How Canada can design a truly effective zero-emission vehicle mandate

August 2022

ELECTRIC MOBILITY CANADA
ACCELERATING ELECTRIC TRANSPORTATION

MOBILITÉ ÉLECTRIQUE CANADA
ACCÉLÉRER L'ÉLECTRIFICATION DES TRANSPORTS

CLEAN ENERGY CANADA

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Executive summary

Canada's passenger vehicle emissions have risen over the past 15 years, despite a slight drop in 2020 due to the COVID pandemic. While Canada has ambitious zero-emission vehicle (ZEV) sales target's, the country's actual ZEV sales share sits far below leading countries.

A lack of ZEV supply in Canada continues to be a key barrier to uptake. While global vehicle supply and variety are expanding rapidly, automakers are prioritizing other markets where they are required to sell more ZEVs.

To get more ZEVs on the road, the federal government must move forward with its commitment to enact a national ZEV mandate. Doing so offers a number of additional benefits.

First, a well-designed national ZEV mandate that complements demand-side EV programs and incentives could help Canada meet both its 2030 and 2035 ZEV sales and its 2030 greenhouse gas (GHG) emission reduction targets. Second, a ZEV mandate provides an insurance policy against a scenario in which the U.S. (to which Canada's current vehicle emissions standards are tied) is unable to implement sufficiently ambitious post-2026 vehicle emission regulations. And finally, a ZEV mandate with annual requirements provides the market certainty industry stakeholders need for planning and investments.

However, such a standard must incorporate best practices in policy design, based on lessons learned from other jurisdictions. These include the design elements outlined in Table 1.

Table 1. Best practices in policy design

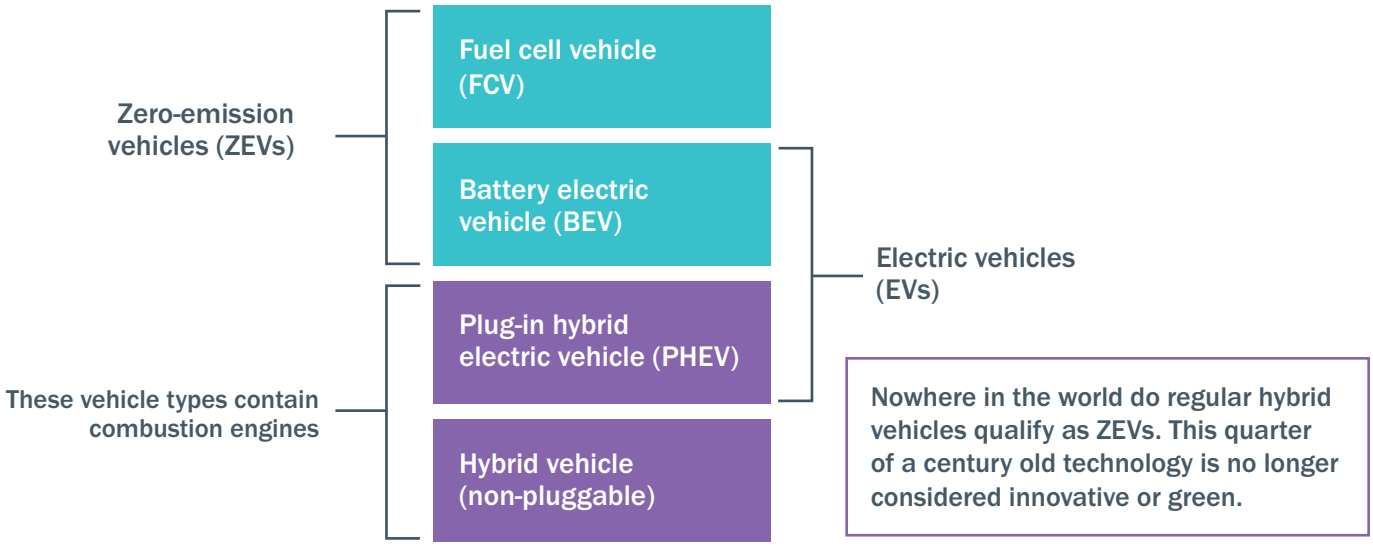
DESIGN ELEMENT	BEST PRACTICE / RECOMMENDATION
ZEV sales trajectory	Sales targets should require automakers to sell an increasing percentage of ZEVs following an "S curve" ramp up to 100% by 2035.
Annual sales requirements	Legally binding annual ZEV sales requirements.
Compliance pathways	• Direct sale of new ZEVs (battery electric vehicles (BEVs), fuel cell electric vehicles (FCVs)) = 1 credit. • Direct sale of new plug-in hybrid electric vehicles (PHEVs) with at least 80 km all-electric range = 0.5 credits. Declining cap on the % of compliance that can be met starting at 20% in 2024 and going down to 0% by 2035 or earlier. • Transparent credit trading and banking. • Bonus partial credits for efforts to increase BEV, PHEV and FCEV sales in Northern and remote communities.
Early action credits	Should not be permitted.
Banking	Allow banked credits to be used for two years before they expire. Declining cap on the % of compliance that can be met using banked credits starting at 25% in 2024 and going down to 0% by 2034.
Borrowing	Should not be permitted.
Penalties	Must include penalties for non-compliance. $20,000 per credit deficit. Reinvest proceeds into charging infrastructure and purchase incentives.
Interaction with provincial ZEV mandates	Acts as a "backstop" for provinces that do not have equal or more stringent mandatory ZEV mandates in place. Must be designed in a way that increases ZEV supply in every region across the country and ensures ZEV inventory is more fairly distributed across provinces.
Timing	Finalize regulation by 2023; implement it to begin taking effect with model year 2024.
Interaction with vehicle CO_2 emission standards	Canada's ZEV mandate and vehicle emission standards must be two separate regulatory instruments with two separate sets of regulatory requirements. The sale of ZEVs may count towards Canada's vehicle emission standards, but ZEV multipliers must be eliminated. The sale of internal combustion engine (ICE) vehicles must not count towards ZEV sales requirements.

Defining zero-emission vehicles

For the purposes of this report, “zero-emission vehicles” (ZEVs) are defined as vehicles that never emit any tailpipe emissions. This means that only battery electric vehicles (BEVs) and fuel cell (FCVs) are considered ZEVs. “Electric vehicles” (EVs) is a category generally understood to include both BEVs and plug-in hybrid electric vehicles (PHEVs). As such, this report does not include PHEVs in its definition of ZEVs.

These terms correspond to generally recognized definitions, as presented in the chart below from Bloomberg New Energy Finance’s 2021 EV Factbook. These definitions are widely used by industry, policymakers and drivers alike. We strongly encourage federal departments to adopt and use these definitions as they establish policies to support the transition to sustainable transportation in Canada.

Figure 1. Globally accepted definitions by vehicle fuel type



Source: Bloomberg NEF. 2021

Why Canada needs a ZEV mandate

1 Passenger vehicle emissions are significant

In 2020, transportation accounted for 24% of Canada's greenhouse gas emissions—the second largest source after oil and gas, at 26%[1], Passenger vehicle emissions account for nearly half of transportation emissions.

Between 2005 and 2019, GHG emissions from Canada's light-duty fleet increased by 7.5%. While 2020 saw passenger vehicle emissions in Canada fall below 2005 levels for the first time because of the COVID pandemic, emissions from pickup trucks, vans, and SUVs still rose by 20%.[2]

2 Canada is falling behind its global peers on ZEV sales

In its Global EV Outlook 2022 report, the International Energy Agency (IEA) states that in 2021, global electric car sales more than doubled to 6.6 million, representing 9% of the total car market.[3] China's EV market share rose to 16% and Europe's to 17%, with individual European countries far surpassing that percentage. In Norway, 86% of new car sales were electric, while in Germany, EV share was 25%.[4] Meanwhile, Canada's BEV, FCV and PHEV sales share sat at 5.5% in 2021, well below the global average.[5]

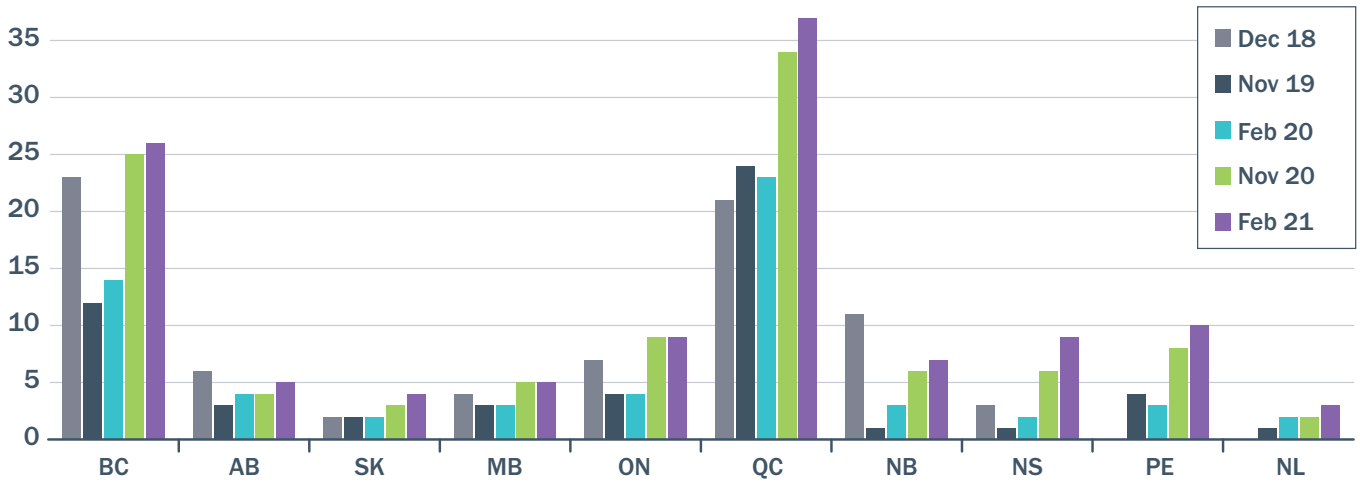
3 BEV, FCV and PHEV supply is still limited

While a recent study commissioned by Transport Canada found an 81% increase in BEV, FCV and PHEV inventory availability in Canada between 2020-2021, supply is still limited.[6] A majority (55%) of dealerships don't have a single BEV, FCV or PHEV in stock. Outside of B.C., Quebec, and Ontario, this percentage rises to an astounding 82% of dealerships. Wait times are also high, with 64% of Canadian dealerships surveyed reporting wait times of 3 to 6 months (or more) as of December 2021—and the issue has become significantly worse since then.[7] Certain automakers have even stopped taking pre-orders for EV models at this time, because demand far outpaces supply.[8] Regulatory action is required to ensure automakers step up to meet growing demand and ensure Canadians have a broad range of BEV, FCV and PHEV makes and models to choose from.

Some of these supply constraints may be attributed to COVID-19 supply chain issues, so a comparison across provinces is a helpful way to look at results as well.[9] BEV, FCV and PHEV supply continues to be unfairly distributed across provinces, with B.C. and Quebec being home to 71% of all BEVs, FCVs and PHEVs available for sale on Canadian dealership lots in 2021. Those two provinces also have many more BEV, FCVs and PHEVs available per person (see Figure 2 below), since several automakers focus the vast majority of their inventory there, including Volkswagen (83%), Kia (86%), Honda (86%), and Ford (98%).

While a growing number of provinces and territories have now introduced ZEV rebate programs (see Figure 3 on the following page), B.C. and Quebec are the only two provinces with both consumer incentives and ZEV mandates in place. Increasing ZEV supply through provincial ZEV mandates has helped these two provinces lead Canada in ZEV sales (see Table 2 below).

Figure 2. ZEVs available for purchase per 100,000 people, by province



Source: Dunsky Energy, 2021

Figure 3. Provincial and territorial zero-emissions vehicle incentives
(as of July 2022)

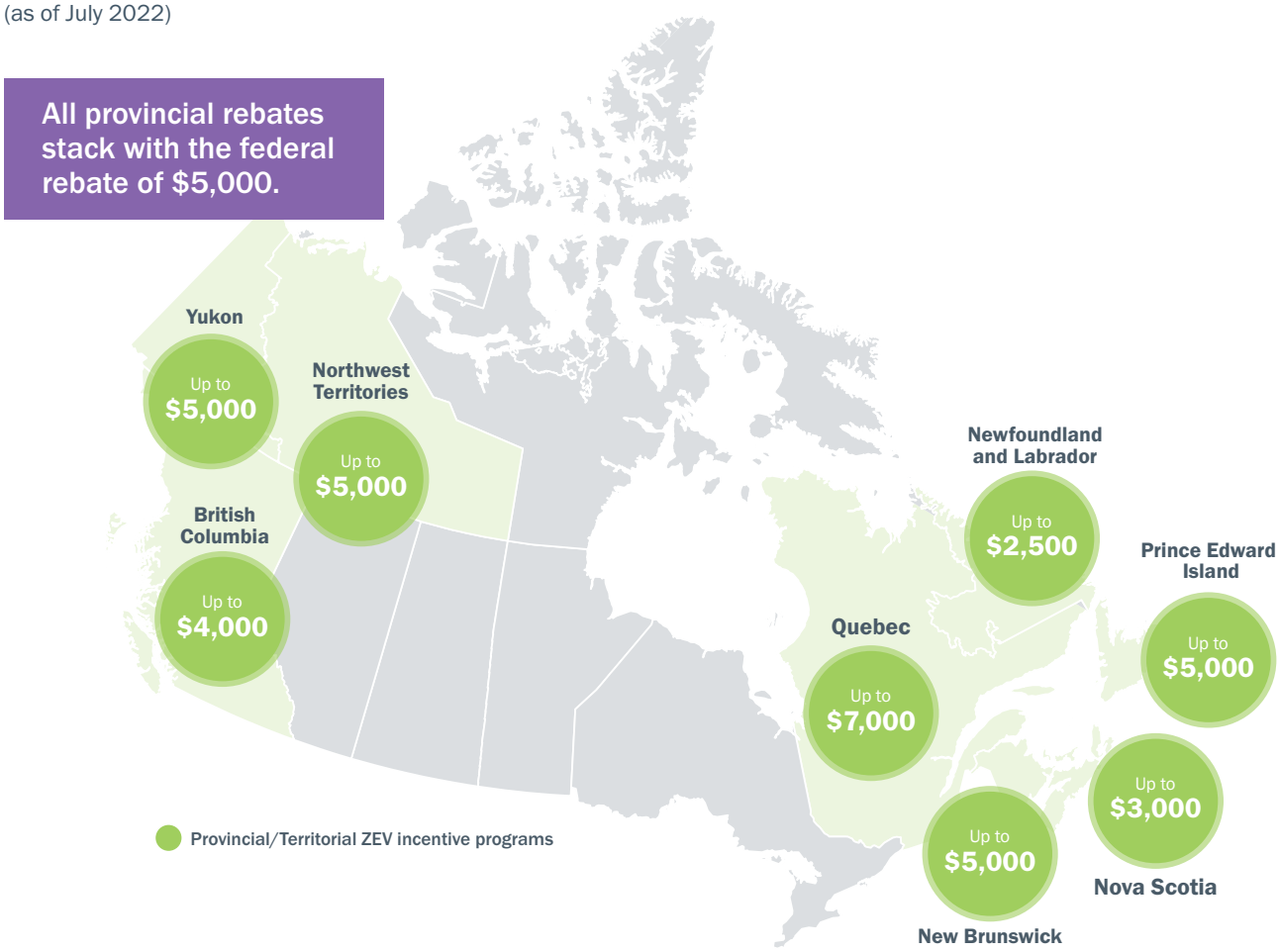


Table 2. Impact of rebates and mandates on ZEV sales

STATE, PROVINCE OR COUNTRY	ZEV REBATE	ZEV MANDATE	ZEV % OF TOTAL SALES Q1-2022[10]
California[11]	Yes	Yes	17%
British-Columbia	Yes	Yes	15.5 %
Québec	Yes	Yes	12.7 %
Canada	**Yes**	**No**	**7.7 %**
Ontario	No	No	5.3 %
Prince-Edward-Island	Yes	No	4.3 %
Manitoba	No	No	2.3 %
New Brunswick	Yes	No	2.3%
Saskatchewan	No	No	1.5 %

4 Automakers are prioritizing other markets where they are required to sell more ZEVs

Global automakers are pouring half a trillion dollars into EV and battery development over the next five years.[12] Responding to increasing EV demand and government policy, automakers are launching new EV makes and models at a rapid pace. There were 522 BEV, FCV and PHEV models available around the world in 2021, up from 380 models at the end of 2019.[13]

The U.S. significantly lags China and the EU when it comes to model availability. By the end of 2020, there were 355 BEV, FCV and PHEV models available in China, compared to 230 in Europe and just 83 in the U.S. Canada is even further behind, with only 66 BEV, FCV and PHEV models available at the end of 2021.[14]

This discrepancy in model availability—and EV sales more generally—is because automakers prioritize EV sales in regions with stringent emission standards or ZEV mandates. According to the International Energy Agency, Europe and China are responsible for 85% of global EV sales.[15] These two regions are also seeing significantly higher EV sales shares: 16% and 17% of passenger vehicles sold in China and Europe, respectively, were electric in 2021, in contrast to just 5% in the U.S.

5 A policy approach that relies on the U.S.-Canada vehicle emission standards alone is insufficient

The U.S. Environmental Protection Agency (EPA) released its final "Revised 2023 and Later Model Year Light-Duty Vehicle GHG Emissions Standards" in December 2021.[16] These rules will play an important role in Canada's baseline policy mix by driving near-term GHG emission reductions in internal combustion engine vehicles. But they will not be sufficient to achieve Canada's ZEV ambitions and GHG emission reduction.

First, the U.S. vehicle emission standards are not nearly as stringent as other global leaders', like the EU. The EU's current emission standards require fleet average emissions of 80.8 grams of CO_2/km by 2025 while the EPA's updated vehicle emission standards require fleet average emissions of 111 grams of CO_2/km by that same year.[17] The EPA indicates that "conventional powertrains" are expected to make up most of the compliance pre-2026, and the U.S. will rely on post-2026 regulations to do the heavy lifting on EVs.[18] Indeed, the EPA expects these final rules to deliver only 17% EV sales by 2026. With mandatory targets of at least 20% ZEV sales by 2026, 60% by 2030, and 100% by 2035, Canada needs additional measures to reflect and achieve its greater ZEV ambitions. Second, a policy approach that relies on the U.S.-Canada vehicle emission standards alone makes Canada dependent on regulatory, legal, and electoral outcomes in the U.S.

The U.S.-Canada market is already bifurcated into ZEV and non-ZEV provinces and states. Canada must align with the group that has ZEV ambitions in line with it's own. **Fifteen other states have adopted a zero-emission vehicle mandate modelled after California's, which together account for 36% of new U.S. car sales—and this list continues to grow.[19] Adding the rest of Canada would put 43% of the U.S.-Canada car market under a ZEV standard.**

If Canada does not align with the leaders (ZEV states), it may end up lacking in ZEV supply as manufacturers will prioritize these states instead of our national market.

6 A national ZEV mandate will ensure that EVs built in Canada, with the support of Canadian tax-payers money, are available to Canadian consumers

If the government of Canada does not implement a stringent ZEV mandate, we may relive the 2011 situation where both the federal and Ontario governments financially supported the production of electric vehicles (Toyota RAV4 EV) in Canada to the tune of $70 million each, only to have them shipped directly to the U.S. market without Canadians having the opportunity to purchase them because, despite Ontario's $8,500 rebate on the purchase of such an EV, there was a ZEV mandate in California, but not in Canada. The billions of dollars invested by the governments of Canada, Ontario and Quebec to directly fund the assembly of ZEVs and ZEV parts domestically must not be destined to benefit only U.S. consumers and U.S. GHG emission reductions.

7 A national ZEV mandate will ensure Canada meets its ZEV sales and GHG reduction targets

Canada's Emission Reduction Plan (ERP) offers the first-ever policy pathway to cut emissions 40% below 2005 levels by 2030 and projects the transportation sector will achieve an 11% reduction in greenhouse gas emissions from 2005 levels by 2030.[20] One of the key policies put forward in the ERP to successfully achieve its targets is a national ZEV mandate.

A national ZEV mandate will drive faster ZEV uptake over the next decade, reduce domestic passenger vehicle emissions, and help ensure Canada meets its 2030 and 2035 sales targets by making ZEVs more available across the country. It also provides an insurance policy against a scenario in which the U.S. is unable to implement sufficiently ambitious post-2026 vehicle emission regulations or does implement them but a future president decides to roll them back.[21]

The federal government has committed $2.3 billion for consumer purchase incentives—the Incentives for Zero-Emission Vehicles (or iZEV program)—and $1.2 billion for ZEV charging infrastructure to-date. These investments will be wasted if they're not supported by sufficient EV supply. A national ZEV mandate will support the supply-side of the equation and ensure provinces that lack their own mandates can still reap the benefits of these demand-side investments.

How to design a ZEV mandate

Governments are increasingly realizing the effectiveness of ZEV mandates in accelerating the market shift.

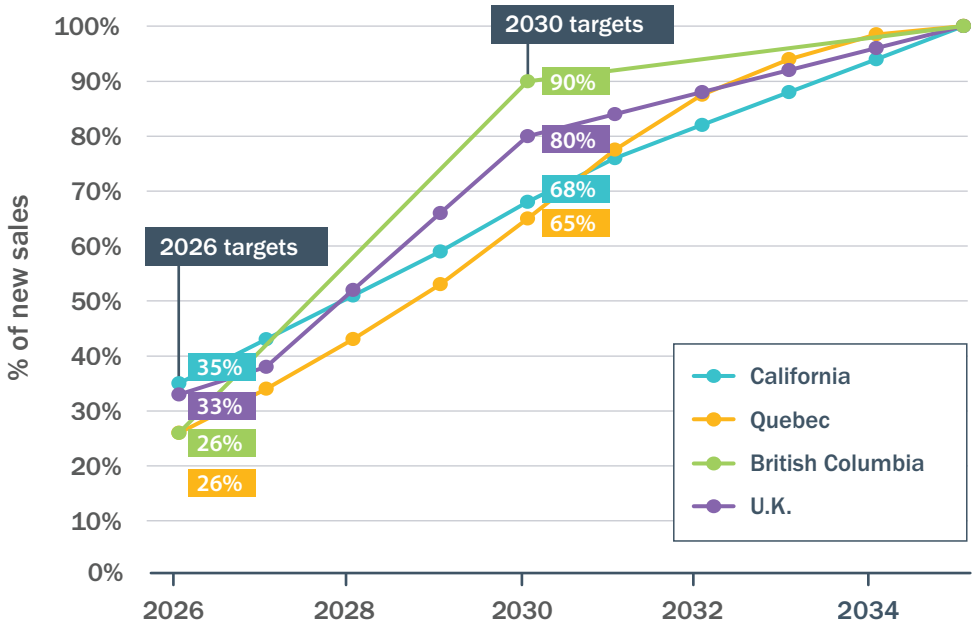
B.C., Quebec and California have zero-emission vehicle mandates in place, and their policies are working: all three jurisdictions have significantly higher ZEV market shares than the national average and account for outsized portions of national ZEV sales. These jurisdictions have years of experience implementing ZEV mandates and are all currently working on updated policies that integrate best practices and lessons learned. The U.K. has also recently announced its intention to adopt a national ZEV mandate and is currently consulting stakeholders on a proposed policy design.[22] Canada must learn from and build on these approaches. A comparison of the key design elements being proposed by the most recent iterations of ZEV mandates in these jurisdictions is included in Appendix A.

This section lays out specific ZEV mandate design recommendations for Canada based on best practices and lessons learned from other jurisdictions.

ZEV sales trajectory

Canada should adopt a ZEV sales ramp up that aligns with California, Quebec, B.C. and the U.K. All these jurisdictions have proposed or implemented sales trajectories that follow an “S curve” ramp up en route to 100% ZEV sales by 2035. These jurisdictions are all targeting at least 26% ZEV sales by 2026 and 65% by 2030, with many striving for more ambitious sales shares.

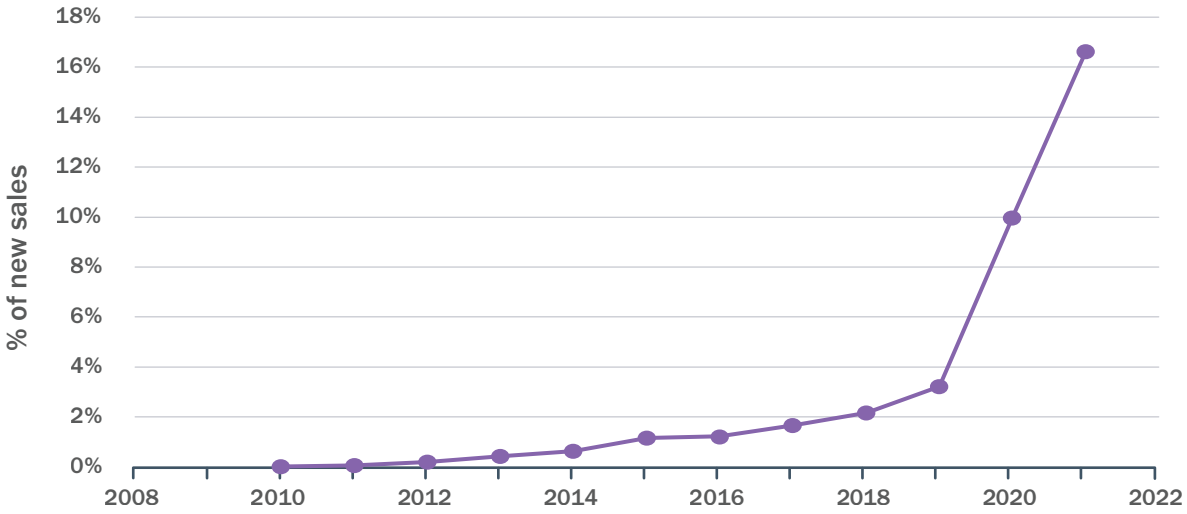
Figure 4. Annual sales requirements in leading ZEV mandate jurisdictions



Annual ZEV sales requirements

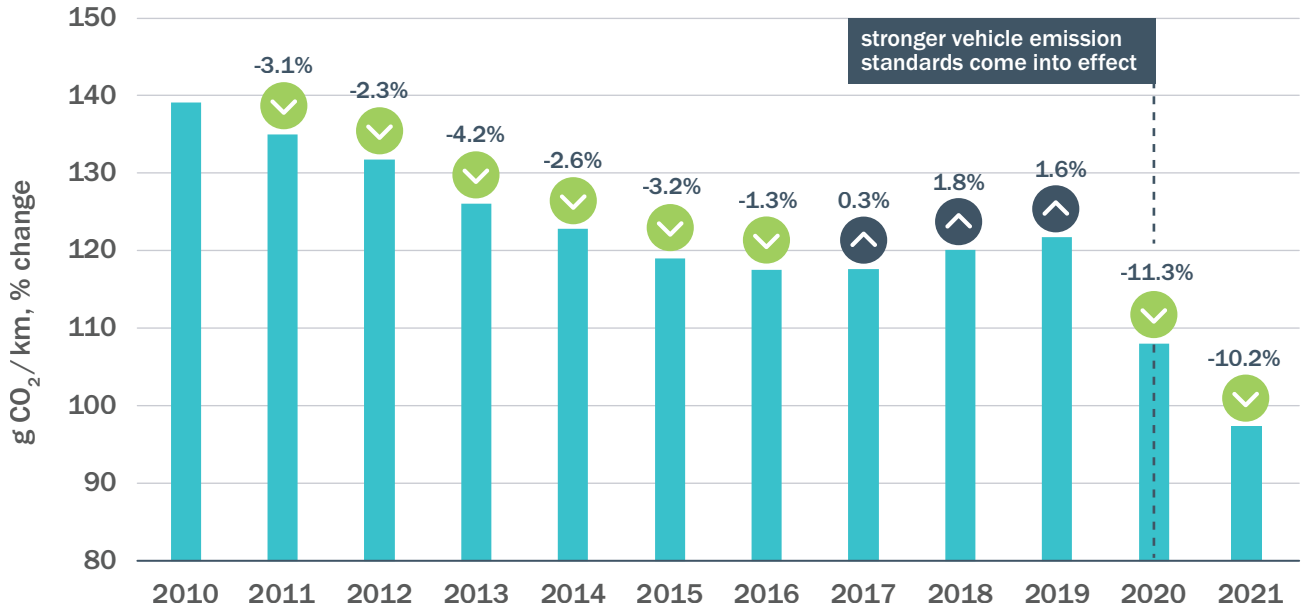
A national ZEV mandate must include strong annual ZEV sales requirements en route to 100% ZEV sales by 2035. This is the case in all other proposed and implemented ZEV mandates, and Canada has committed to doing so in its Emissions Reductions Plan.[23] Annual requirements ensure automakers don't delay investments or continue to prioritize other markets where they are required to sell ZEVs until absolutely necessary. We saw this delay play out in the EU, where automakers ramped up efforts only in 2020 to meet the incoming mandatory CO_2 emissions target of 95 g/km, but not in the years prior (see figures below). Annual requirements also avoid a "zig-zag" sales trajectory where automakers maximize ZEV sales in compliance years but hold them back in years between. Finally, annual requirements provide market certainty to guide private sector planning and investments. Regulating only 2030 and 2035 targets, for instance, would make it harder on those trying to plan for the ZEV transition (e.g. charging station providers, electric utility companies, municipalities, building developers, and raw material suppliers, among others).

Figure 5. EV sales in the EU



Source: International Energy Agency, 2022

Figure 6. Carbon emissions of new cars in the EU



Source: European Automobile Manufacturers' Association (ACEA)

Compliance pathways

Direct sale of new ZEVs. The types of ZEVs eligible for credits must include new BEVs and FCVs, similar to all other ZEV mandates implemented to-date. Best practice for ZEV mandate design is now allocating one credit per zero-emission vehicle sold.[24] This approach reduces complexity, prevents an oversupply of credits, maximizes emission reductions, and provides the greatest certainty of achieving sales targets.[25] For instance, Quebec's draft ZEV regulation proposes to allocate only one credit per vehicle sold despite previously offering multiple credits for certain vehicles such as long-range battery electric vehicles. Used ZEVs should not be eligible. While California, Quebec and B.C.'s ZEV mandates allow the sale of used ZEVs to earn credits, California and Quebec place a cap on the percentage of an automaker's compliance obligation that can be met this way and plan to phase out this compliance pathway by 2032 and 2034, respectively. Excluding used ZEVs from a national mandate will reduce administrative complexity, avoid giving credit for the same vehicle twice and ensure a better supply of new vehicles.[20]

Direct sale of new PHEVs. Canada's ZEV mandate should at first grant partial credit (0.5 per vehicle maximum) to PHEVs so long as they meet a minimum all-electric range requirement of 80 km. Studies have found that PHEV fuel consumption and tailpipe CO_2 emissions in real-world driving are about two to four times higher than advertised.[26] In a country like Canada, with harsh winters, a PHEV burns a lot more gas in cold weather compared to warm weather. However, PHEVs have also been shown to play a role in helping new buyers make the transition from gas to electric. Therefore, Canada should make PHEVs eligible for partial credit but put a declining cap on the percentage of compliance PHEVs can be used to achieve in any given year, starting with 20% in 2024 and 0% by 2035 or earlier to factor in the transitory nature of this technology. Best practice jurisdictions have taken a range of approaches to the treatment of PHEVs in ZEV mandates, but all propose some limits on their eligibility—whether by adding all-electric range requirements, only offering partial credits, including a cap on what percentage of an automaker's compliance obligation PHEVs can meet, phasing out PHEV eligibility by a certain date, excluding PHEVs altogether, or a combination of these.[27]

Trading. Transparent credit trading between manufacturers should be allowed to provide compliance flexibility and reward automakers that over-comply. All existing and proposed ZEV mandates allow for credit trading. Canada could consider phasing out credit trading as a compliance pathway in 2035 to ensure "compliance requirements are fully met through the direct sale of ZEVs by then.

Bonus partial credits for efforts to increase sales in Northern and remote communities: To ensure ZEV uptake in Northern and remote communities, Canada should award bonus partial credits for automaker efforts that contribute to BEV, PHEV and FCV sales in those communities.[28] These partial credits would be awarded in addition to the base credits received for the ZEV sales. They could be modelled after California's Environmental Justice allowances, which can be earned by automakers that take action to increase access to ZEVs in priority communities (under California's system, "priority" is based on income level). Limits must be placed on the use of these credits. For instance, California's Environmental Justice allowances can be used to meet up to 5% of an automaker's compliance obligation for a limited number of years. Eligible communities must be clearly and narrowly defined. Finally, measures to ensure integrity and avoid "gaming" may also be needed, such as by granting one full credit at the time of the sale and granting the bonus partial credit only if the vehicle remains registered in an eligible community two years later. The bonus partial credits should be phased out by 2035.

Early action credits

Canada should not grant early action credits for ZEV sales prior to the regulations coming into effect. Giving away too many upfront credits has the potential to flood the market with credits, significantly diluting the impact of the ZEV mandate and delaying deployment for the first few years.

Banking

Canada should allow "banked credits" to be used for two years before they expire and cap the percentage of compliance banked credits that can be used towards a given year, starting at 25% in 2024 and declining to 0% by 2034, in line with Quebec's draft regulation. Jurisdictions have taken a range of approaches to credit banking (i.e. using excess credits accumulated in previous years to meet compliance requirements in future years) in ZEV mandates, but all propose some limits on banking—whether by limiting the number of years before a banked credit expires, limiting the percentage of an automaker's compliance obligation banked credits can meet, phasing out banking by a certain date, prohibiting banking altogether, or a combination of these.[29]

Borrowing

Canada should not allow "credit borrowing", also known as a "carry-forward" provision. Other jurisdictions have taken a range of approaches to credit borrowing. California, Quebec and B.C. allow credit borrowing within limits (averaging compliance across two to three years), and the U.K. proposes that no credit borrowing be allowed. Borrowing could have the effect of delaying ZEV production and sales to future years with no penalties for non-compliance, thus delaying the GHG emission and other benefits that come with those sales.

Penalties

Carmakers must face administrative penalties if they fail to comply with a zero-emission vehicle mandate. Canada's current tailpipe emission standards impose no immediate consequences if carmakers fail to clean up the cars they sell. Moreover, administrative penalties must be high enough to change automaker behaviour and motivate them to sell more EVs.[30] Experts recommend a minimum of $20,000 for every ZEV sale a carmaker falls short, which aligns with the penalty amounts under Quebec and California's ZEV mandates.[31] To maintain the efficiency of the penalty overtime, it should be tied to the Consumer Price Index (CPI), as proposed by Quebec in its latest draft ZEV regulations.[32] Proceeds collected must be reinvested back into programs that encourage and enable ZEV uptake, with a focus on charging infrastructure and purchase incentives.

Timing

Canada should finalize the regulation by 2023 with the first year of compliance obligations coming into effect in 2024. This timeline coincides with Canada's commitment to align with the most ambitious clean car standards in the U.S. post-2025 either federally or at state level, as well as the U.K.'s proposed first year of compliance obligations.[33] It is also consistent with the length of time other jurisdictions took to develop and implement their ZEV mandates (see Table 3). Phasing in ZEV sales requirements prior to 2026 will give Canada the best chance at meeting its 2026 ZEV sales target.

Table 3. Timelines for ZEV mandate development and implementation in select jurisdictions

Jurisdiction	Intention to adopt ZEV mandate announced	First year of compliance obligations	Total time to develop and implement ZEV mandate
Quebec	October 2015	2018	2 years, 3 months
B.C.	November 2018	2020	1 year, 1 month
U.K.	October 2021	2024 (proposed)	2 years, 3 months

Interaction with provincial ZEV mandates

Canada should treat the federal ZEV mandate as a "backstop" in that a national ZEV mandate would only be applied where provinces do not have equal or more stringent mandatory ZEV mandates in place. This approach would allow provinces like B.C. and Quebec to continue to set higher bars for ambition. It would also help smaller, resource-constrained provinces and territories who are themselves exploring a ZEV mandate but are concerned about the technical expertise and resources needed to set up a credit market. The federal ZEV mandate must be designed in a way that increases ZEV supply in every region across the country and ensures ZEV inventory is more fairly distributed across provinces. There are no other ZEV mandate-specific jurisdictional best practices to draw from for this design element. Made-in-Canada creative solutions will be required.

Interaction with passenger vehicle emission standards

Canada's ZEV mandate and vehicle emission standards must be two separate regulatory instruments with two separate sets of regulatory and compliance requirements. The purpose of a ZEV mandate is to accelerate the deployment of zero-emission vehicles by increasing the supply of these vehicles in Canada and improving consumer access and choice. Meanwhile, the purpose of the vehicle emission standards is to gradually lower the total GHG footprint of Canada's vehicle fleet over time. Moreover, Canada incorporates the U.S. vehicle emission standards by reference, making it too challenging to attempt to integrate a ZEV mandate into a policy that is developed largely outside of Canada's control. Once two separate regulations are developed, ZEV sales could continue to count towards an automaker's fleet average emissions to bring that average down—so long as each ZEV sale is treated as a single sale (as opposed to allowing for "electric vehicle multipliers", which have been shown to significantly erode the GHG emission benefits of vehicle emission standards). In other words, because the ZEV mandate will take responsibility for driving supply, the electric vehicle multiplier compliance flexibility under Canada's vehicle emission regulations is no longer needed and must be eliminated immediately, or by the end of 2025 at the latest. The sale of more efficient internal combustion engine vehicles must not count towards an automaker's ZEV sales requirements, as ICE vehicles do not help to achieve a ZEV mandate's policy objectives.

Policies to complement a national ZEV mandate

A national ZEV mandate must be part of a broader clean cars policy package that addresses both supply and demand barriers to ZEV uptake while also ensuring Canada's auto sector captures the economic benefits of the domestic and global shift to ZEVs.

Top priority measures to be pursued in addition to a national ZEV mandate include:

- **Consumer incentives:** Until EVs reach price parity in sticker price, incentives are needed to "level the playing field" between electric and gas cars. Low- and modest-income Canadians also benefit from the fuel and maintenance savings an electric car provides but are less likely able to afford a new vehicle. Therefore, Canada should establish an additional income-tested incentive for these families and make EV incentives available to used car buyers too. One way for Canada to develop such programs would be through a financially neutral feebate system.

- **A National EV infrastructure deployment plan:** To ensure that Canadians can confidently travel in every region of the country, from highways and cities to rural and remote areas, Canada needs a well-funded and well-planned strategy that charts out Canada's charging needs in line with our ZEV sales targets and channels public investments most effectively. The plan must include a focus on providing charging solutions for Canadians living in multi-unit residential buildings or who otherwise don't have access to a driveway to ensure they have access to home charging too.

- **Consumer education and industry training:** Many Canadians want to go electric but have unanswered questions or don't know where to start. Leading and trusted organizations like Plug'n Drive, EV Society, Plug in BC, AVÉQ, EVAAC and others have established a suite of programs to educate and support consumers in making the transition to electric vehicles. As a trusted source of information for many consumers, dealership sales teams must also receive training in order to better inform EV buyers.

- **Vehicle emission standards:** Canada must align its vehicle emission standards with the toughest standards in North America and eliminate compliance flexibilities that water down the policy's effectiveness, including by immediately ending all Advanced Technology Multipliers. This flexibility was designed to voluntarily support supply allocation of ZEVs to Canada. With a ZEV mandate established, this multiplier would simply enable greater emissions from conventional combustion vehicles.

- **National ZEV supply chain strategy:** The federal government must develop a national ZEV supply chain strategy in coordination with industry that picks winners based on where along the EV supply chain Canada is best positioned to compete, focusing efforts on building those areas of the supply chain up.

- **Federal EV leadership:** The federal government can lead by example and help its elected officials, employees, and contractors go electric by ensuring federal fleets are 100% electric and federal buildings are EV-ready.

Demand-side policies are critical to incentivizing the consumer adoption of ZEVs, but they cannot exist in a silo. Strong supply-side measures, such as the ZEV mandate outlined in this document, are required to avoid excess demand in the ZEV market and maintain stable, accessible ZEV pricing. Such strategic, long-term supply-side incentives will ensure Canada meets its electrification and net-zero ambitions for the passenger transportation sector.

See Electric Mobility Canada's 2030 EV Action Plan for more detail on the package of policies needed to reach Canada's ZEV ambitions.[34]

Conclusion

Swiftly implementing a national zero-emission vehicle sales mandate can reduce GHG emissions and air pollution in one of Canada's highest-emitting sectors and create more choice for Canadian car buyers while supporting a globally competitive electric vehicle industry. But how we design this policy matters. This federal government should incorporate the best practices in ZEV mandate design laid out in this paper to ensure Canada's zero-emission vehicle sales mandate is meaningful and delivers the best environmental and economic outcomes for Canadians.

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19. These states include Connecticut, Maine, Maryland, Massachusetts, New York, New Jersey, Oregon, Rhode Island, Vermont, Colorado, Washington, Virginia, Minnesota, Nevada and Delaware. The 43% calculation is based on data from the U.S. Bureau of Transportation Statistics and the National Automobile Dealers Association.
20. Environment and Climate Change Canada. *2030 Emissions Reduction Plan: Canada's next steps for clean air and a strong economy.* https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/emissions-reduction-2030.html (2022).
21. If the EPA is able to put ambitious post-2026 vehicle emission rules in place, Canada's passenger vehicle emissions would fall even further, and OEMs operating in Canada will be well-placed to comply with little effort and at a low cost because they were already operating under Canada's ZEV standard.
22. UK Department for Transport. *Technical consultation on zero emission vehicle mandate policy design.* https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1067041/technical-consultation-on-zero-emission-vehicle-mandate-policy-design.pdf (2022).
23. "Develop a light duty vehicles ZEV sales mandate, which will set annually increasing requirements towards achieving 100% LDV ZEV sales by 2035, including mandatory interim targets of at least 20% of all new LDVs offered for sale by 2026 and at least 60% by 2030." Environment and Climate Change Canada. *2030 Emissions Reduction Plan: Canada's next steps for clean air and a strong economy.* https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/emissions-reduction-2030.html (2022).
24. For instance, a Simon Fraser University Sustainable Transportation Action Research Team simulation study demonstrates that a one-credit-per-ZEV sold approach would lead to actual ZEV sales that align with the Canadian 2030 sales target (which was 30% by 2030 at the time of the simulation), whereas a California-like system would lead to fewer sales than targeted due to the assignment of multiple credits per vehicle. See Chandan, B., Axsen, J. & McCollum, D. How to design a zero-emissions vehicle mandate? Simulating impacts on sales, GHG emissions and cost-effectiveness using the AUtomaker-Consumer model (AUM). *Transport Policy.* https://www.sciencedirect.com/science/article/pii/S0967070X21003656 (2021).
25. *Ibid.*
26. International Council on Clean Transportation. *Real-World Usage of Plug-in Hybrid Electric Vehicles: Fuel Consumption, Electric Driving, and CO_2 Emissions.* https://theicct.org/publication/real-world-usage-of-plug-in-hybrid-electric-vehicles-fuel-consumption-electric-driving-and-co2-emissions/ (2020)
27. California allows long-range (>70 mile) PHEVs to be eligible for full credit with no phase-out date and shorter-range PHEVs (<70 mile but < 43 mile) to be eligible for partial credit until 2028. California also places a 20% cap on the percentage of compliance obligation a manufacture can meet through the sale of PHEVs. Quebec is proposing to award only partial credit to longer-range PHEVs (>80 km) with no phaseout date or cap on the percentage of compliance obligation that can be met through PHEVs. The UK is proposing to exclude PHEVs from its ZEV mandate.
28. PHEVs should be eligible for special bonus credits only if this paper's earlier recommendations concerning PHEVs are adopted (i.e. minimum 80 km all-electric range requirement, only partial credit awarded to PHEVs, cap on percentage of compliance obligation that can be met by PHEV sales).
29. California allows credits to be banked for up to four years but phases some credit banking out starting in 2029 and all credit banking out starting in 2032. Quebec limits credit banking to 25% of an automaker's compliance obligation in 2022 and reduces that limit to 0% after 2033. BC allows credit banking in its current regulation but has signaled it would require banked credits to expire in future regulations. The UK proposes that no banking be allowed in its ZEV mandate.
30. Sustainable Transportation Action Research Team. *Policy Pathways to 100% Zero-Emission Vehicles by 2035 in Canada.* https://cms.equiterre.org/uploads/rapport_zev_en3.pdf (2022).
31. *The Free Press.* https://lfpress.com/opinion/columnists/jaccard-rev-up-zero-emission-vehicle-mandates (2021). Quebec's draft regulation proposes an increase in penalties from $5,000 to $20,000 for phase 2 of its ZEV standard. California's current penalty of $5,000 USD per credit deficit also translates into $20,000 USD per ZEV sale because it has been offering approximately four credits per ZEV sale.
32. Government of Quebec. *Regulations amending the Regulation respecting the application of the Act to increase the number of zero-emission motor vehicles in Québec in order to reduce greenhouse gas and other pollutant emissions.* http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=1&file=77395.pdf (2022).
33. Environment and Climate Change Canada. A Healthy Environment and A Healthy Economy. https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/healthy-environmenthealthy-economy.html (2020).
34. The 2030 EV Action Plan. *Electric Mobility Canada.* https://2030evactionplan.ca/ (2022).

Appendix A

Comparison of ZEV standard design details in other Western jurisdictions

	California	Quebec	British Columbia	U.K.
Enabling legislation	ZEV Program Current ZEV regulation (model years 2018 to 2025) Proposed ZEV regulation for 2026 onward Proposed Amendments to ZEV regulation for 2026 onward proposal	Act to increase the number of zero-emission motor vehicles in Quebec in order to reduce greenhouse gas and other pollutant emissions Regulation respecting the application of the Act[1] 2022 – Draft Amendments (June 8, 2022 version) Draft regulation to amend the Regulation respecting the application of the ZEV Act Draft regulation to amend the Regulation respecting the limit on the number of credits and the confidentiality of some information	Zero-Emission Vehicles Act[2] ZEV Regulation B.C. Zero-Emission Vehicles Act & Regulation Guidance Document CleanBC Roadmap to 2030 (includes updated targets for 2026, 2030 and 2035 only. No other regulatory details.)	N/A Technical consultation on zero emission vehicle mandate policy design
Government lead	California Air Resources Board	Ministry of Environment *(Ministère de l'Environnement et de la Lutte aux Changements climatiques)*	Ministry of Energy, Mines and Low Carbon Innovation	Department for Transport
Regulated automakers	Large (>20,000 annual vehicle sales) and intermediate volume manufacturers (20,000 > 4,501 annual vehicle sales) are currently regulated. Small volume manufacturers (<4,500 in annual sales) can opt-in/participate in credit market between 2026-2034. In 2032 they must submit compliance plans. Starting in 2035, they will also be required to comply.	Large (>20,000 annual vehicle sales) and intermediate volume manufacturers (20,000 > 4,501 annual vehicle sales) are currently regulated. Small volume manufacturers (<4501 vehicles) can opt in	Large (>5,000 annual vehicle sales) and medium volume manufacturers (5,000 > 1,001 annual vehicle sales) are currently regulated. Small volume manufacturers (<1,000 vehicles) can opt in	Would apply to manufacturers of new cars and vans. Does not differentiate between sizes at this time. No proposal yet for treatment of small volume manufacturers.

[1] Quebec has one additional regulation: Regulation respecting the limit on the number of credits that may be used by a motor vehicle manufacturer and the confidentiality of some information

[2] https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/19029

	California	Quebec	British Columbia	U.K.
ZEV credit / sales requirements[3]	22% by 2025 35% by 2026 43% by 2027 51% by 2028 59% by 2029 68% by 2030 76% by 2031 82% by 2032 88% by 2033 94% by 2034 100% by 2035	22% by 2025 26% by 2026 34% by 2027 43% by 2028 53% by 2029 65% by 2030 77.5% by 2031 87.5% by 2032 94% by 2033 98.5% by 2034 100% by 2035 No minimum portion from BEVs, no more manufacturer categories	10% by 2025[4] 25% by 2026 90% by 2030 100% by 2035	22% by 2024 28% by 2025 33% by 2026 38% by 2027 52% by 2028 66% by 2029 80% by 2030 84% by 2031 88% by 2032 92% by 2033 96% by 2034 100% by 2035[5]
Nature of targets	Legally binding annual targets	Legally binding annual targets	Legally binding annual targets	Legally binding annual targets
Compliance pathways	1. Direct sale of ZEVs 2. Direct sale of PHEVs a. Max. 20% of manufacturer's ZEV allowance in a given model year b. With >70 mile electric range, no phase out date c. With >43 mile electric range, only 2026 through 2028	1. Direct sale of BEVs a. New b. Reconditioned (imported, max 4yrs / 100 000 km) - reduced credit 2. Direct sale of PHEVs (min range 80 km) a. New b. Reconditioned (imported, max 4yrs / 100 000 km) - reduced credits	1. Direct sale of Class A and Class B ZEVs[6] 2. Credit transfers between suppliers	1. Direct sale of ZEVs

[3] Automakers must achieve a certain percent of their sales in credits. As credits per ZEV sold can exceed 1, the number of ZEVs actually produced may not equal the percentage credit requirement.

[4] 2025 target is from ZEV Act; 2026, 2030 and 2035 targets are from the CleanBC Roadmap to 2030 and not yet legislated.

[5] Vans are treated separately under the UK's proposed ZEV mandate. Proposed uptake trajectory for vans is 8% by 2024, 11% by 2025, 14% by 2026, 25% by 2027, 34% by 2028, 43% by 2029, 52% by 2030, 62% by 2031, 71% by 2032, 81% by 2033, 90% by 2034, 100% by 2035.

[6] Medium volume suppliers can use any combination of ZEV Class A and/or B credits to meet their compliance requirements. Large volume suppliers must meet a minimum increasing annual ZEV Class A % requirement. The remainder of the compliance requirement can be met with either ZEV Class A or B credits. Class A vehicles include BEV and FCEV with an electric range greater than or equal to 80.47 km or an extended range EV with an electric range greater than or equal to 121 km. Class B vehicles include PHEV with a range greater than or equal to 16 km and an extended range EV with an electric range greater than or equal to 16km but less than or equal to 121 km.

	California	Quebec	British Columbia	U.K.
Compliance pathways	3. Environmental Justice Credits a. Max. 5% of manufacturers' ZEV allowance b. Discounted sales in designated communities from 2024 through 2031 c. End of lease sales from 2026 through 2031 d. Below MSRP threshold sales from 2026 through 2028 4. Early Action Credits a. Max 15% of manufacturers' ZEV allowance b. Only for the first three years after the commencement of a manufacturer's ZEV requirements. 5. Trading Credits a. Only through 2030 6. Direct sale of certain MDVs a. Manufacturers may choose whether their MDV sales apply towards compliance under ACC II or the ACT, but not both.[7] Summary: Starting in 2032, compliance obligations can only be met through direct sales of ZEVs and PHEVs with electric range >70 miles.	3. Direct sale of low-speed EVs (minimum 3 wheels, max speed 32-40km/h) a. New b. Reconditioned (imported, max 4yrs / 100 000 km) - reduced credits 4. Early action credits: Covering a maximum of 35% of compliance in 2019-2021, and a maximum of 25% in 2022-2024. Post 2025, Draft amendment (June version): Maximum % of compliance by reconditioned EVs is: • 30% in 2022-24 • 20% in 2025-27 • 15% in 2028-30 • 10% in 2031-33 • 0% after 2033	3. Initiative agreements for (a) the sale of used ZEVs (if BEV, EREV, EREV – medium, FCEV or PHEVs and originally sold or leased outside of BC and (b) the sale of zero-emission MHDVs. Credits from initiative agreements can be used to satisfy up to 5% of compliance obligation for a given year. 4. Purchase agreements for the sale of credits from government (at a cost of $5,000 (the penalty rate) + $500 per credit). This is meant to be a last resort due to unforeseen circumstances when no other options are available.	

[7] Though specific requirements on the MDV classes to be included are not yet provided, it is expected that certain manufacturers will take advantage of this, particularly those who convert light-duty gasoline or diesel trucks into BEV and where the weight of the battery exceeds 8,500 pounds. The aim is to prevent a loophole where manufacturers would add weight onto their vehicle to prevent obligations under the light-duty vehicle fleets, reclassifying them as MDV.

	California	Quebec	British Columbia	U.K.

Credits per vehicle sold	Post-2026:
	BEVs: Certification Range Value. Minimum certification range value greater than or equal to 200 miles, determined according to the "California Test Procedures for 2026
	PHEVs (if all-electric range >70 miles) and HFCVs: 1 credit
	From 2026 through 2028, other PHEVs (all-electric range >43 miles) can get partial credit. Sum of:
	• Max. 0.85 partial ZEV credit (calculated using specified range-based formula)
	• Additional credit of 0.15 for US06 all-electric range of min. 10 miles
	• Sum cannot exceed 1.00 credits.
	Environmental Justice Credit:
	• Sales to approved community clean mobility programs (from 2024 through 2031):
	  • +0.5 credit for ZEV
	  • +0.4 credit for PHEVs
	  • Must be sold at 25% discount from CPI-indexed MSRP[8]
	• End-of-lease sales (from 2026 through 2031):
	  • +0.15 credit for ZEVs and PHEVs with MSRP < $40k
	• Below MSRP threshold (from 2026 through 2028):
	  • +0.1 credit for passenger ZEVs and PHEVs with MSRPs < $20k
	  • +0.1 credit for light-duty ZEV/PHEV trucks with MSRPs < $26k
		BEV and FCEVs:
		Maximum 4 credits
		Formula: (0.01 x range (in km) x 0.6214) + 0.5
		PHEVs:
		Maximum 1.3 credit
		Formula: (0.01 x range (in km) x 0.6214) + 0.3
		Low-speed EVs:
		0.15 credit
		Post-2025:
		• BEVs HFCVs receive 1 credit
		• PHEVs with all-electric range of >80km receive 0.5 credits
		• For MY 2025-2027, PHEVs with all-electric range of <80km but >50km can receive credit according to this formula:
		  • Number of credits = (R / 200) + 0.05; where R= all electric range
			Pre-2026:
			• Class A (BEV with range > 80.47km, FECV with range > 80.47km, EREV with range > 121km) - up to max of 4.0 credits per vehicle
			• Class B (PHEV with range >16km, EREV with range >16km but <121km) - up to 1.3 credits per vehicle)
			• Class C (all other BEVs, EREVs, FCEVs, PHEVs with shorter range) - no credits issued
				Only BEVs and FCEVs eligible for credits.
				PHEVs are not eligible for credit under the proposed ZEV mandate design.

[8] A manufacturer's suggested retail price values will begin with the 2026 model year, the first year this value is offered, for the purpose of the price adjustment.

	California	Quebec	British Columbia	U.K.
Early Action Credits	Yes, for the two model years prior to commencement of a manufacturer's ZEV requirements. Each eligible BEVs = 1.0 credit. PHEVs calculated with the method outlined above. Early action credits contribute to max. 15% of a model year's ZEV allowance and can be used for the first three years after the commencement of a manufacturer's ZEV requirements.	Yes, credits from sales in 2014 to 2017 can be applied to cover a maximum of 35% of compliance in 2019-2021, and a maximum of 25% in 2022-2024. Phase out in the proposed amendment = 2025-2027: 20% 2028-2030: 15% 2031-2033: 10% After 2033: 0%	Yes, early action credits from ZEV sales in model year 2019 can be used towards compliance requirements.	None.
Credit trading	Yes—trading between manufacturers allowed. Before trading excess credits, they must be applied to any existing deficits. Trading is not permitted after the 2030 model year.	Yes—trading or selling credits between manufacturers allowed. Must be documented.	Yes—trading between manufacturers allowed.	Yes—trading between manufacturers allowed. No cross-trading between car and van credit systems.
Credit banking	Yes, excess credits from direct sales and EJ credits can be banked and used for future years through 2031. Early compliance credits can be banked and used through 2028. Before carrying over excess credits, they must be applied to any existing deficits. Credits can be banked for max. 4 model years after which the credit was earned.	Yes—but limited to 25% of compliance in a given year. Post 2025: ZEV credits accumulated in 2018-2024 must be divided by 4 and PHEV credits must be divided by 2.2 to adjust to new regulation. As of 2025, credits can only be used during the three year compliance period they were accumulated in or the following compliance period and are subject to the following caps: • 2025-2027: 20% • 2028-2030: 15% • 2031-2033: 10% • 2034 onward: 0%	Yes—credits from previous years can be used to satisfy a current model year compliance requirement. While section 43(e) of the Act allows for regulations providing for the expiration of credits, ZEV credits currently do not expire. However, the oldest model year credits in the supplier's balance are used first towards compliance.	No banking or borrowing. Annual targets are required to be met within the year in which they apply and cannot be met by sales achieved in either prior or future years.[9]

[9] "We want to avoid a mechanism that encourages an oversupply in the first few years followed by a constrained supply at a later date."

	California	Quebec	British Columbia	U.K.
Credit borrowing	Yes, credits from future years can be retroactively applied to existing deficits. A manufacturer must make up the deficit within three model years by submitting a commensurate amount of excess: • ZEV and PHEV credits (2026 through 2030) • Environmental Justice credits (2026 through 2031) • Early Compliance credits (2026 through 2028) or • Pooled ZEV or PHEV credits (2026 through 2030)	Yes, compliance requirements are applied over a 3-year period. Manufacturers can accumulate credits at any point in the compliance period to meet their obligations.	Yes, one grace year is allowed as long as the automaker was in compliance the previous model year. An automaker cannot use two grace years in a row.	No borrowing.
Credit "pooling"	For 2026 to 2030 model years, pooled ZEV and PHEV credits from other section 177 ZEV U.S. states can be utilized up to a specified pooled allowance (% of annual ZEV requirement): • 2026: 25% • 2027: 20% • 2028: 15% • 2029: 10% • 2030: 5% 2031 and beyond will not allow pooled credits. PHEV credits may not be used beyond PHEV allowance.	No pooling credits from other jurisdictions. (i.e. BC ZEV mandate credits cannot be used to comply with Quebec's ZEV mandate).	No pooling of credits from other provinces allowed.	No cross-trading/"pooling" between separate car and van certificate streams.
Penalty for non-compliance	US$5,000/credit The penalty for 1 ZEV credit deficit is equal to the value of 4 ZEV credits, which translates into a penalty of US $20,000 for each ZEV sale an automaker falls short.	C$20,000/credit to reflect the new credit allocation model. + annual indexation	C$5,000/credit (due at the end of the grace year following the year of non-compliance)	Not yet determined.

	California	Quebec	British Columbia	U.K.
Interaction with vehicle CO_2 emission standards	For pre-2026, California's CO_2 regulations and ZEV mandate are two separate regulations. ZEV sales made in compliance with California ZEV mandate count towards the federal CO_2 emission standards but are not awarded "super credits" or any other preferential accounting. GHG regulations for post-2026 have not yet been developed at the state or federal level.	ZEV sales made in compliance with Quebec ZEV mandate can count towards federal CO_2 emission standards.	ZEV sales made in compliance with British Columbia ZEV mandate can count towards federal CO_2 emission standards.	No proposal yet on whether ZEV mandate and CO_2 emissions are linked, partially linked or not linked. For CO_2 regs, proposal is to establish a baseline of the average CO_2 emissions from new ICE and hybrid cars sold over a set period (excluding BEV sales), with a requirement on vehicle manufacturers to not get worse or reduce by a nominal or small amount.

CLEAN ENERGY CANADA