-in electric vehicles to market and expand their electrified model line up at an unprecedented pace. By 2023, it is expected that there will be more than 120 ZEV models available across all segments in Canada, giving consumers a multitude of options to meet their transportation needs.

When it comes to charging infrastructure, there is an opportunity for the private sector to leverage the ZEV transition to provide creative benefits to consumers. Examples include providing free charging at retailers, grocers, outlets, malls, tourist destinations and event facilities. Other innovative ideas include providing preferred parking for ZEVs and discounts to ZEV owners with affiliated partners.

Should the Government scale up its existing efforts on incentives, infrastructure, and awareness and what are the priorities?

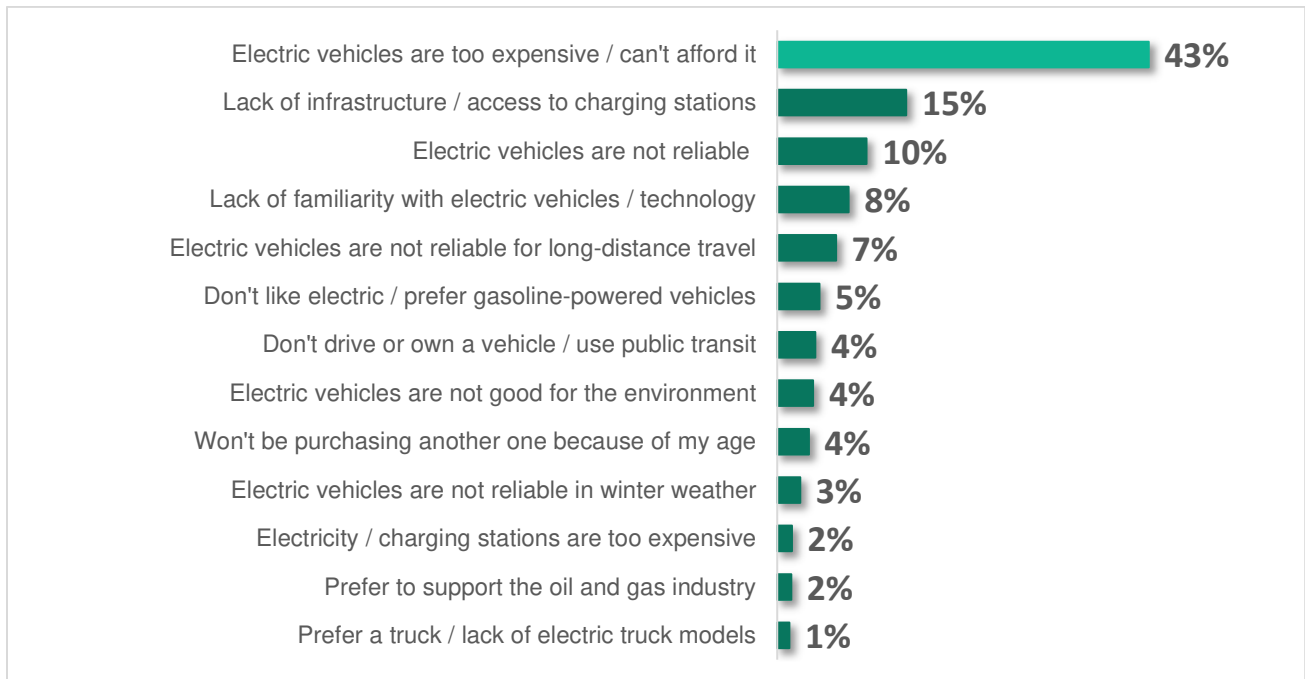
The federal government needs to significantly scale up its existing efforts on incentives, infrastructure, and awareness if it is to achieve the ZEV sales targets. ZEVs accounted for just 5 per cent of all Canadian new light duty vehicle registrations in 2021¹¹. Without additional efforts to increase consumer ZEV demand and adoption, achievement of the ZEV sales target is at risk.

The largest barriers to EV adoption in Canada are the higher costs of EVs, concerns with vehicle charging, vehicle range, a lack of a comprehensive, convenient, and accessible charging infrastructure and consumer education. According to a Government of Canada's survey from November 19, 2020 (Chart B), cost is by far the main barrier to consumers purchasing a plug-in electric car or truck¹².

¹¹ Statistics Canada, <https://www150.statcan.gc.ca/n1/pub/11-627-m/index-eng.htm>

¹² Internal government poll shows strong support for electric vehicle subsidy, <https://globalnews.ca/news/7632277/internal-government-poll-support-electric-vehicle-subsidy/>

Chart B – What is the main reason you do not own and do not expect your next car or truck to be electric?

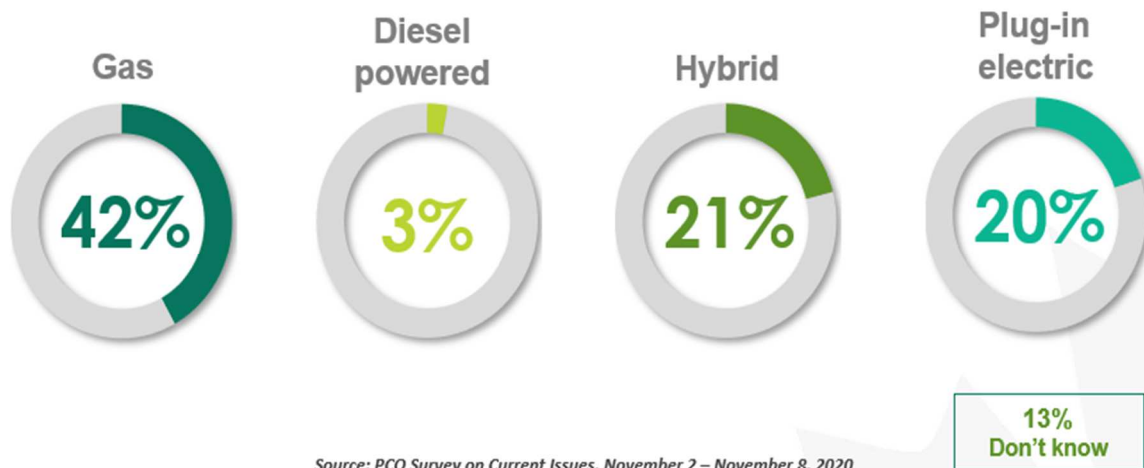


This survey also indicates that only 20% of Canadians surveyed think that their next vehicle purchase will be a plug-in electric vehicle (See Chart C). This indicates a need for additional consumer demand-side policies to achieve the governments future ZEV sales targets.

Chart C- Do you think the next car or truck you buy is most likely to be a plug-in electric, a hybrid, or diesel powered?

The level of interest in hybrid and plug-in electric models is very high. About two in five Canadians say their next car or truck is likely to be one of these types of vehicles

Do you think the next car or truck you buy is most likely to be plug-in electric, a hybrid, or gas or diesel powered?

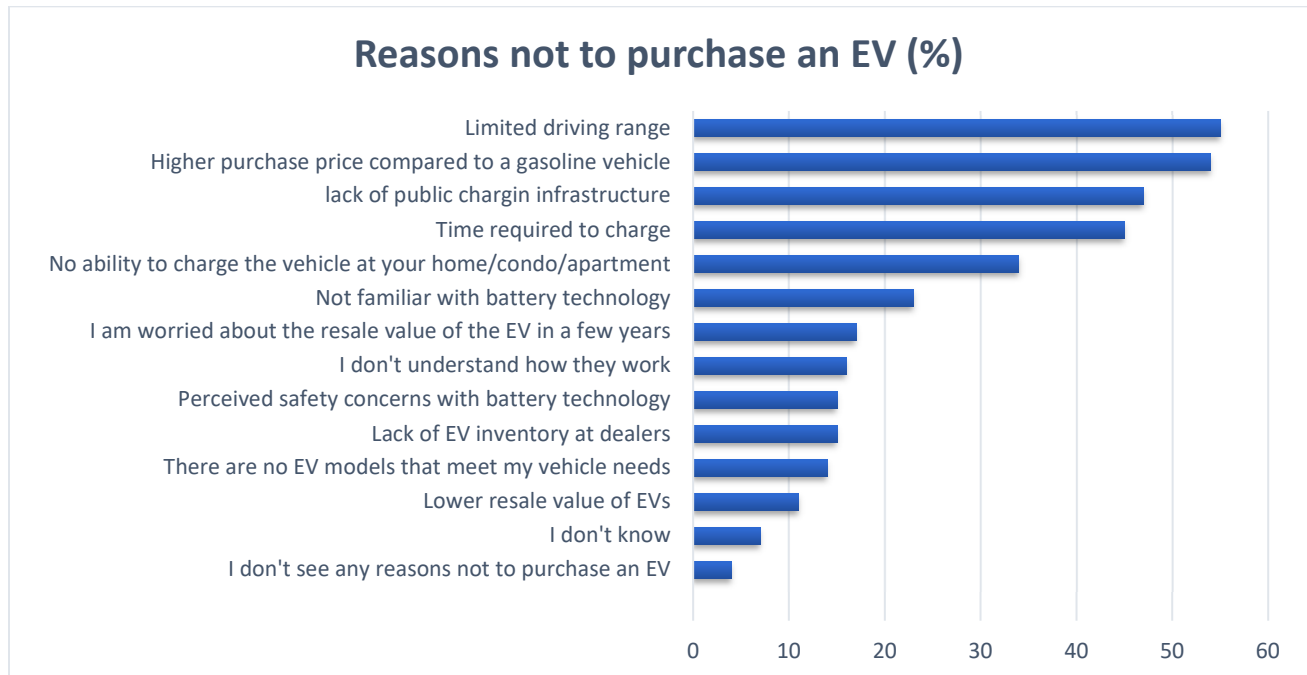


*Source: PCO Survey on Current Issues, November 2 – November 8, 2020
Base: All respondents (n=1,000)*

Deloitte's 2022 Global Automotive Consumer Study revealed similar consumer concerns. The Canadians that participated in the Deloitte survey responded that their three greatest concerns regarding electric vehicles are driving range (23%), vehicle cost/price premium (22%), and a lack of electric vehicle charging infrastructure (12%).

According to research by Leger commissioned by the CVMA and Global Automakers of Canada (GAC), a lack of EV inventory or models to suit consumers' needs are minor factors in the decision to purchase an EV (Chart D)¹³. Consistent with other consumer surveys, the main reasons not to purchase are limited driving ranges, cost, a lack of public charging infrastructure and the time required to charge.

¹³ Leger, CVMA and GAC Online Survey on Electric Vehicles, May 5, 2021 <http://www.cvma.ca/press-release/new-survey-underscores-need-ambitious-government-efforts-convince-canadians-purchase-electric-vehicles/>

Chart D – Reasons Not to Purchase an EV

Until price parity between ZEVs and ICE vehicles is achieved, consumer incentives like the federal iZEV and other consumer financial and non-financial incentives will be critical over the next decade to offset the higher costs faced by consumers^{14,15}. To ensure the program is as effective as possible, CVMA recommends the incentive amount be increased, the vehicle eligibility parameters be broadened to include larger and longer-range ZEVs, and the government commit long-term funding to the program. PHEVs should also continue to receive appropriate incentives as they are integral to the transition towards an all-electric future.

There is provincial disparity for consumer purchase incentive programs, some jurisdictions offer consumer incentives, where others do not. Meanwhile, some jurisdictions have introduced policies such as a ZEV tax in Saskatchewan that actively work against federal efforts to incent consumers to purchase a ZEV. In jurisdictions where there are incentive programs, most of the incentive value falls short in offsetting higher costs of ZEVs.

Canada should benchmark its efforts to provide consumer incentives against other jurisdictions. For example, the U.S. is taking significant steps to incent consumer purchases of ZEVs with a proposed USD \$12,500 purchase incentive. Canada must replicate the U.S. purchase incentive otherwise, as consumer demand increases in the U.S., the same will not hold true for Canada.

At the same time, large investments in public charging infrastructure across Canada will continue to be required to provide consumers with the confidence that this vehicle technology is a viable alternative to meet all their personal transportation needs – from daily commutes to extended family travel – without anxiety around recharging in a timely and convenient manner. To meet consumer

¹⁴ CAR Technology Roadmaps, https://www.cargroup.org/wp-content/uploads/2018/01/Technology_Roadmap_Combined_23JAN18.pdf

¹⁵ CARB, Advanced Clean Cars II Workshop, September 20, 2020, <https://ww2.arb.ca.gov/sites/default/files/2020-09/ACC%20II%20Sept%202020%20Workshop%20Presentation%20%28Updated%29.pdf>

recharging expectations primarily while travelling, the expanded public network will need to be DC fast charging (100 kW and up to 350 kW capabilities). Without this, consumers will not be able to depend on reasonable charging times for the broad range of ZEVs coming to the market in the near future.

Canada is currently lagging leading jurisdictions around the world on ZEV charging infrastructure. According to data from the IEA and European Alternative Fuels Observatory, Canada currently has 10,936 publicly accessible slow chargers (i.e. Level 2) and 2,258 publicly accessible fast chargers¹⁶. Global leaders on the total number of publicly available electric vehicles (EV) chargers include China, the United States, Netherlands, South Korea, and France. China, with more than 800,000 publicly available chargers, accounts for over 60 per cent of such chargers in the world.

The European Union's Alternative Fuel Infrastructure Directive (AFID) has recommended that EU countries aim for 1 public charger per 10 EVs on the road, a ratio of 0.1. Using this metric, Canada has 0.06 public chargers per EV, well behind the EU average of 0.09 and the global average of 0.12.

As Canada works to achieve the 100% ZEV target, significantly more charging infrastructure will be required. Many leading ZEV jurisdictions have undertaken comprehensive, public assessments of the charging infrastructure required to achieve ZEV adoption goals. For example, the California Energy Commission recently estimated that the state needs 1.2 million new public and shared chargers (mix of Level 2 and DC Fast Charge) by 2030 to meet the needs of 7.5 million EVs.

According to the Canada Energy Regulator, if Canada were to achieve 100% ZEV sales by 2040 (later than the current 100% ZEV sales target for 2035), the on-road ZEV stock would reach 39 million vehicles by 2050. To achieve the AFID recommended ratio of 1 public charger per 10 EVs on the road, Canada would need 3.9 million public chargers by 2050.

We recommend the federal government undertake a public assessment of the charging infrastructure (all levels and mix of charging power) required for Canada to achieve the ZEV sales target while considering consumer acceptability. Such an assessment would allow governments at all levels to develop the long-term plans required to build a national charging network. We recommend the assessment be regularly updated with public reports on the progress being made.

The assessment should incorporate the technology developments underway in the automotive industry and implications for charging infrastructure. Over the long-term, consideration should also be given to other infrastructure needs when new technologies (i.e., fuel cells, hydrogen) become viable for widespread consumer adoption.

The government should also work with provinces and municipalities to undertake an assessment of the power grid readiness for the demand of home charging. Upgrades to the grid will take time and financing and need to start now if ZEV targets are to be reached.

Pertaining to awareness, the government needs a broad-based communication strategy to educate consumers on the environmental benefits of transitioning to a ZEV and the incentives available. Yukon has reported some success with regular "Discovery Days" working with dealers and current ZEV owners. This initiative and similar efforts need to be undertaken across Canada with much greater frequency.

¹⁶ According to IEA and EAFO, slow chargers are defined as those providing between four and 22 kilowatts of power with fast chargers providing above 22 kilowatts.

Chart E below indicates significant growth in Yukon EV uptake, due in large part to the purchase incentive program and aggressive efforts towards consumer education through “Discovery Days”. Note that Yukon does not have a ZEV sales mandate.

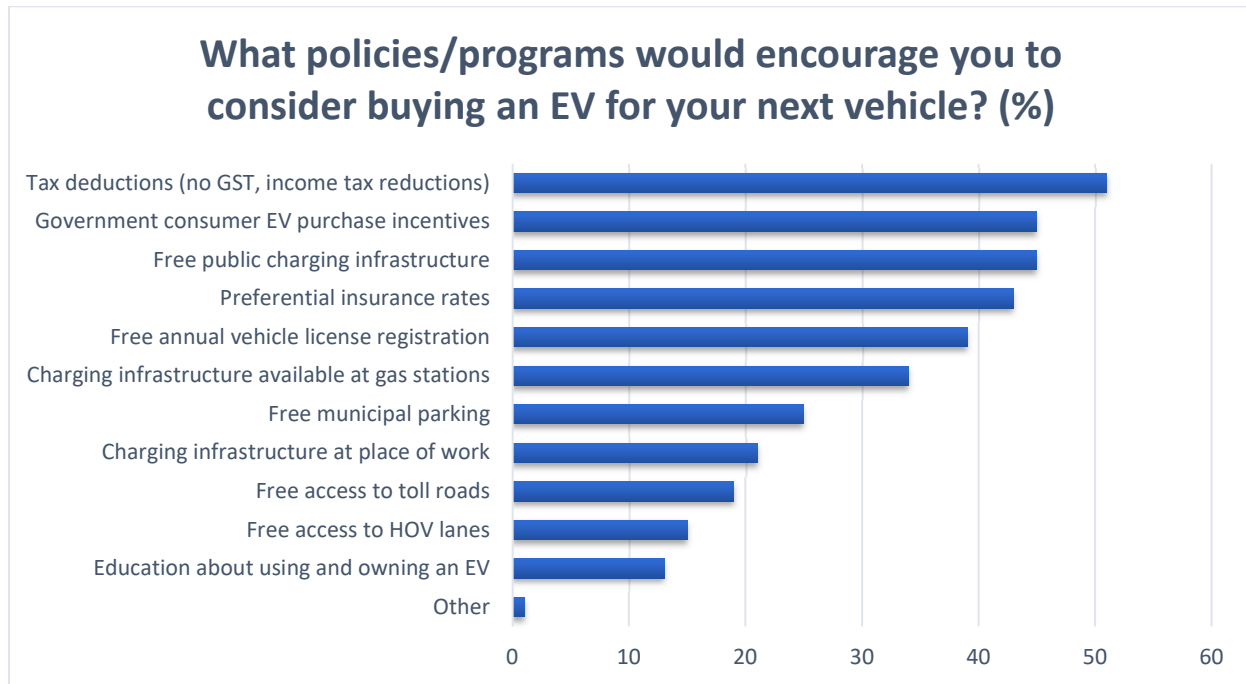
Chart E – Vehicle Registration Data for EVs, Yukon Territories

<i>iHS Registration Data thru Nov 2021</i>	\$0K EV Incentive	\$0K EV Incentive	\$0K EV Incentive	\$5K EV Incentive
Yukon Stats (Non-ZEV Mandated Province)	2018 CY	2019 CY	2020 CY	2021 CYTD
% EV vs % of Total Vehicles	0.07%	0.47%	1.7%	4.6%

Should Canada explore other options to close the price gap between ZEVs and ICE vehicles, including feebates or measures that prevent higher leasing and lending rates for ZEVs?

According to research by Leger, tax deductions, consumer purchase incentives, preferential insurance rates, free annual vehicle licence registration, free municipal parking, and free access to toll roads and HOV lanes are the policies that would be most effective at encouraging Canadians to buy an EV (Chart F)¹⁷. These policies would close the total cost of ownership gap and help the government achieve its sales targets. Not only are these programs most effective, 66% per cent of Canadians surveyed support municipal, provincial and federal governments spending to provide consumers incentives to buy EVs.

¹⁷ New survey underscores need for more ambitious government efforts to convince Canadians to purchase electric vehicles, <https://www.cvma.ca/press-release/new-survey-underscores-need-ambitious-government-efforts-convince-canadians-purchase-electric-vehicles/>

Chart F - Considerations for Buying an EV

Norway, the leading ZEV jurisdiction in the world, uses a VAT tax exemption for ZEVs as the way to close the EV to ICE vehicle pricing gap. Eliminating the GST/HST (in Canada) on new and used ZEVs would be a significant motivator for consumers to help make the switch from ICE to ZEVs

The best way to reduce ZEV lease costs is to increase used ZEV market residual values (which are dramatically lower than comparable ICE vehicles). A policy measure that would significantly help in that area would be the introduction of a used ZEV consumer purchase incentive program. A used ZEV consumer incentive program would boost new ZEV residuals that are used in calculating lease payments as well as provides a ZEV ownership pathway to lower income households.

We recommend that Canada assess the several used EV incentives in place (e.g., Oregon) and consider conducting a federal pilot program (or supporting a provincial program) to assess how such used EV incentives can support a strong used EV market.

Should Canada's Excise tax on Fuel – Inefficient Vehicles (Green Levy) be modernized to better align with climate objectives (e.g. include a wider range of vehicles?)

The Green Levy Excise Tax should be eliminated with focus put on more effective policies that are proven to deliver environmental benefits. Introducing a vehicle scrappage program (as outlined below) to replace 0.5 to 2 million vehicles that are 12 years or older from the on-road fleet would allow the federal government to achieve a 1.7 – 7 Mt GHG reduction in the near term. Such a measure would provide significant and immediate environmental benefits and aligns with Canada's climate objectives.

A more effective alternative to the Green Levy is the elimination of GST/HST on ZEVs. This has been proven to work in other jurisdictions and would send a powerful signal to consumers.

What are the RD&D gaps to support the uptake of ZEV technologies and charging/refuelling solutions (e.g. higher-power charging solutions, V2G, energy storage, etc.)?

To meet consumer recharging expectations, the expanded public charging network will need to be primarily DC fast charging (100 kW and up to 350 kW capabilities). Without this, consumers will not be able to depend on reasonable charging times for the broad range of ZEVs coming to the market in the near future.

Where vehicles dwell for multiple hours, robust Level 2 charging infrastructure will be needed. To facilitate this, homes and multi-unit residential buildings (MURBs) may need to be upgraded to have the appropriate services for these type of charges. Vehicle to grid and other opportunities to integrate the entire electrical generation and use infrastructure should be considered as technology develops in this area. This will require developing industry standards for reverse energy flow from ZEV initially to homes and later to the power grid.

What challenges and opportunities do you anticipate for the electricity grid as a result of accelerating our EV sales targets?

A significant amount of new power generation will be required in Canada to achieve a fully electrified vehicle fleet. To ensure Canada achieves its GHG emissions reduction targets emphasis must be on clean, renewable, net-zero energy generation.

According to the IEA's 2022 Energy Policy Review of Canada, further GHG emissions reductions in electricity generation of an estimated 47 Mt CO₂-eq are needed to reach Canada's GHG targets for 2030 with even deeper cuts needed to reach net zero emissions in 2050¹⁸. The IEA notes that "Canada will need to ensure sufficient new clean generation capacity to meet the sizeable levels of electrification that its net zero targets imply."

There are various estimates of Canada's future electricity needs in response to a growing ZEV fleet from NRCan, the Canada Energy Regulator, private sector analysts and provincial utilities.

- **ICF Grid Readiness Report:** Natural Resources Canada retained the consulting firm ICF International Inc. to carry out a study to help Canadian utilities to compare and discuss practices to understand the expected electrical energy demands from future electric vehicle fleets in Canada and the impact on electricity grids¹⁹. The study forecasts energy demand on the assumption that the light-duty fleet is nearly 100% ZEV by 2050 based on the previous federal target of achieving 100% ZEV sales by 2040. ICF's forecast suggests a 156.5 TWh EV load per year by 2050, representing 22.6% of current domestic annual electricity consumption. The study concludes that "requirements for EV readiness, including but not limited to grid readiness, are multifaceted and will require considerable investments in supporting infrastructure, policy, and education."
- **Canada Energy Regulator:** If the share of electric vehicles increases to 64% of new vehicles sales by 2040 (well below current government targets), electricity demand for

¹⁸ IEA, Energy Policy Review, <https://iea.blob.core.windows.net/assets/7ec2467c-78b4-4c0c-a966-a42b8861ec5a/Canada2022.pdf>

¹⁹ ICF Grid Readiness Report, https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/ExecutiveSummary_EV.pdf

transportation increases 33 TWh by 2040. This represents about 8.5% of the projected total end-use electricity demand in 2040²⁰.

- **EY Canadian electric vehicle transition:** In a moderate adoption scenario where EVs represent 15% of the on-road fleet by 2030 (6.5 million vehicles), electricity demand would increase by 32 TWh, or 5.5%²¹. To supply this increase, EY concludes that power and utility companies would need to manage demand and invest in aging grid infrastructure to respond to changing load profiles.
- **Hydro Quebec:** Electric vehicle adoption will increase provincial electricity demand by 3.3 TWh between 2019 and 2029, part of an expected total increase in electricity demand of 15.9 TWh (9% increase over 2019)²².
- **Ontario Independent Electricity System Operator:** Overall, electricity demand from transportation electrification is forecast to grow from 0.9 TWh in 2023 to 26 TWh in 2042, an average annual growth rate of nearly 20%. The 2021 EV forecast is in line with federal government ZEV sales targets, which projects 6.6 million EVs in Ontario by 2042, with an annual charging demand of 24.4 TWh and a peak demand of 1,200 MW²³.
- **BC Hydro:** BC Hydro is predicting there will be around 350,000 EVs on B.C. roads by 2030²⁴. This is estimated to add an additional 1,050 gigawatt (1.05 TWh) hours of electricity load per year.

Given varied projections and lack of Canada-wide energy demand forecasts, a coordinated effort with utilities is required to ensure that as ZEV adoption increases the charging infrastructure is available and powered by clean electricity. Local and community grids should also be monitored for their capability to support increasing ZEV charging loads.

There will come a point in time where the ZEV car park will become a very large, distributed energy source that could provide energy to the grid when needed (and generate revenue for ZEV owners and possibly aggregators). Charging stations, particularly where vehicles are connected for some period of time (at home, at work) will need to be bidirectional and smart (vehicle to grid, vehicle to home). At current, Ontario's IESO is looking at EV batteries as a distributed energy. There may be other jurisdictions where similar review is taking place.

²⁰Canada Energy Regulator, Market Snapshot: Electric vehicle projection shows changes in electricity and fuel demand, <https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/market-snapshots/2019/market-snapshot-electric-vehicle-projection-shows-changes-in-electricity-fuel-demand.html>

²¹ Canadian electric vehicle transition, EY Strategy, https://assets.ey.com/content/dam/ey-sites/ey-com/en_ca/topics/oil-and-gas/canadian-electric-vehicle-transition-the-difference-between-revolution-or-evolution.pdf

²² Hydro Quebec electricity demand forecast 2020, <http://news.hydroquebec.com/en/press-releases/1656/growing-electricity-demand-forecasted-in-quebec-despite-the-public-health-crisis/>

²³ IESO Annual Planning Outlook, <https://www.ieso.ca/en/Sector-Participants/Planning-and-Forecasting/Annual-Planning-Outlook>

²⁴ BC Hydro, <https://electricvehicles.bchydro.com/about/our-role-with-EVs>

What role does Canada’s critical minerals and battery supply chain have in helping Canada achieve its ZEV targets?

With the right policies in place to support the transition to ZEVs and attract new investment, Canada is positioned to generate significant economic benefits. The transformation underway in the automotive industry will radically re-work supply chains from the mining of critical minerals to battery cell production and vehicle final assembly.

The International Energy Agency (IEA) projects that for the world to achieve net-zero globally by 2050, six times more mineral inputs will be required by 2040 than today. Of this increase, electric vehicles and battery storage demand for mineral inputs are expected to grow by a least thirty times to 2040²⁵.

Canada is in the top five countries producing cobalt, copper, graphite, precious metals, nickel, and uranium, and has the potential to expand in lithium, magnesium and rare earths production. We are the only nation in the Western Hemisphere with deposits of the complete suite of minerals required to make next-generation electric batteries.

Increasing and diversifying Canadian production of critical minerals has the potential to enhance North American security and increase trilateral trade. Building North American supply chains from mineral exploration to production for these elements also presents an important opportunity for job creation and economic growth, while ensuring responsible mining practices.

As part of the transformation to electrification in the automotive industry, Ford, General Motors, and Stellantis (FCA Canada Inc.) have recently announced new investments of \$6 billion in Ontario, the majority of which is dedicated to electric vehicle assembly. This will create significant opportunities to grow the EV battery supply chain in Canada if government moves quickly to encourage the development of critical mineral mining and processing capabilities that align with the needs of the automotive industry.

The first step is to make strategic investments to build Canada’s critical mineral mining and refining capacity. Efforts should be redoubled to attract more investment into EV assembly and the associated parts supply chain, including batteries and electric motor production. To complete the supply chain, more needs to be done to boost EV adoption by helping consumers make the switch to an EV with enhanced EV purchase incentives and a comprehensive national EV charging network. Implementing a ZEV sales mandate that takes Canada out of alignment with North America would actively work against efforts to build a critical mineral and battery supply chain.

What end of life EV battery strategies need to be in place to support our environmental goals while achieving the 100% ZEV target?

Battery technology is developing rapidly to meet consumer expectations, lower costs, and reduce environmental and social impacts as ZEVs are brought to market at an unprecedented pace. The processes for recovering valuable materials from end-of-life batteries (EVs and other products) are also evolving as new ideas are being developed, demonstrated, and implemented at commercial scale across North America and globally (see CVMA factsheets on EV batteries that explains in

²⁵ The Role of Critical Minerals in Clean Energy Transitions, <https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/executive-summary>

detail the various journeys a battery might take once removed from a vehicle, but prior to being recycled)²⁶.

EV batteries do not follow the traditional consumer good pathway of 'use then discard'. There are multiple pathways in the EV battery lifecycle including reuse, repair, remanufacture, or repurposing, all prior to recycling to recapture valuable materials. Given these multiple pathways and the innovation underway in the sector, traditional extended producer responsibility regulatory measures are not needed to support environmental goals.

The risk of EV batteries being discarded, posing environmental challenges, is minimal given the value of EV batteries and their potential for reuse, repair, remanufacture or repurposing. In addition, an EV battery's size, weight, the need for specialized tools and training to remove them from a vehicle, the existing waste management regulations for hazardous materials, and an already established for profit industry that specializes in end-of-life management of vehicles ensures the overwhelming majority of EV batteries are well managed.

Prescriptive end of life regulations for EV batteries have the real potential to hurt ZEV uptake. The Quebec government's EPR proposal which is under review includes a "best before date" for EV batteries at 10 years which would lead to the premature recycling of EV batteries and undermines consumer confidence in adopting new EV technology. It also has the potential to negatively impact residual values of vehicles and weaken the used EV vehicle market.

Harmonized and supportive regulations that facilitate the movement and transportation of EV batteries across Canada and between Canada and the United States are required as costs represent a significant portion of the cost to manage EV batteries either at end of their vehicle or useful life.

We recommend that government work with industry to ensure environmental goals are achieved while encouraging innovation, the transition of the automotive dismantlers and recyclers sector, and the continuing adoption of ZEVs.

Additional measures

While there is significant focus on new vehicles, if Canada is committed to achieving meaningful GHG reductions from the entire LDV transportation sector, policy actions must be taken to address emissions from the vast majority of vehicles in operation. More than half of the on-road LDV fleet is six years or older and these vehicles do not have the same emission-reducing technologies of new vehicles. Over one-third of vehicles on Canadian roads are 12 years or older with GHG emissions that are ~30% higher than that of a comparable sized new ICE vehicle.

Introducing a vehicle scrappage program to replace 0.5 to 2 million vehicles that are 12 years or older from the on-road fleet would allow the federal government to achieve a 1.7 - 7 Mt GHG reduction in the near term.

Focusing solely on electrifying the 6 per cent of new vehicles joining the fleet annually will not have a significant impact on overall LDV sector GHG emissions. It takes approximately 20 years to renew

²⁶ See CVMA factsheets on EV batteries: <http://www.cvma.ca/wp-content/uploads/2021/06/Understanding-EV-Batteries.pdf>, <http://www.cvma.ca/wp-content/uploads/2021/09/Journey-of-Electric-Vehicle-Battery.pdf> and <http://www.cvma.ca/wp-content/uploads/2021/12/ev-battery-journey.pdf>

or “turnover” the majority of the on-road fleet inventory; the fastest way to accelerate LDV GHG reductions is to incent faster fleet turnover through a scrappage program.

A higher penetration of renewable and low carbon fuels compatible with newer vehicle technologies and aligned with U.S. fuel performance standards will also compliment on-going GHG reductions across the fleet.

A handwritten signature in black ink, appearing to be 'BK', with a long horizontal stroke extending to the right.

Brian Kingston
President and CEO
Canadian Vehicle Manufacturers' Association

About the Canadian Vehicle Manufacturers' Association (CVMA)

The Canadian Vehicle Manufacturers' Association is the industry association that has represented Canada's leading manufacturers of light and heavy duty motor vehicles for more than 90 years. Its membership includes Ford Motor Company of Canada, Limited, General Motors of Canada Company, and Stellantis (FCA Canada Inc.). Collectively its members operate 5 vehicle assembly plants as well as engine and components plants, and have over 1,300 dealerships. 136,000 jobs are directly tied to vehicle assembly in Canada. Direct and indirect jobs associated with vehicle manufacturing are estimated at over 792,000 across Canada.