ELECTRIC MOBILITY CANADA
ACCELERATING ELECTRIC TRANSPORTATION

MOBILITÉ ÉLECTRIQUE CANADA
ACCÉLÉRER L'ÉLECTRIFICATION DES TRANSPORTS

NATIONAL ELECTRIC MOBILITY STRATEGY

Electric Mobility Canada

June 2024

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ABOUT ELECTRIC MOBILITY CANADA

Founded in 2006, Electric Mobility Canada is a national membership-based industry association dedicated exclusively to the advancement of electric mobility as an opportunity to support the Canadian economy while fighting climate change and air pollution.

EMC has a wide range of member organizations including, light, medium, heavy-duty, and off-road vehicle manufacturers, infrastructure providers, utilities, tech companies, mining companies, research centers, governmental departments, cities, universities, fleet managers, unions, environmental NGOs, and EV owners' groups.

EMC's mission is to enable and accelerate the transition to sustainable electric mobility in Canada through advocacy, collaboration, education, and thought leadership, with the end goal of creating a cleaner, healthier, and more prosperous future for all Canadians.

Electric Mobility Canada supports the activities of its members by:

- Communicating legislative, policy, technical and operational matters of key interest pertaining to electric mobility to our membership. This includes identifying the actions required to meet the needs of the members and proactively communicating these needs to policy makers and other stakeholders.
- Establishing partnerships to accelerate the adoption of electric mobility through research, demonstration projects, policies, programs, and strategies to increase market penetration.
- Acting as a resource center for relevant and contemporary information on electric mobility from across Canada and around the globe.

Electric Mobility Canada is the unifying and authoritative voice for the Transition to electric mobility across Canada.

1. INTRODUCTION

Why electrification is important and how Canada will benefit

Electrification represents not only a shift in the *source* of energy for common applications, such as mobility and heating, but also a shift in *amount* of energy required for any final end-use. Electrification is therefore an important form of energy efficiency—the 'first fuel' society should employ to use less, waste less, spend less. Put another way, electrification is inextricably part of the root of the energy transition, representing an unavoidable strategy to be employed deeply and broadly across all major sectors, for the benefit of the economy and individual household affordability: because when we use less, we waste less and spend less, too. When it comes to transportation, EVs and the electrification of light-, medium- and heavy-duty transportation—especially land- and marine-based transportation—will be a key part of the path to cleaner air, better health, heavier wallets, and a safer climate for Canadians.

➔ Electrification is an essential part of the solution to overall transportation decarbonization: a necessary <u>but not a sufficient</u> strategy to achieve deep reductions in GHG emissions over the long term. Other solutions include "increasing convenience by implementing system-level and design solutions" (e.g., land-use planning, zoning reform, safe active transportation, and equitable transit-oriented development to reduce commute times, improve walkability and bikeability, and improve quality of life). "Reducing transportation emissions starts with understanding and addressing the factors influencing travel demand and optimizing the amount of travel needed to reliably access services and distribute freight to ensure the mobility needs of all Americans are fully met."[i] Further solutions include transportation demand management and mode-shifting to adopt more efficient travel options, i.e., improving efficiency by increasing the availability of highly efficient travel options (like public transit), while also improving the energy efficiency (or fuel economy) of all vehicles, especially passenger vehicles, which often have low occupancy. TDM initiatives are multimodal in nature and include strategies like congestion pricing and parking pricing paired with affordable transit options, car free zones with accessible and safe bike and pedestrian infrastructure, ride sharing promotions, safe walking, biking, and rolling routes to school, transit fare discounts, off-peak goods delivery incentives, etc.

1. Air pollution and health

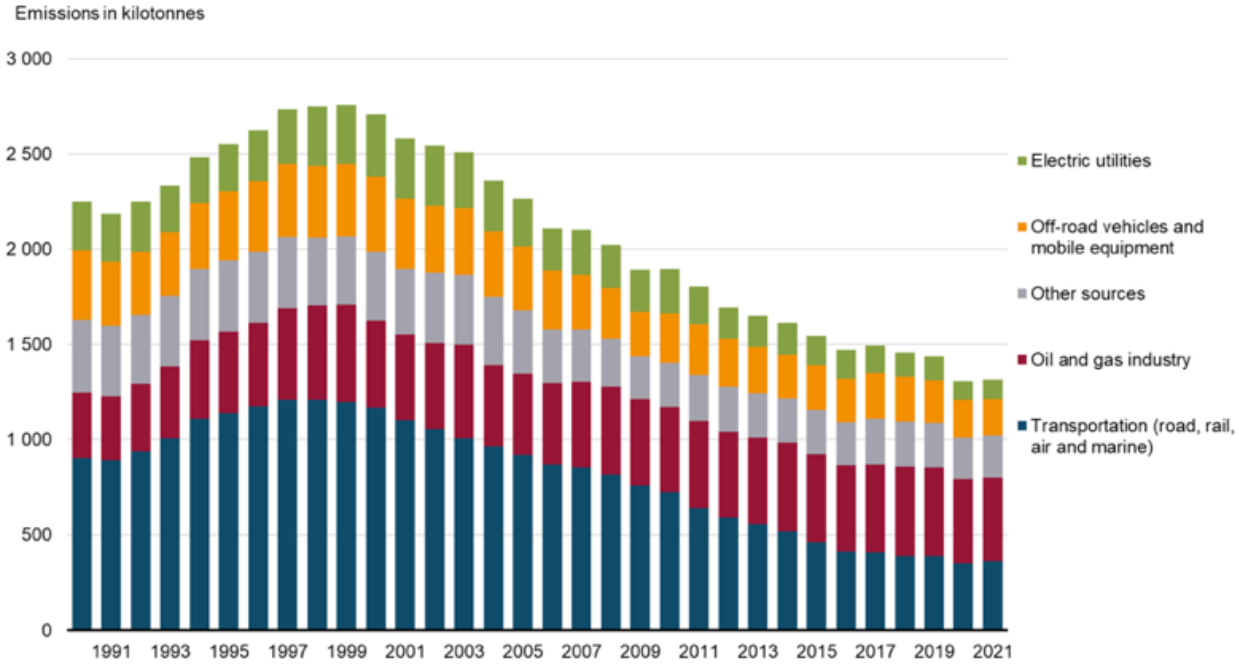
According to Health Canada's most recent assessment of the health impacts of air pollution in Canada, elevated levels of fine particulate matter (PM2.5), ground-level ozone (O_3), and nitrogen dioxide (NO_2) are a contributing factor in 15,300 premature deaths per year nationwide.

- National morbidity or nonfatal health outcomes from these key air pollutants include 2.7 million asthma-symptom-days and 35 million acute-respiratory-symptom-days per year.
- The total economic cost of all health impacts attributable to air pollution is $120 billion (2016 CAD) annually, or approximately 6% of Canada's real gross domestic product (in 2016).
- "Health Canada and other international agencies have concluded that PM2.5, NO_2 and ozone cause or are likely to cause premature mortality based on extensive evidence from epidemiological studies… These three pollutants also account for the majority of population health impacts from air pollution. There is robust scientific evidence of health effects at very low concentrations of these pollutants, and no evidence of an exposure threshold in the population. In other words, *any incremental increase in air pollutant concentration is associated with an increased risk of adverse health outcomes*."[ii]
- This means we need to take action today to prevent the worsening health outcomes that would otherwise accompany growth in population and economic activity. More specifically, the impact of

growth in transportation demand, as measured by annual passenger-kilometres and tonne-kilometres travelled, must be offset by the adoption of more efficient, low- or non-emitting vehicles.

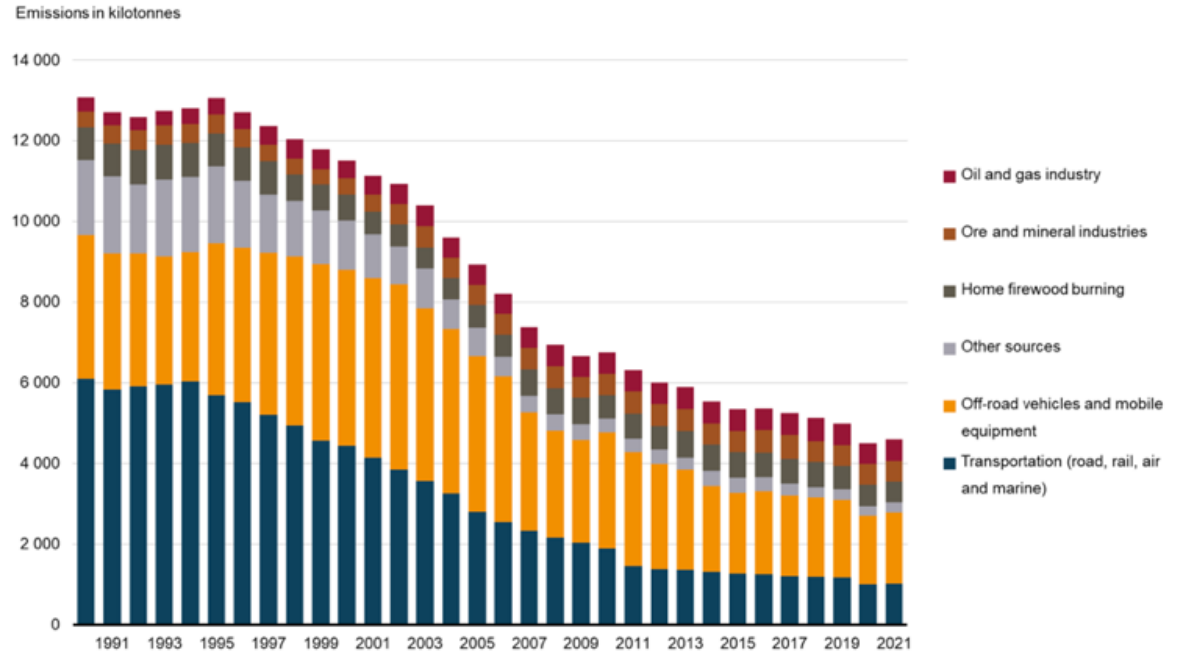
- Fuel combustion, including from mobile (e.g. on-road vehicles and off-road equipment) and power generation (e.g. coal or natural gas) sources, directly releases particles and nitrogen oxides (NOx) into the air. In addition, combustion emits a suite of organic and inorganic compounds that contribute to secondary $PM_{2.5}$ and ozone.[1]
- Along with the oil and gas industry, transportation (road, rail, air and marine) and off-road vehicles and mobile equipment were the largest sources of both nitrogen oxide (NOx) emissions and carbon monoxide (CO) emissions. According to the 2023 Canadian Environmental Sustainability Indicators[iii] published by Environment and Climate Change Canada, in 2021, transportation, off-road vehicles and mobile equipment accounted for 42% (556 kilotons) of national nitrogen oxide (NOx) emissions, 15% (210 kt) of total emissions of volatile organic compounds (VOCs), and more than half (61% or 2,780 kt) of total national emissions of carbon monoxide (CO).

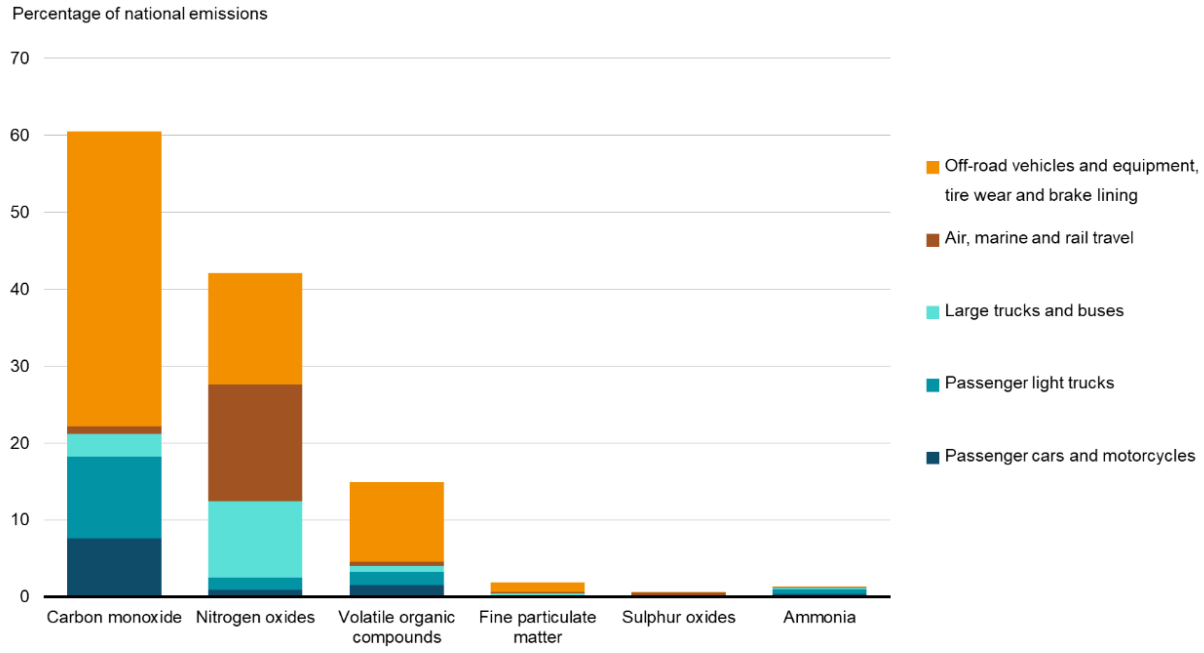
Figure 7. Total nitrogen oxide emissions by source, Canada, 1990 to 2021



[1] Ozone is not emitted directly but formed from precursors such as NOx and volatile organic compounds (VOCs) via secondary reactions in the atmosphere and reactions with sunlight.

Figure 16. Total carbon monoxide emissions by source, Canada, 1990 to 2021





2. Climate change (greenhouse gas emissions)

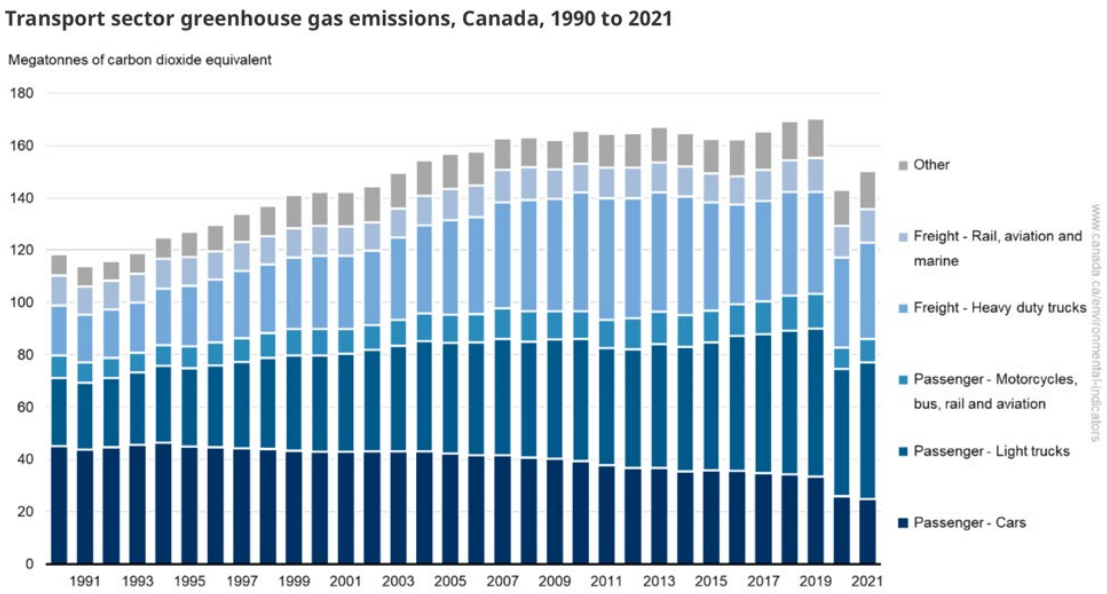
In April 2021, Canada significantly increased the ambition of its greenhouse gas (GHG) emission reduction target: by 2030, the federal government aims to achieve a 40% to 45% reduction compared to 2005 emission levels.[iv] This is especially significant for the electric mobility industry because Canada has never achieved one of its climate targets; because overall emissions have grown substantially since record-keeping began in 1990; and because as transportation has long been the second-highest emitting economic sector in the country. While neither overall emissions nor sectoral emissions from transport have fully rebounded to their pre-pandemic high (23% above 1990 levels in 2019), the annual share of emissions from transportation has held steady at slightly less than one-quarter of national GHGs (equivalent to 150 megatons of carbon dioxide equivalent [Mt CO_2 eq] in 2021).[v]

Between 1990 and 2021, GHG emissions from the transport sector grew by 27%, driven mostly by increases from freight heavy-duty trucks and passenger light trucks. Part of the increase was due to a higher number of vehicles on the road and to changes in vehicle type used. Although total emissions from passenger transport grew by 8%, emissions from cars declined by 45%, while emissions from light trucks (including trucks, vans, and sport utility vehicles) doubled. Emissions from freight travel grew by 62% between 1990 and 2021. Specifically, emissions from freight heavy-duty trucks almost doubled and emissions from other modes of freight transport increased by 13%.[vi]

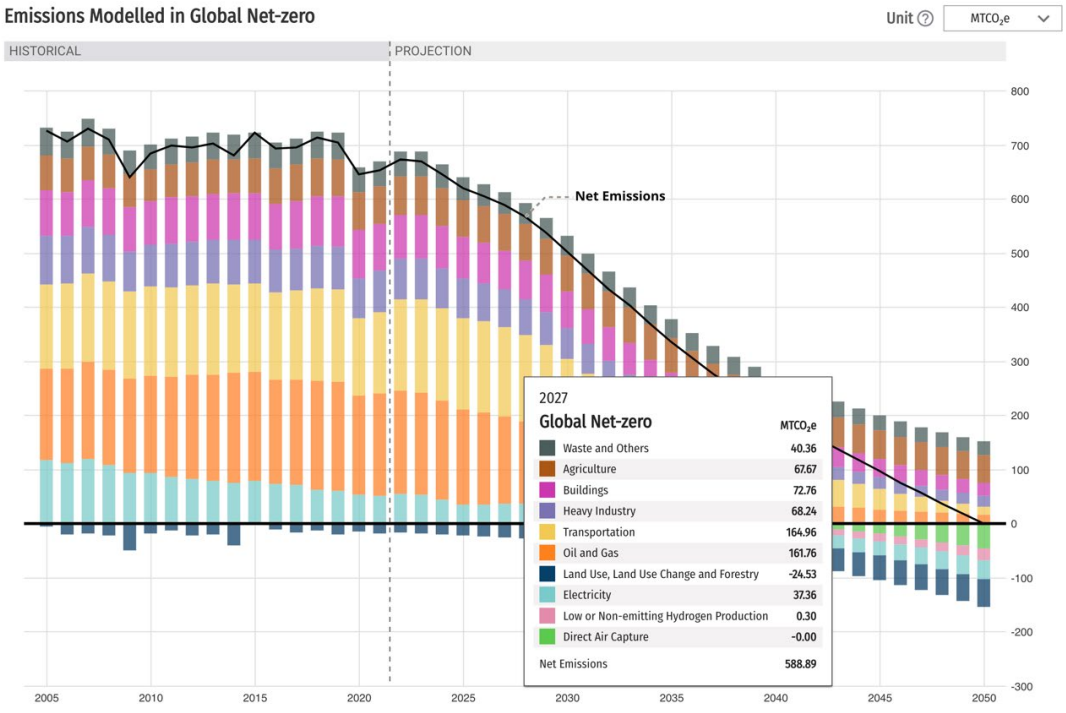
According to the latest (2023) National Inventory Report[vii] published by Environment and Climate Change Canada:

- From 2005 to 2021, overall transport sector GHGs decreased by 4.3%. However, from 2005 to 2019, sectoral emissions increased by 9%.
- From 2005 to 2021, passenger cars (-41%) and passenger light trucks (+23%) decreased by a combined total of 9%. We expect that as people go back to a post-pandemic economy and resume commuting, GHG emissions from the light-duty vehicle subsegment will increase again in the short term. Although emissions in this subsegment decreased as of 2021 relative to the 2005 reference year, emissions from all light-duty cars and trucks were 7% higher in 2019 (pre-pandemic).
- Heavy-duty freight trucks increased by 2%, which is 6 percentage points below the 2019 pre-pandemic level.

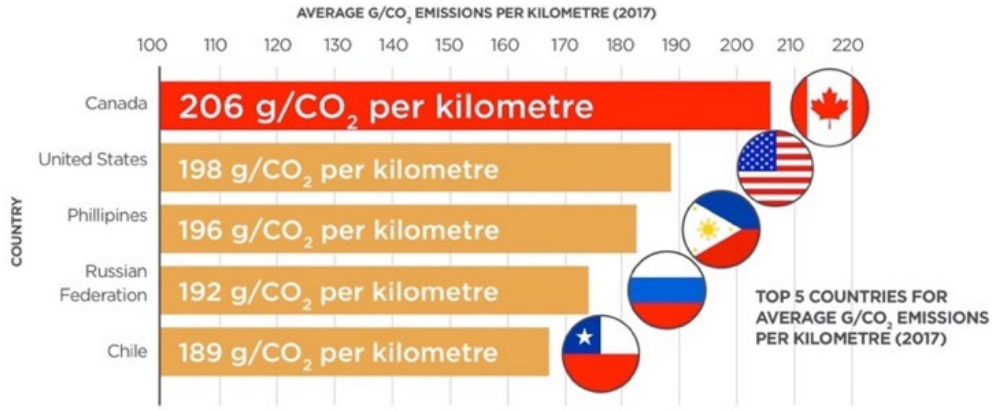
It is worth noting that the significant drop in emissions from 2019 to 2020 was the highest annual decrease since 1990 and was driven by the impacts of the COVID-19 pandemic on the transport sector (fewer kilometres driven and a decrease in air traffic). This suggests the ongoing possibility of a partial or full rebound, absent additional efforts to decouple emissions from continued growth in the vehicle stock and in demand for the movement of people and goods.



According to the Canada Energy Regulator, under a global net-zero scenario, GHG emissions from transport in Canada will soon become the leading source of GHG emissions, overtaking oil & gas GHG emissions by 2027.[viii] [see chart][ix]



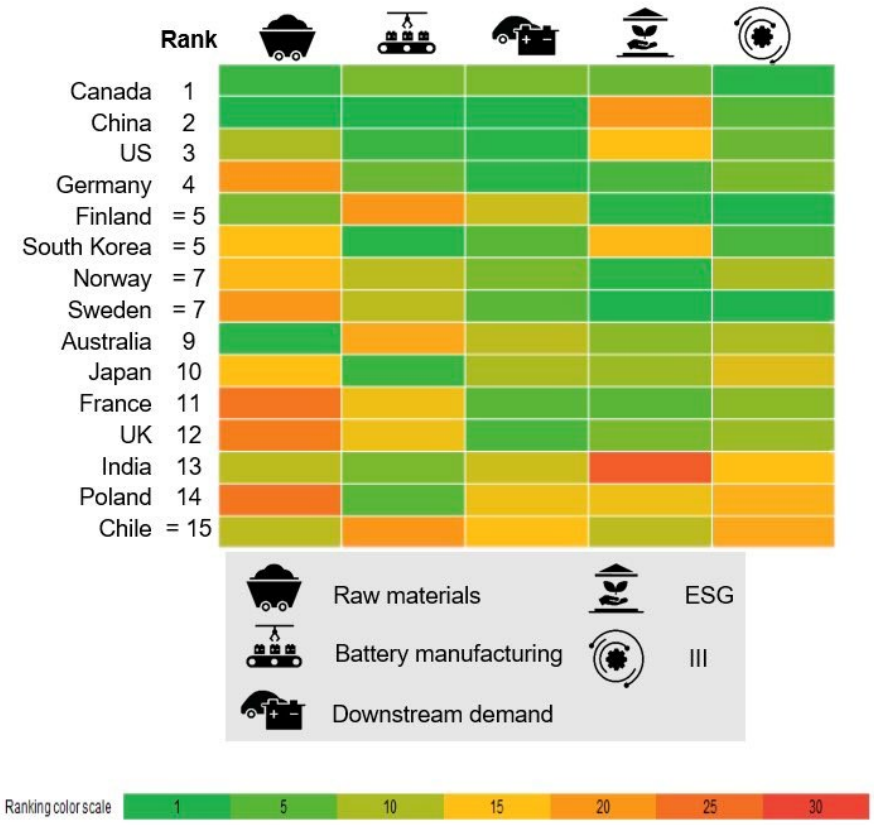
According to 2019 report from the International Energy Agency, Canada's light duty passenger fleet is the most emissions-intense in the world, measured in terms of carbon dioxide emissions per kilometer driven.[x] The Canadian passenger fleet is also the largest and second heaviest in the world.



3. Economic growth and global shifts in mobility

Canada stands at a pivotal crossroads in its automotive landscape, where the shift towards EVs represents not just a move towards sustainability, but also a significant economic opportunity. As the global automotive industry pivots towards electrification, Canada has the potential to position itself as a leader in EV manufacturing, innovation, and infrastructure development, thereby fostering economic growth and job creation. Indeed, the transformation of the North American auto industry is already well underway, with Canada having attracted over $34 billion worth of EV and battery-related investment over the last four years.[xi] The country has seen significant investment across the supply chain, from EV battery mineral extraction and processing to midstream chemical refining and battery active material production, to cell and module manufacturing, to EV assembly, to EV battery components harvesting and recycling. Yet, while Canada is clearly emerging as a contender across the entire EV supply chain, fulfilling its battery-building potential more likely means focusing efforts on a few key stages, such as EV assembly, battery cell manufacturing, clean battery materials production.[xii]

Since 2019, the Canadian government has accelerated investment in the EV industry to create high-paying sustainable jobs for Canadians while decarbonizing the economy. Since 2021, auto investments have more than tripled, making Canada the top destination in the world for growth in the battery supply chain according to Bloomberg New Energy Finance: “Canada’s consistent manufacturing and production advances, and strong ESG credentials, have helped it become a leader in forming the battery supply chains of the future. Strong integration with the US automotive sector means Canada is also a big winner of the ‘friendshoring’ ambitions of the Inflation Reduction Act. The country’s position in BNEF’s ranking is propelled by policy commitment at both the provincial and federal level.”[xiii]



One of the primary economic opportunities presented by the transition to electric vehicles lies in manufacturing. Canada boasts a strong automotive manufacturing sector with established expertise and infrastructure. By capitalizing on this foundation, Canadian manufacturers can retool their facilities to produce electric vehicles and components, thereby securing a foothold in the rapidly expanding EV market. This transition is leading to the creation of thousands of jobs in manufacturing plants across the country, stimulating economic growth and revitalizing local economies. A 2022 study by Clean Energy Canada found that by 2030, Canada's EV battery supply chain could support nearly 250,000 direct and indirect jobs and add $48.2 billion to its gross domestic product. When induced jobs are considered (for example, employees at a restaurant popular with supply chain workers), a total of nearly 323,000 jobs could be created across Canada and $59 billion added to the Canadian economy.[xiv]

Canada is rich in natural resources critical to the production of EV batteries, such as lithium, nickel, and cobalt. As global demand for these minerals surges, Canada has the potential to become a leading supplier, further bolstering its economy. By investing in domestic mining and refining operations, Canada can reduce its reliance on imports and establish a competitive advantage in the burgeoning battery market.

The transition to electric vehicles also presents opportunities for innovation and research. Canadian companies and research institutions can lead the way in developing advanced battery technologies, charging infrastructure, and electric vehicle components. By fostering a culture of innovation and entrepreneurship, Canada can attract investment and talent, driving technological advancements and creating high-value jobs in the process.

Furthermore, the adoption of electric vehicles can lead to significant cost savings for Canadian consumers and businesses. EVs have lower operating and maintenance costs compared to traditional internal combustion engine vehicles, thanks to fewer moving parts and cheaper electricity prices compared to gasoline or diesel. A recent report from Clean Energy Canada compared popular EV models with their gas engine equivalents and found that going electric can save a typical Canadian driver $3,800 annually.[xv] By transitioning to electric vehicles, Canadian households and businesses can reduce their transportation expenses, freeing up disposable income for other expenditures or investments.

However, realizing the full economic potential of the transition to electric vehicles will require concerted efforts from policymakers, industry stakeholders, and other key actors. Investments in infrastructure, incentives for consumers and businesses, supportive regulations, and collaboration between government and industry will be essential to overcome challenges and capitalize on opportunities.

The transition to electric vehicles represents a significant economic opportunity for Canada, with the potential to drive job creation, innovation, and sustainable economic growth. By embracing this shift and investing in the necessary infrastructure and policies, Canada can and is positioning itself as a global leader in the electric vehicle market, while reaping the economic benefits of a cleaner, more sustainable transportation sector.

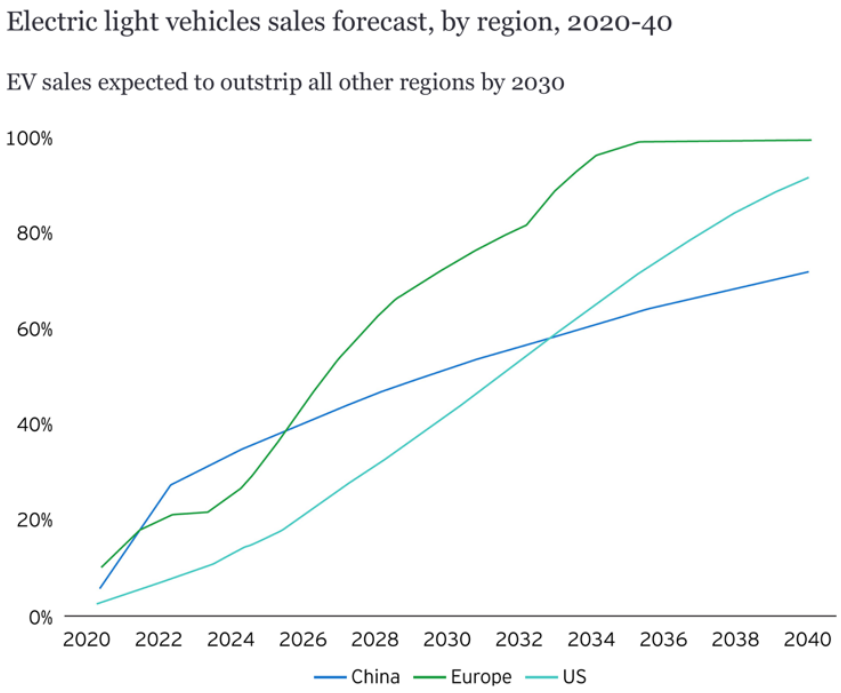
It is great news and recent transformative investments are saving the automotive sector in Canada. But more work needs to be done.

According to a March 2023 report from Ernst and Young, global leaders identified six essential pillars for EV transition success: [xvi]

1. A resilient supply chain
2. Clean and green power
3. Accessible charging infrastructure
4. A smart grid
5. Digitization
6. Skilled labor

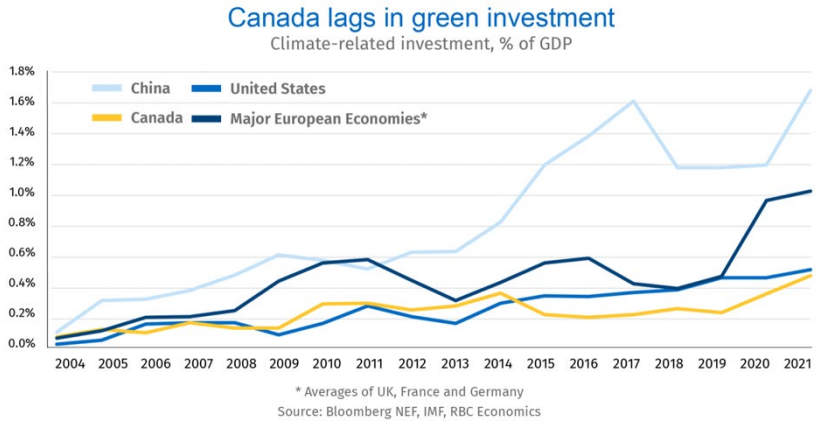
“Several factors feed into the uptake in electric mobility:

- Regulation is giving certainty to the direction of EV travel. It builds toward 2035 when most developed economies pledge to phase out sales of new internal combustion engine (ICE) vehicles.
- Global subsidies and incentives, which topped US$30bn by the end of 2021, are making EVs more affordable. Subsidies continued into 2022, though some markets, such as China, are becoming self-sustaining.
- EVs fit with the societal and political urgency to decarbonize. They help to reduce dependency on fossil fuels at a time of high energy prices and security concerns.
- Global automakers are proving their commitment to an electric future by investing almost US$1.2t into EV production and battery facilities.
- Utilities are continuing to invest in EV infrastructure, driven by consumer demand, revenue opportunities and sustainability goals.”



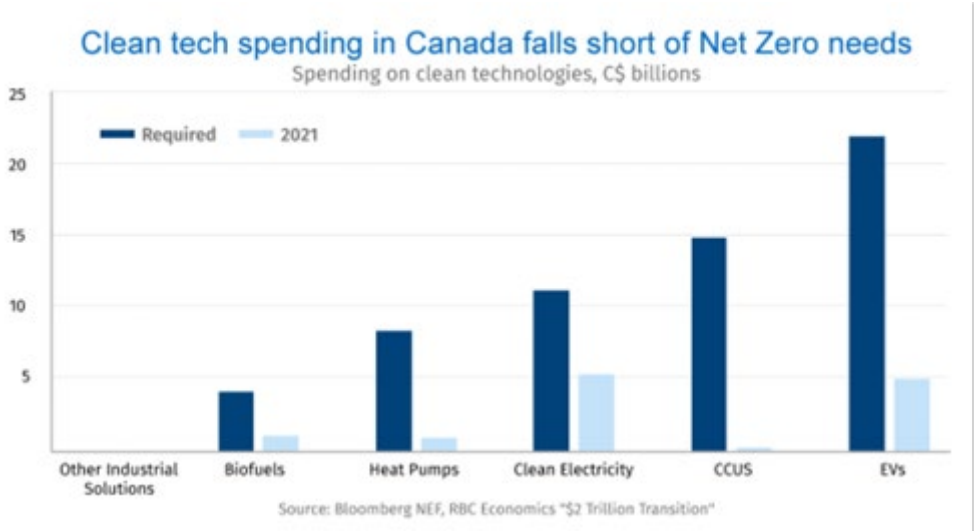
(Credit: EY)

According to a 2022 report from the Royal Bank of Canada, "In Canada, we have lagged since 2014, when spending on clean technologies fell sharply. Though we have made up some ground in the last few years, **the pace of spending is still about half that of other major economies.** China leads the pack, spending about 1.5% of GDP on green investment each year. In some key industries, it's the undisputed global leader, dominating solar panel and battery manufacturing, accounting for 40% of the world's nuclear reactors under construction, and recently overtaking Europe in the share of electric vehicles sold. Historically a leader, Europe spends around 1% of GDP on green investment. The U.S., Australia and Japan are further behind. But a major shift is coming south of the border. The recently passed U.S. Inflation Reduction Act will pump US$370 billion into clean investment and leverage additional money from the private sector.[xvii]



Canada could be left behind

"Canada will need to adjust its policies, or risk falling even further behind major economies. After a decade of investment, we're still not spending enough on clean electricity, which needs $200 billion in investment by 2035 to meet current green grid goals, and more thereafter to accommodate rapid growth in electricity demand. That said, we are much closer to spending enough on green electricity than in any other sector: investment there needs to *merely* double. ***Spending on electric vehicles (EVs) will need to grow from about $4 billion to nearly $22 billion annually*** while spending on heat pumps to decarbonize buildings will need to grow more than eight times over current levels.[xviii]



Toward a National Electric Mobility Strategy

Canada has already made great strides in the transition toward an electrified transportation system, not only in terms of consumer adoption by drivers, but also in terms of investment by major auto manufacturers. However, much work remains to expand light- and heavy-duty EV sales, accelerate vehicle stock turnover, build out recharging capability, and deepen and extend the supply chain to support the realization of planned manufacturing capacity. In service of these goals, Electric Mobility Canada presents a vision to increase the uptake of EVs, reduce our transportation emissions, and improve the wellbeing of Canadians. The vision is characterized by three overarching objectives: (1) increasing the **supply** of affordable and accessible EVs; (2) ensuring an increase in EV **demand** by 2030 in line with climate targets; and (3) establishing the resources, systems and **infrastructure** to enable rapid EV uptake.[xix]

In turn, these priorities are geared toward the following outcomes: (i) Expanded EV availability and choice; (ii) Reduced road transport emissions (iii) Easier access to reliable EV charging across Canada; (iv) Increased domestic manufacturing and recycling; (v) More affordable EVs; and (vi) Reduced transportation costs for Canadians households and fleets.

2. BOOSTING LIGHT-DUTY CONSUMER EV ADOPTION

Advancing a national electric mobility strategy means establishing policies, regulations, and incentives to support broad-based adoption of both electric vehicles themselves and the infrastructure to keep them reliably energized. Canada already has some of these ingredients in place nationally. Key policies include emission standards, fuel taxes, incentives for EV purchases, and subsidies and regulations to facilitate charging infrastructure deployment. Financial incentives could include tax credits, rebates, or point-of-purchase subsidies to consumers and businesses for purchasing electric vehicles, as well as for installing charging infrastructure. Government could further develop standards and regulations for EV charging infrastructure, as well as targeted programs to support deployment by households, fleets, condos, and workplaces.

EMC recognizes the inelastic nature of demand for personal automobility, and the strong reliance of Canadians on light-duty cars and trucks for personal transportation. Of the 26.2 million registered vehicles on Canadian roads in 2021, more than 24 million (nearly 92%) were light-duty passenger vehicles.[xx] Indices of car ownership consistently find that more than 4 of every 5 Canadian households own or lease a car, while more than one-third possess two or more vehicles.[xxi] Canadians are deeply accustomed to car ownership and often live in communities designed around expectations of car dependence. While changes to land use planning, modal shifts to public transit and active transportation, and other strategies to reduce overall transportation energy demand are widely understood[xxii] to be important facets of the transition toward a decarbonized transportation sector, EMC recognizes and emphasizes that consumer adoption of light-duty electric mobility options is an essential element of any future decarbonized transportation system, given persistently high levels of personal vehicle ownership in Canada and "the obdurate automobility regime."[xxiii]As S&P Mobility has recently argued, "failure to electrify is not an option."[xxiv]

EMC therefore proposes policy solutions to overcome barriers to consumer EV adoption that focus on affordability and value, education, and awareness, as well as new polluter-payer funding mechanisms to support their implementation.

2.1 MAINTAIN ZERO EMISSION VEHICLE REBATES

Governments should continue purchase incentives for new passenger EVs but focus on value for electric-only range to include more long-range electric cars, SUVs, and pickup trucks.

The federal government should continue to provide purchase incentives to make EVs more affordable until their prices are equivalent to those of gas vehicles. This levels the playing field between the two types of vehicles. New vehicle incentives also increase the number of used EVs available which, over time, leads to lower prices for used electric cars. The federal EV rebate program should be updated to include more of the long-range cars, SUVs, and pickup trucks that Canadians want to buy.

Going forward, eligibility for incentives should be based on the price relative to electric range, rather than sticker price alone. If a given trim of a Zero-Emission car, crossover, or SUV costs less than $145 (MSRP) per kilometer of range (EPA/NRCan) offered, it should be eligible. If a trim of a ZEV pickup truck costs less than $180 per kilometer of range, it too should be eligible. All zero emission vehicles under $45,000 in price should remain eligible, regardless of their price-to-range value. Plug-in hybrids (PHEVs) at this price point should also be eligible for incentives but only if they offer at least 80 km of electric range. Finally, electric vehicles above $100,000 should be exempted from the federal luxury tax introduced under the 2022 Select Luxury Items Tax Act.[xxv]

2.2 IMPLEMENT A FEEBATE SYSTEM

The most polluting vehicles should fund the incentive programs for new electric vehicles.

The federal government should impose a fee on the purchase of the most polluting new vehicles and use the revenues generated to fund EV purchase incentives. As successful experiences in Sweden, France, Singapore, and other jurisdictions[xxvi] have shown, such "bonus-malus" systems can be designed to be revenue-neutral—thus avoiding recourse to increased public spending at a time of relative budgetary/fiscal austerity—while enabling industry and consumer confidence in the ongoing availability of EV purchase incentives.[xxvii]

To increase EV affordability and drive accelerated EV adoption, EMC therefore proposes that Canada establish a feebate system where purchases of the most polluting new passenger vehicles would be subject to polluter-pay fees that would fund ZEV purchase incentives (see 2.1 above). Average and less-than-average polluting vehicles would face no fee, while drivers would face a new disincentive to purchasing vehicles with the highest carbon dioxide emissions. This approach would offer consumers a choice: they can purchase a cleaner car and avoid the fee, or they can pick a higher polluting vehicle and help support other Canadians in going electric. Until all categories of vehicles are available in an electric version, exemptions could be proposed for large families and people who need bigger vehicles for work. The structure of the program would need to be designed with equity in mind to ensure transportation electrification accelerates without unduly penalizing disadvantaged groups.

2.3 ENABLE EV ADOPTION BY LOW- AND MODEST-INCOME HOUSEHOLDS

Make EVs more accessible for low- and modest-income households.

Low- and medium-income Canadians can also benefit from the fuel and maintenance savings an electric car provides—indeed, they would benefit more from the operational cost savings of going electric, since transportation energy costs represent a larger share of annual household spending for these Canadians (compared to those with higher incomes).[xxviii] However, low-income Canadians are less likely to be able to afford a new or even a used EV, and upfront costs continue to be cited as one of the top barriers to overall EV adoption (regardless of income). Evidence shows that low-income households respond more strongly to up-front purchase incentives,[xxix] which suggests this capital cost barrier is felt even more acutely by disadvantaged Canadians.

For these reasons, Canada should establish an income-tested incentive program to make EVs more accessible to low-income consumers and drivers. Inspired by analogous programs in California[xxx] and BC[xxxi], an equity-focused EV incentive program should include an incentive 'top-up' for the purchase of a new EV, an incentive/rebate for the purchase of a used EV, and low-interest loans for first-time EV buyers.

2.4 LIFT THE iZEV CAP FOR FLEETS

Make it easier for taxi, carshare, rideshare or other ride-hailing companies to go electric.

To accelerate the transition to fully electric transportation by 2030, it is important to prioritize the electrification of high-use vehicles, such as those used by taxi, carshare, rideshare, and ride-hailing companies. Currently, these businesses face a cap on the number of EV incentives they can access under the iZEV program when purchasing or leasing cars.[xxxii] To support their transition to EVs, we recommend removing this cap for these and other transportation facilitators and providers. While Transport Canada amended program conditions in March 2023 to enable pre-registered carsharing

companies to access up to 50 incentives per year, EMC believes any cap is too restrictive, given the potential for ridesharing and carsharing services to displace single-occupancy vehicle activity and reduce transport emissions in certain regions and urban contexts.[xxxiii]

2.5 EV EDUCATION AND SALES FORCE TRAINING

Support consumer EV education and industry salesforce training

Many Canadians want to go electric but have unanswered questions or do not know where to start. Governments should work with leading and trusted organizations like Plug'n Drive, EV Society, Plug in BC, the Electric Vehicle Association of Atlantic Canada (EVAAC), l'Association des Vehicules Électriques du Québec (AVÉQ), and others to establish a suite of programs to educate and support consumers in making the transition to EVs. Though interest is growing, Canadian consumers still express concerns and low levels of consumer awareness continue to be a barrier. Consumer education efforts could include creating a Canadianized version of MIT's CarbonCounter.com and supporting communication initiatives on the availability and ease of charging. EMC also recommends that the federal government keep supporting industry sales force training to facilitate EV sales.

2.6 A GREEN SCRAPPAGE PROGRAM

Offer a vehicle scrappage programs for all types of vehicles.

EMC urges federal and/or provincial governments to establish a program that gets fossil fuel powered vehicles off the road and replaces them with zero emission modes of transportation. Canada-specific research shows that, under reasonable assumptions regarding vehicle lifespan and average annual kilometres driven, accelerating the retirement of a gas car and replacing it with an EV will deliver a more than 40-tonne reduction in CO_2 emissions over a 10-year timeframe (>4 tonnes per vehicle, per year), relative to a scenario in which the internal combustion engine (ICE) passenger car stayed on the road.[xxxiv]

All polluting vehicles–from cars and trucks to buses to off-road vehicles–should be eligible to be scrapped and recycled as part of the proposed program. Government could also offer clean transportation options such as dedicated EV rebates or public transit passes, vouchers for bicycles, vouchers for EV-only car/rideshare services, etc., for Canadians who are not looking to purchase a new vehicle.

3. ENABLING MEDIUM-, HEAVY-DUTY AND OFF-ROAD FLEET ELECTRIFICATION

EMC proposes several solutions to overcome and address the barriers in the fleet and non-passenger segment, including for affordability, the transition to electric public transit, electric school bus and truck fleets, electric off-road electric vehicles, and actions the government can take regarding federally regulated facilities.

The medium- and heavy-duty zero emission vehicle (MHD ZEV) segment is developing at a fast-growing pace, thanks to support from the federal government, the private sector and R&D development. Yet, we are still in the early stages of the decarbonization of this segment. In September 2022, the Electric Medium and Heavy-Duty Vehicle (eMHDV) working group of Electric Mobility Canada published a document addressing the gaps in

the eMHDV ecosystem.[xxxv] While some gaps can be handled swiftly with government support, some others will take more time and will need dedicated attention by governments, fleets, bus and truck manufacturers, and utilities over the medium- to long-term.

3.1 AFFORDABLE ELECTRIC TRANSIT BUSES

Make the transition to electric transit buses more affordable.

Tax credits and rebates are needed to lower the upfront cost of zero-emission buses and related infrastructure. Continue to provide predictable and long-term funding to municipalities and transit agencies that plan to convert their entire fleet to electric vehicles.

3.2 ELECTRIC SCHOOL BUS ADOPTION

Work across jurisdictions to accelerate electric school bus adoption.

Provide predictable and long-term funding to school bus operators that plan to convert their entire fleet to electric vehicles through a simpler, more efficient version of the ZETF program to make funding more readily available. Incentives should be stackable with other federal and provincial programs supporting cleaner commutes for students. Include vehicles with final assembly in Canada, sold and serviced through Canadian businesses.

3.3 ELECTRIC TRUCKS IN COMMERCIAL FLEETS

Accelerate the integration of electric trucks into commercial fleets.

Accelerate business cases for ZEV medium- and heavy-duty fleets with funds for transition planning and for the purchase of vehicles.

3.4 FEDERAL FACILITIES

Electrify vehicle fleets in ports, airports, and similar federal facilities

Phase out fossil-fuel vehicles at federally regulated properties, such as water ports, intermodal railyards, parks, and airports, through a combination of tolls on polluting vehicles, obligations for subcontracting operators, restrictions on access for polluting trucks.

3.5 ELECTRIC OFF-ROAD VEHICLES

Make electric off-road vehicles more affordable

A growing number of companies offer a diversity of off-road vehicles ranging from electric snowmobiles to electric watercrafts and electric ATVs that are either used for work or pleasure, and that can help significantly reduce GHG emissions, air, and water pollution. For example,

- A modern gas snowmobile emits as much air pollutants as forty modern cars.
- Noise pollution is also a nuisance to wildlife.
- In remote regions of the country, snowmobiles can often be one of the first means of transportation.
- Because of our winters, snowmobiles are relied upon by law enforcement units (for search and rescue work and emergency missions), they are used by surveyors, ranchers, public utility employees, environmental and wildlife scientists, ski centres, recreational park agencies, and countless other organizations. The same is true for other off-road vehicles.

Today, a growing number of cities, states, countries, and automakers are moving towards 100% ZEV sales by 2035 of both road and off-road vehicle and Canada could do the same. The jurisdictions that are including targets for the electrification of off-road vehicles include New Jersey (Bill S 432), California (Sept. 23, 2020, Executive Order) and New York (Bill S 2758). If the government is serious about achieving zero emissions in the transport industry, it must also extend these policies to the off-road sector. In addition, some of the leaders in the electric off road and marine industry are based here in Canada, which means that supporting the transition to zero emission will help create high paying sustainable jobs in the country.

That is why we recommend:

- A federal rebate for the purchase of electric snowmobile, personal watercraft, or RV in line with the Yukon rebate of $2500.[xxxvi]
- A ZEV mandate for small off-road vehicles in line with the most ambitious jurisdictions in North America, whether at the federal or state level.
- A luxury tax exemption for zero emission vessels as they are more expensive to purchase and need to be encouraged.[xxxvii]

Implement a federal rebate and tax incentives for the purchase of electric off-road vehicles for work or leisure activities: snowmobiles, watercraft, ATVs, and boats. Making these vehicles more affordable will help support clean energy transition in rural and remote regions while also supporting jobs in Canadian businesses that manufacture them.

3.6 FERRIES

Support the electrification of Canada's ferry services

Work with regional or provincial ferry agencies, as well as Crown corporations like BC Ferries, to launch a program to support the electrification of ferry services across Canada.

According to the Canadian Ferry Association, "Canada is home to over 180 different ferry routes with a route presently operating in each province and most of the territories. These ferries represent a mix of private and publicly operated routes as well as a mix of passenger, freight, and mixed-use ferries… Transportation through waterways has always been a crucial part of Canada's history."[xxxviii] With ferry routes in every region across Canada, the ferry sector continues to play an integral role in Canada's economic and social development.

In June 2022, a large EMC delegation went to Norway for the EVS35 International conference. That is when we discovered that 47% of Norway's ferries were already electric. The largest ferry in Norway, the Bastø Electric15 is 139.2-metre-long and 21-metre-wide has room for 600 passengers and 200 cars or 24 trucks. The battery and fast-charging systems for all three ferries are supplied by Siemens Energy from the battery factory in Trondheim. Bastø Electric uses batteries with a capacity of 4.3 MWh. The fast-charging system has a capacity of 9 MW, according to the shipping company. When docking, the ferry is always "charged at lightning speed".

BC Ferries has already acquired six new electric ferries. The Ontario Ministry of Transportation recently commissioned the construction of two of them. The Quebec government announced that it would adopt a zero-emission ferry for its Saint-Ignace-Sorel and L'Isle-aux-Coudres ferry services starting in 2030.

We recommend that the federal government works with regional or provincial ferry agencies, as well as Crown corporations like BC Ferries, to launch a program to support the electrification of ferry services across Canada to lower GHG emissions, air and water pollution, underwater noise AND create a Canadian zero emission marine industry to become a North American leader.

4. IMPLEMENTING A NATIONAL EV INFRASTRUCTURE DEPLOYMENT PLAN

Planning and investment in charging infrastructure, including public charging stations, fast-charging networks, and home charging solutions, is an essential component of any strategy to enhance EV adoption amongst drivers and fleets. This involves partnerships with public and private stakeholders to ensure adequate coverage and accessibility, as well as public and private investment to

Public charging must be ubiquitous and reliable enough to ease drivers' concerns that they could be stranded on the roadside because of inadequate charging networks. Deployment of public charging is particularly crucial for the millions of drivers who do not have a dedicated private parking spot.

Transitioning to electric mobility requires a new way of thinking about the fueling infrastructure of the future: electric vehicle charging. We propose solutions to overcome EV charging challenges in multi-unit buildings, remote areas, highway corridors and on public lands.

4.1 EV CHARGING INFRASTRUCTURE TARGETS

Set targets for EV charging installations, for all types of vehicles

Set clear and ambitious targets, aligned with NRCan's latest reports on public and residential infrastructure deployment needs, for putting EV charging connectors in key areas such as apartment buildings, workplaces, downtown cores, along highways and remote travel corridors, and at fleet depots. Expand current funding programs and provide them with the necessary resources to support a strong and timely roll out of charging infrastructure across the country, to achieve those targets. Ensure charging access for all Canadians by setting targets specific to northern, rural, and Indigenous communities.

4.2 EV-READY PARKING

Make one-million condominium and apartments EV-ready over four years

Some 30% of Canadians live in apartments or condominiums.[xxxix] A lack of EV charging access in these buildings creates a major barrier to EV uptake. Policies and investments are therefore needed to accelerate reliable, convenient, equitable and affordable access to EV charging in multi-unit residential buildings (MURBs) across Canada. Recent research has shown how comprehensive retrofit approaches, which futureproof all parking for EV charging, are typically the most cost-effective and convenient strategy on a lifecycle basis.[xl] The federal government should take immediate steps to make one-million parking spaces EV-ready. EMC and others[xli] have urged the federal government allocate $250 million per year for five years specifically for the purpose of funding 50% of electrical power upgrade and make-ready infrastructure costs in existing multi-unit residential buildings.

4.3 NATIONAL BUILDING CODES

Add EV charging requirements to national building codes

Establish provisions in the upcoming review of the National Model Building and Electrical Codes to have all new residential parking spots be "EV-ready" and 20%-40% of new non-residential parking spots to include the basic electrical infrastructure needed for EV charging. Cities should also be encouraged to play a leadership role by developing their own EV-ready requirements.

4.4 UNDERUTILIZED GOVERNMENT LAND

Put underutilized government-owned lands to work: establish public charging "hubs"

To support access to charging in urban areas for those without reliable home charging access, establish charging hubs on underused government-owned lands, particularly in high-density urban areas. Charging hubs should be large, open to all charging operators without exclusivity, and accessible to the public. User fees should be limited to charging services, which may include idling fees.

4.5 CONNECTION REBATE TO COVER UTILITY COSTS

Provide a connection rebate to cover costs levied by utilities when building large-scale charging stations

Moving freight and large volumes of passenger vehicles with electricity will require electrical service upgrades to accommodate the power needs of large-scale charging infrastructure. These installations are costly today. Federal and provincial governments, electric utilities, provincial regulators and charging operators must work together to better allocate these costs while recognizing the economic opportunities. In the near-term, Canada can support charging investments by providing time-limited rebates for large-scale charging investments.

4.6 HOME ENERGY RETROFITS

Include EV charger installation in home energy retrofit programs

While most Canadians live in single detached houses in Canada in 2016,[xlii] hundreds of thousands of older Canadian homes have outdated electrical panels, making it difficult and sometimes impossible to install an EV charger. With EVs being three-times more energy efficient than gas cars and contributing to reducing GHG emissions, existing home energy retrofit programs should support the installation of newer, more efficient electrical panels and EV charging infrastructure, including panel size and smart panel upgrades. It is worth noting that the 2 provinces with the lowest amount of single detached houses (Québec and BC) are the ones with the highest percentage of EV sales.

Table 1
Occupied private dwellings and types of dwelling, by region, 2016

	Occupied private dwellings	Single-detached houses	Apartments in a building that has five or more storeys	Apartments in a building that has fewer than five storeys	Apartments or flats in a duplex	Other dwellings[1]
	number			percent		
Canada	14,072,080	53.6	9.9	18.0	5.6	12.9
Newfoundland and Labrador	218,670	73.3	0.3	5.3	11.5	9.5
Prince Edward Island	59,470	69.2	0.1	15.2	1.7	13.7
Nova Scotia	401,990	65.5	5.3	14.5	3.1	11.5
New Brunswick	319,775	69.3	1.2	13.8	4.2	11.4
Quebec	3,531,660	45.4	5.3	32.7	7.5	9.1
Ontario	5,169,175	54.3	17.2	10.1	3.4	15.0
Manitoba	489,050	67.8	8.0	13.7	1.4	9.1
Saskatchewan	432,625	72.7	2.4	13.2	2.2	9.5
Alberta	1,527,680	61.9	4.1	14.6	2.8	16.5
British Columbia	1,881,970	44.1	9.4	20.5	12.2	13.7
Yukon	15,215	62.0	0.3	11.6	4.0	22.1
Northwest Territories	14,980	57.6	3.0	15.9	2.6	20.9
Nunavut	9,815	44.3	1.1	13.3	1.8	39.5
Census metropolitan areas (CMAs)	9,835,655	45.4	13.8	20.7	6.5	13.7
Outside CMAs	4,236,425	72.7	0.9	11.8	3.5	11.0

(Source: StatsCan 2016 survey)

4.7 FUNDING PROGRAMS FOR MHDV CHARGING INFRASTRUCTURE

Establish a dedicated grant-based incentive program to support the deployment of large-scale EV charging installations and electrical service upgrades, to facilitate the medium and heavy-duty segments, particularly in the truck sub-sector that is not considered under the current CIB program for electric buses and school buses. The new program should support charging infrastructure design and deployment for MHD commercial and public fleet depots, including funding for urban hubs, highway-side locations, and rest-stops. As-a-service offerings that shift charging solutions to Opex rather than Capex should be considered eligible for funding

4.8 TECHNOLOGY-BASED SOLUTIONS

Leverage technology-based solutions to add value and reduce costs for EV drivers and the grid.

Funding programs should offer flexibility for innovative charging solutions such as software-based charging management solutions that can help optimize charging load by shifting and shaping demand, by sharing power intelligently between vehicles and other load sources, and mobile charging solutions to complement static charging infrastructure especially for underserved and urban areas where there are grid limitations. This can help EV drivers, property owners, fleet managers, and utilities save money by reducing the need for costly upgrades on both sides of a customer meter while ensuring reliable charging infrastructure access.

4.9 RIGHT TO CHARGE

Support right to charge rules for residents of multifamily properties.

Residents of multifamily properties such as apartment and condominium buildings are sometimes prevented by property managers or resident associations from installing or accessing charging stations. This contributes to an inequitable disparity in charging access between residents of single-

family homes and multi-family properties. Provincial "Right to Charge" rules provide support to residents of multifamily properties by allowing them to pursue adding EV charging infrastructure for their use in most circumstances.

4.10 SUPPORTING RURAL, REMOTE, AND OFF-ROAD ACCESS TO CHARGING.

Rural, remote, and off-road regions do not always have access to sufficient electricity supply that can accommodate charging infrastructure for light-, medium-, heavy-Duty and off-road electric vehicles. These regions must be supported in making level 2 and fast charging infrastructure accessible, especially if they are off-grid, with green-innovative charging solutions.

5. ADOPTING AND SECURING EV REGULATION

Achieving EV adoption will require coordination and strategy – including a focus on overcoming the challenges of vehicle availability and supply. We also need to ensure no Canadians are left behind, whether they live in rural, remote, or Indigenous communities.

5.1 NATIONAL ZEV SALES REGULATION

Maintain the national ZEV sales regulations for passenger vehicles, requiring 100% ZEV sales by 2030.

National ZEV sales regulations will push automakers to introduce more EV makes and models, increasing consumer choice, reducing long wait times for EVs, and improving battery technology to help meet the ever-growing demand for EVs in Canada. It will also help supply EVs across Canada, where currently most EVs available for sale are distributed to the two provinces that already have ZEV mandates in place: British Columbia and Quebec. Apply national ZEV sales regulations only where provincial standards are weak or do not exist.

National ZEV sales regulations will increase consumer choice, reduce wait times for vehicles, reduce vehicle costs, deliver better value for infrastructure programs, attract industrial production, and drive innovation (through longer-range battery technology) to supply ever-growing domestic ZEV demand and achieve ZEV goals. It will also help to level the playing field across Canada. Today, most EV supply goes to the two provinces that already have ZEV mandates in place: British Columbia and Quebec. So, Canada should treat a federal ZEV standard as a means of filling in the gaps in ZEV policy across Canada and to ensure that EV supply is available in provinces which have not yet established their own ZEV mandates of equal or greater stringency, relative to the federal program. For more details, see the co-authored 2022 report by EMC and Clean Energy Canada, titled "How Canada can design a truly effective zero-emission vehicle mandate." [xliii]

5.2 STRONG TAILPIPE EMISSIONS STANDARDS

Implement strong tailpipe emission standards for all types of vehicles.

Canada must align its auto tailpipe emission standards with the toughest emission standards in North America, in addition to establishing a national ZEV mandate. Cleaner cars not only cut carbon emissions, but they also improve air quality in our communities and save consumers money at the pump. The existing standards have too many "compliance flexibilities" (loopholes) which should be eliminated going forward. Canada must also strengthen emission standards for larger vehicles like

buses and trucks, as these are big contributors to tailpipe pollution. Standards should not be footprint based, like the US EPA standards, since that approach entices car manufacturers to sell larger models and abandon their smaller, more efficient models.

5.3 NATIONAL ZEV SALES REGULATION FOR MHDVS

Adopt a national ZEV sales regulation for medium and heavy-duty trucks and buses requiring 100% ZEV sales by 2040 at the latest.

Set a target to achieve 100% zero-emission bus and truck sales by 2040, at the latest, with interim milestones along the way. Increase ambition as technology and product offerings improve. Align Canada's requirements with the most ambitious targets in North America.

The federal government should establish a national zero-emission vehicle regulation on sales of medium- and heavy-duty vehicles (MHDVs) to secure zero-emission MHDV supply, support domestic manufacturing, cut pollution in one of Canada's highest emitting sectors, and meet its legislated climate/emissions targets under the federal Emissions Reduction Plan. EMC recommends a comparable approach for interim milestone sales targets that mirrors the requirements established in California's Advanced Clean Truck program and the proposed sales targes for British Columbia's MHDV subsector.[xliv]

Our proposed federal targets for milestone years (2026, 2030, 2035, and 2040) are indicated below for each vehicle class sub-segment of MHDVs. Tradeable compliance credits would be generated for each category, including transit and school buses, class 2b/class 3 vehicles, class 4-8 trucks, and class 7-8 tractors. EMC recommends each subsegment be subject to its own individual annual requirement, from 2026 through to full ZEV adoption in each vehicle class by 2040. The success of such a regulation will depend on the continuation of a complementary policy package, including a renewed point-of-sale purchase incentive for zero-emission MHDVs (iMHZEV or Incentives for Medium- and Heavy-Duty Zero-Emission Vehicles program), dedicated infrastructure funding for MHDV fleets via the Zero Emission Vehicle Infrastructure Program (ZEVIP) and Canada Infrastructure Bank (CIB), fleet education and awareness, financing options for small- and medium-sized enterprises, and electricity and infrastructure planning.

For more information on our specific regulatory design recommendations, please refer to the briefing note "Policy Design Recommendations for A Zero Emission Medium- and Heavy-Duty Vehicle Sales Regulation," endorsed by EMC and prepared in partnership with Clean Energy Canada and other members.[xlv]

Proposed federal MHDV sales targets for milestone years				
Model Year	**Transit and school buses**	**Class 2b/3**	**Class 4-8**	**Class 7-8 tractors**
2026	20%	10%	8%	3%
2030	100%	32%	30%	7%
2035	100%	78%	75%	33%
2040	100%	100%	100%	100%

5.4 ENABLE ADOPTION BY DISADVANTAGED COMMUNITIES

Develop a plan to help rural, northern, First Nations and Inuit communities go electric

Many rural, northern, and indigenous communities in Canada have not yet had equal opportunity to participate in the benefits of the EV transition due to a lack of charging options and vehicle availability, among other things. It is critical that these barriers be addressed to allow all Canadians a meaningful opportunity to drive electric.

6. PROMOTING DOMESTIC EV JOBS AND MANUFACTURING CAPACITY

A Canadian EV Economic Development and Investment Attraction Strategy, focused R&D efforts, and action to protect Canadian industry and workers from foreign buy-domestic rules will help ensure a prosperous transition to an electric mobility economy in Canada.

6.1 Support and attract EV-related business and investment in Canada

Focus on attracting more investment to accelerate EV manufacturing and related industries in Canada, including assembly, parts, machinery, charging equipment, and battery making, critical battery materials extraction/processing with a "Canadian EV Economic Development and Investment Attraction Strategy." Building these industries will create good sustainable jobs and raise the profile of EVs to further support their adoption in Canada.

6.2 Focus R&D investments on strategic EV technologies

Canada should focus its efforts on accelerating technologies, research, development, and manufacturing associated with reducing the costs of vehicle batteries and thus vehicle costs per unit of range. Achieving economies of scale in vehicle, battery and charging infrastructure production will also help to reduce costs for consumers and fleets.

Finally, to keep Canada competitive, create new financial instruments to support domestic EV-related R&D and manufacturing, including MHDV, off-road, marine and rail vehicles and ecosystems.

6.3 Work with provinces to fast-track EV-only service technician training

EVs are far less complicated machines than gas vehicles. Work with provinces to revamp the vehicle mechanic curriculum to prioritize EVs by fast-tracking training for EV mechanics and provide them with more apprenticeship opportunities.

6.4 Support retraining programs and help workers make the transition to zero carbon industry.

Building a labor force with the right skills– from engineering and research, electrical and mechanical, charging infrastructure installation, maintenance, and fleet management–will be critical to the success of Canada's transition to a zero-carbon economy. Explore opportunities for the government to support employers, whether traditional industry or all-EV, to train new employees who have not previously worked in the EV industry. Maintain existing funding commitments for training and re-training.

6.5 Take a North American approach to EV manufacturing and supply chains

Work with the US Administration to ensure that any "Buy America" policies reflect the North American auto market and do not negatively impact Canadian EV-related businesses or suppliers. Collaborate with the U.S. to build a North American EV industry and supply chain.

6.6 Support electrification in the mining sector

Support electrification at mining locations across Canada and promote sustainable mining development and operations, particularly in relation to minerals and metals needed for the ZEV supply chain in Canada and other jurisdictions.

6.7 Support EV battery circular economy

Modernize the legislative and regulatory framework to facilitate the transportation of used and end-of-life batteries to encourage battery recovery, repurposing, remanufacturing, and recycling in an integrated North American market.

7. EXPANDING FEDERAL, PROVINCIAL, AND TERRITORIAL [PUBLIC-SECTOR] LEADERSHIP

Governments can lead by example and make use of its own facilities, convening ability and internal process to help accelerate the transition to electric mobility.

7.1 Establish a "Privy Council Office for Electric Transport"

Create a dedicated Privy Council Office to coordinate EV responsibilities across departments and advise the Prime Minister on progress being made towards achieving the government's electrification goals. Centralized coordination and Prime Ministerial oversight will elevate the importance of this issue and ensure it receives the attention it deserves.

7.2 Make government & parliamentarian EV awareness and education a priority

Unless both consumers and policy makers understand all the benefits, needs and savings associated with electric vehicles, the transition to an electric future will take longer than necessary. The government should make education a priority, working with leading organizations like Plug'n Drive, EV Society, AVÉQ, EVAAC, Plug in British Columbia and others to establish experiential learning opportunities for elected officials and civil servants.

7.3 Convene electricity stakeholders to develop EV solutions for our grid

Establish cross-Canadian guidance for electricity regulators to speed up deployment of charging infrastructure.

Establish an intergovernmental table to examine electrical system regulatory matters to expedite EV charging infrastructure installation and to support utilities Work through the Council of Canadian

Energy Ministers to establish pan-Canadian guidance for electricity regulators to expedite deployment of charging infrastructure. Guidance could address electrical service size challenges for EV charging; demand charges and opt-in electricity rates for public charging; the need for EV charging station connection prioritization to keep infrastructure expanding in step with EV demand; and pre-building distribution and transmission capacity in locations where future charging installations are anticipated. Charging infrastructure for medium- and heavy-duty vehicles as well as for light-duty vehicles should be included in the scope of work.

7.4 Ensure federal fleets and buildings are 100% electric and EV-ready

Government can lead by example and further increase domestic EV demand and investment by using its own purchasing power. Starting now, every vehicle purchased by the government should be electric, unless an electric option does not yet exist to meet a specific need. Canada should also start electrifying its owned and leased parking lots immediately to offer charging options to its fleets, employees, and visitors. Set a hard target of at least 10% of all owned and occupied parking spaces being electrified by no later than 2025.

7.5 Establish a Zero Emission Zone in the City of Ottawa

The Government of Canada should work with the National Capital Commission and the City of Ottawa to establish a Zero Emission Zone (ZEZ) in downtown Ottawa. ZEZs are areas in which polluting vehicles are required to pay a fee to enter, acting as a disincentive for gas-vehicle use within the zone, and encouraging forms of zero emission travel such as EVs, bicycles or electric public transit. Other cities and national capitals (e.g., London, UK) are implementing Zero-Emission zones too.

7.6 Adopt “Clean procurement” policies across Canada:

Lowest bidder public policies have hampered the transition to cleaner, sometimes more expensive technologies that can, in the end, be less expensive when total cost of ownership is considered. New “clean procurement” policies could help Federal departments, agencies and crown corporations, provincial governments, municipal governments, transit agencies, ferry agencies, school boards and other institutions to purchase zero emission vehicles of all types without conflicting with free trade agreements.

8. MONITORING AND EVALUATION.

EMC recommends the establishment of mechanisms to monitor progress, track key performance indicators, and evaluate the effectiveness of policies and programs related to electric mobility. This allows for adjustments and improvements over time to ensure the strategy's success.

1. **EV CHARGING INFRASTRUCTURE TARGETS (repeated from 4.1)**
   Set targets for EV charging installations, for all types of vehicles

   Set clear and ambitious targets, aligned with NRCan’s latest reports on public and residential infrastructure deployment needs, for putting EV charging connectors in key areas such as apartment buildings, workplaces, downtown cores, along highways and remote travel corridors, and at fleet

depots. Expand current funding programs and provide them with the necessary resources to support a strong and timely roll out of charging infrastructure across the country, to achieve those targets. Ensure charging access for all Canadians by setting targets specific to northern, rural, and Indigenous communities.

Other important indicators

2. **SHARE OF ELECTRIC VEHICLES IN LIGHT-DUTY VEHICLE SALES (%)**
   Targets: Electric vehicles (EVs) account for 60 percent of the total annual light-duty vehicle (LDV) sales by 2030 and 100 percent by 2035.

3. **SHARE OF ELECTRIC VEHICLES IN LIGHT-DUTY VEHICLE FLEET (%)**
   Targets: Electric vehicles (EVs) account for 20–40 percent of the total light-duty vehicle (LDV) fleet by 2030 and 85–100 percent by 2050.

4. **SHARE OF ELECTRIC VEHICLES IN TWO- AND THREE- WHEELER SALES (%)**
   Targets: Electric vehicles (EVs) account for 85 percent of the total annual two- and three-wheeler sales by 2030 and 100 percent by 2050.

5. **SHARE OF BATTERY ELECTRIC VEHICLES AND FUEL CELL ELECTRIC VEHICLES IN BUS SALES (%)**
   Targets: Battery electric vehicles (BEVs) and fuel cell electric vehicles (FCEVs) account for 60 percent of the total annual bus sales by 2030 and 100 percent by 2050.

6. **SHARE OF BATTERY ELECTRIC VEHICLES AND FUEL CELL ELECTRIC VEHICLES IN MEDIUM- AND HEAVY-DUTY COMMERCIAL VEHICLES SALES (%)**
   Targets: BEVs and FCEVs account for 35 percent of the total annual medium- and heavy-duty commercial vehicle (MHDV) sales by 2030, in the vehicle classes where feasible, and 100 percent by 2040, in line with the CALSTART Beachhead Strategy and the Global Memorandum of Understanding on ZE MHDVs.

9. CONCLUSION

The global shift to electric mobility is gaining momentum due to environmental concerns, technological advancements, industry commitments, and supportive governmental policies. In Canada and elsewhere, electric vehicles are increasingly recognized not only as a cleaner alternative to traditional internal combustion engine vehicles, but as an essential component of any strategy to reduce local air pollution and address climate change. Technological innovations in battery technology and charging infrastructure have made EVs more accessible and practical for consumers, while government incentives and mandates are further driving adoption. All of this underscores the importance of the transition to EVs as the *sine qua non* of efforts to decarbonize the transportation sector.

To be sure, across Canada, the shift toward electric mobility is accelerating, with EVs representing 11% of total new vehicle sales in 2023 and federal targets now in place to ensure EV market share grows significantly over the next decade. Canada has the opportunity to lead this transition by leveraging its natural resource base, manufacturing capabilities, clean electricity, and innovative technology sector. With abundant renewable energy sources and a strong automotive industry, Canada can support widespread EV adoption and invest in EV production and battery technology. However, there is a long road to travel to reach the mass adoption targets

for passenger vehicles by 2035, and to begin the more challenging process of transitioning medium- and heavy-duty vehicle stock to zero-emission alternatives. By implementing the additional supportive policies outlined in this National Electric Mobility Strategy—that is, by maintaining and enhancing EV regulations (sales mandates), investing in infrastructure, fostering collaboration between industry, governments, and consumers, and continually tracking progress—Canada can become a global leader in electric mobility, contributing to a sustainable, low-carbon transportation system at home and abroad.

APPENDIX

A. Elements of a US e-mobility association's national policy platform

ZERO EMISSION TRANSPORTATION ASSOCIATION		
Policy Pillar	**Description**	**Recommendations**
1. EV Market Development	Promote federal policies that expand consumer access to electric vehicles and accelerate fleet electrification across all vehicle classes.	• Implement and defend 30D, 25E, and 45W Clean Vehicle Tax Credits that balance maximizing vehicle eligibility with growing the domestic supply chain. • Support electrification of federal fleets (USPS, GSA, DOD, DOE). • Repeal the Federal Excise Tax for zero-emission vehicles. • Elevate policies that seek to electrify mobile machinery, including freight, port, construction, mining, and agricultural equipment.
2. EV Charging Infrastructure Deployment	Educate stakeholders about federal policies that rapidly expand the national electric vehicle charging infrastructure network.	• Assist with NEVI State Formula Program and Charging and Fueling Infrastructure Grant Program implementation. • Assist IRA's 30C Charging Credit implementation. • Advocate for increased charging infrastructure in federal facilities. • Ensure a robust supply chain of equipment and materials necessary to support the manufacturing and deployment of charging infrastructure. • Support stronger workforce development programs for infrastructure deployment and operation • Make rural EVSE deployment an allowable expense under USDA's Rural Energy for America Program (REAP) financing.
3. Performance and Emissions Standards	Advance economy-wide performance and emissions standards that reduce transportation emissions and encourage adoption of zero-emission vehicles.	• Defend strong light- and medium-duty GHG and multi-pollutant standards in MY 2027 and beyond. • Defend strong heavy-duty phase 3 GHG standards. • Advocate for robust CAFE standards that align with EPA emission standards. • Support California waivers (ACC2, ACT, HD, NOx, and ACF).

		• Support the inclusion of eRINS under the Renewable Fuel Standard.
4. American EV and Battery Manufacturing	Advocate for increased opportunities to advance the EV battery supply chain.	• Promote funding for workforce development. • Support the development of federal EV battery labeling, collecting, and recycling best practices to advance the development of a circular supply chain. • Pursue a memorandum of understanding (MOU) between the Environmental Protection Agency and Departments of Commerce, Energy, Transportation, Interior, and State to encourage a whole-of-government approach to addressing critical mineral supply chain issues.
5. Domestic Critical Mineral Development	Strengthen America's EV supply chain and ensure a secure supply of strategic critical minerals.	• Reduce barriers in the permitting process while maintaining high environmental, social, and governance standards. • Rapidly scale up domestic battery recycling capacity to support battery manufacturing goals established by the IRA.
6. State Policy	Provide thought leadership and education regarding state policies that reduce barriers to the adoption of electric vehicles and increase advanced manufacturing across the EV supply chain.	• Raise awareness about economy-wide programs (ACC II, ACT, and ACF) to expand electric vehicle deployment and maintain a focus on increasing the number of states adopting California standards under Clean Air Act Section 177. • Conduct outreach to state agencies and public sector stakeholders regarding funding available under the NEVI and Community Grants Programs. • Provide stakeholder education on best practices to reduce barriers to adoption (purchase incentives, modernization of the auto retail process for EV consumers, effective communication of economic, health, and environmental benefits of EVs).
7. Environmental Justice	Expand equitable access to EVs and jobs in the zero-emission transportation industry to all.	• Improve Multi-Unit Dwelling (MUD) charging availability through the building code process and make-ready policies. • Encourage construction of ZEV Transportation Network Company (TNC) and rideshare deployment.

		• Engage with the broader EJ coalition to expand workforce opportunities in the EV supply chain.

B. The US National Blueprint for Transportation Decarbonization

The 6 levers:

1. Policy and Regulation
2. Infrastructure, Industrial Investments, and Financing
3. Research and Innovation
4. Data and Analytic Tools
5. Workforce Education and Training
6. Stakeholder Engagement and Public-Private Partnerships

ENDNOTES

[i] Page 36. https://www.energy.gov/sites/default/files/2023-01/the-us-national-blueprint-for-transportation-decarbonization.pdf

[ii] Page 7. Emphasis /italicization added. https://www.canada.ca/content/dam/hc-sc/documents/services/publications/healthy-living/2021-health-effects-indoor-air-pollution/hia-report-eng.pdf

[iii] Environment and Climate Change Canada (2023) Canadian Environmental Sustainability Indicators: Air pollutant emissions. Consulted on March 27, 2024. Available at: www.canada.ca/en/environment-climate-change/services/environmental-indicators/air-pollutantemissions.html

[iv] https://unfccc.int/NDCREG
https://unfccc.int/sites/default/files/NDC/2022-06/Canada%27s%20Enhanced%20NDC%20Submission1_FINAL%20EN.pdf

[v] https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions.html#transport

[vi] https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions.html#transport

[vii] Environment and Climate Change Canada (2023) National Inventory Report 1990-2021: Greenhouse Gas Sources and Sinks in Canada. https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/inventory.html

[viii] https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/2023/canada-energy-futures-2023.pdf

[ix] https://apps2.cer-rec.gc.ca/energy-future/?page=emissions&mainSelection=greenhouseGasEmission&yearId=2023&sector=&unit=megatonnes&view=&baseYear=&compareYear=&noCompare=&priceSource=&scenarios=Global%20Net-zero&provinces=ALL&provinceOrder=YT,SK,QC,PE,ON,NU,NT,NS,NL,NB,MB,BC,AB&sources=WASTE,AGRI,BUILD,HEAVY,TRANSPORTATION,FOSSIL,LAND,ELECTRICITY,HYDROGEN,AIR&sourceOrder=WASTE,AGRI,BUILD,HEAVY,TRANSPORTATION,FOSSIL,LAND,ELECTRICITY,HYDROGEN,AIR

[x] https://www.iea.org/reports/fuel-economy-in-major-car-markets

[xi] https://www.canada.ca/en/environment-climate-change/news/2023/12/canadas-electric-vehicle-availability-standard-regulated-targets-for-zero-emission-vehicles.html

[xii] https://cleanenergycanada.org/new-modelling-finds-canadas-battery-supply-chain-could-be-a-boon-for-jobs-and-the-economy-assuming-canada-takes-action/

[xiii] https://about.bnef.com/blog/china-drops-to-second-in-bloombergnefs-global-lithium-ion-battery-supply-chain-ranking-as-canada-comes-out-on-top/

[xiv] https://cleanenergycanada.org/new-modelling-finds-canadas-battery-supply-chain-could-be-a-boon-for-jobs-and-the-economy-assuming-canada-takes-action/

[xv] Clean Energy Canada (Sept. 27, 2023). *A Clean Bill: Making the switch to clean energy cuts carbon and cost from household energy bills*. https://cleanenergycanada.org/report/a-clean-bill/

[xvi] https://www.ey.com/en_gl/insights/energy-resources/six-essentials-for-mainstream-ev-adoption

[xvii] https://thoughtleadership.rbc.com/proof-point-canada-still-isnt-spending-enough-on-the-green-economy/

[xviii] https://thoughtleadership.rbc.com/the-price-of-power-how-to-cut-canadas-net-zero-electricity-bill/

[xix] Following Australia's example: https://www.dcceew.gov.au/sites/default/files/documents/national-electric-vehicle-strategy.pdf

[xx] https://www150.statcan.gc.ca/n1/daily-quotidien/221201/dq221201c-eng.htm

[xxi] https://www.newswire.ca/news-releases/turo-index-reveals-canadian-millennials-are-increasingly-priced-out-of-car-ownership-due-to-inflation-859492822.html; Transport Canada. *Transportation in Canada 2018: Overview Report*. Ottawa, 2018.https://publications.gc.ca/site/eng/369813/publication.html?wbdisable=true

[xxii] Meadowcroft, James, Katherine Monahan, Hossein Hosseini, Colleen Kaiser, Shabnam Khalaj, Nathan Lemphers, Sonia Patel, Derek Eaton, and Cameron Roberts. January 2021. "Pathways to Net Zero: A Decision Support Tool." Page 32. https://transitionaccelerator.ca/reports/pathways-to-net-zero-a-decision-support-tool/

[xxiii] Håvard Haarstad, Siddharth Sareen, Jens Kandt, Lars Coenen, and Matthew Cook. 2022. "Beyond Automobility? Lock-in of Past Failures in Low-Carbon Urban Mobility Innovations." *Energy Policy* 166 (July): 113002. https://doi.org/10.1016/j.enpol.2022.113002.

[xxiv] Guido Vildozo, *Fuel for Thought: From aspiration to reality, building the trail to vehicle electrification*, S&P Global Mobility (April 29, 2024). https://www.spglobal.com/mobility/en/research-analysis/fuel-for-thought-electric-vehicle-planning-oems-suppliers.html

[xxv] https://www.canada.ca/en/revenue-agency/services/forms-publications/publications/ltn2/subject-vehicles-under-select-luxury-items-tax-act.html

[xxvi] Équiterre and Horizon Advisors. *The Road Ahead to Low-Carbon Mobility: A Feebate System for Canada's Light-Duty Vehicle Segment*. November 23, 2020. https://www.equiterre.org/en/resources/news-a-feebate-system-to-promote-clean-vehicles-in-canada

[xxvii] Sandra Wappelhorst, "Incentivizing Zero and Low-Emission Vehicles: The Magic of Feebate Programs." The International Council on Clean Transportation (June 8, 2022).https://theicct.org/magic-of-feebate-programs-jun22/

[xxviii] Lindsay Wiginton, Jeff Turner, and Hannah MacDonald. "Integrating Equity Into EV Purchase Incentives." (January 19, 2022). Dunsky Energy + Climate Advisors. https://www.dunsky.com/integrating-equity-into-ev-purchase-incentives/

[xxix] Gordon Bauer, Chih-Wei Hsu, and Nic Lutsey. "When might lower-income drivers benefit from electric vehicles? Quantifying the economic equity implications of electric vehicle adoption." The International Council on Clean Transportation (February 2021). https://theicct.org/wp-content/uploads/2021/06/EV-equity-feb2021.pdf

[xxx] https://cleanvehiclegrants.org

[xxxi] https://goelectricbc.gov.bc.ca/personal-rebate-offers/passenger-vehicle-rebates/

[xxxii]https://tc.canada.ca/en/road-transportation/innovative-technologies/zero-emission-vehicles/incentives-zero-emission-vehicles/program-overview

[xxxiii]Ioannis Tikoudis, Luis Martinez, Katherine Farrow, Clara García Bouyssou, Olga Petrik, and Walid Oueslati. 2021. "Ridesharing Services and Urban Transport CO2 Emissions: Simulation-Based Evidence from 247 Cities." *Transportation Research Part D: Transport and Environment* 97 (August): 102923. https://doi.org/10.1016/j.trd.2021.102923.

[xxxiv] Jameel Shaikh. "Canadian Passenger Vehicle Scrappage Policy Analysis." Prepared for the International Council on Clean Transportation (October 2020). https://theicct.org/sites/default/files/publications/Canada-PV-scrappage-oct2020.pdf

[xxxv] https://emc-mec.ca/wp-content/uploads/2023/05/eMHDV-Ecosystem-Gaps-Report-September-2022.pdf

[xxxvi] https://yukon.ca/en/driving-and-transportation/apply-rebate-new-zero-emission-snowmobile

[xxxvii]https://www.canada.ca/en/revenue-agency/services/forms-publications/publications/ltn2/subject-vehicles-under-select-luxury-items-tax-act.html

[xxxviii] https://canadianferry.ca/ferries-in-canada/

[xxxix] https://www12.statcan.gc.ca/census-recensement/2016/as-sa/98-200-x/2016005/98-200-x2016005-eng.cfm

[xl] Dunsky Energy + Climate Advisors. *Futureproofing Multifamiliy Buildings for EV Charging*. Low Carbon Citites Canada. (April 11, 2024). https://www.dunsky.com/comprehensive-and-cost-effective-ev-futureproofing-for-multifamily-communities/.

[xli] TAF, https://taf.ca/ev-ready-charging/

[xlii] https://www12.statcan.gc.ca/census-recensement/2016/as-sa/98-200-x/2016005/98-200-x2016005-eng.pdf

[xliii] https://emc-mec.ca/wp-content/uploads/2023/05/ZEV-Standard-Best-Practices-EN-FINAL.pdf

[xliv] Government of British Columbia, *B.C. Medium- and Heavy-Duty Zero-Emission Vehicles: 2023 Consultation Paper* (May 19, 2023). https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/electricity-alternative-energy/transportation/bc_mhd_zev_2023_consultation_paper_20230516.pdf

[xlv] Clean Energy Canada, Electric Mobility Canada et al., "Policy Design Recommendations for A Zero Emission Medium- and Heavy-Duty Vehicle Sales Regulation" (April 10, 2024). Submission to ECCC.