PEMBINA Institute

SUBMISSION

Electric Vehicle Availability Standard

Pembina Institute comments and recommendations

Submitted to Environment and Climate Change Canada

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Electric Vehicle Availability Standard

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Summary

The Pembina Institute urges the federal government to maintain the ambition and integrity of the Electric Vehicle Availability Standard (EVAS). We specifically recommend the following:

- **Do not delay. Timely implementation drives affordability and emissions reductions.** Delaying the EVAS beyond 2027 would erode affordability gains and emission reductions. The current timeline must be maintained to achieve early cost declines and avoid locking in emissions.
- **Stay zero-emission. Exclude conventional hybrids to protect emission goals.** Incorporating conventional hybrids would halve emissions reductions, delay cost savings and prolong fossil-fuel dependance through the 2030s.
- **Set strong targets. Ambition builds confidence and competitiveness.** Committing to at least 50% electric vehicle (EV) sales by 2030 and 90% by 2035 is essential to sustain affordability, meet emissions goals, and give investors and utilities the certainty to plan infrastructure and supply chains.
- **Use flexibility wisely. Support the transition without weakening standards.** Offering flexibility should ease compliance without undermining the EVAS. Limited adjustments to plug-in EVs and EV charging investments can help automakers adapt, but excessive crediting would erode the regulation's impact.

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Context

The Pembina Institute welcomes the opportunity to provide input into the review of the Electric Vehicle Availability Standard (EVAS). The EVAS is an essential regulation for improving electric vehicle (EV) affordability and availability, strengthening Canada's domestic EV market to support a globally competitive supply chain, lowering emissions and improving public health.

A strong EVAS delivers wide-ranging benefits for Canadians

- The EVAS helps make EVs more affordable by increasing model availability, stimulating competition and lowering upfront costs. Over time, EVs also reduce household expenses, saving families an estimated $30,000–40,000 over 10 years through lower fuel and maintenance costs.[1] The standard helps ensure that Canadian drivers have the same level of access to competitive vehicle options and prices as those in major markets such as Europe and China.

- The EVAS protects and grows jobs in Canada's EV industry. At least 130,000 Canadians are currently employed in the sector. By maintaining the EVAS, employment could grow to approximately 600,000 by 2035. Without the standard and related policies, that number could fall by nearly half, to about 360,000 jobs.[2]

- Keeping the EVAS on schedule drives measurable emissions outcomes. By 2035, emissions from light-duty vehicles (passenger cars and light trucks) are projected to fall to 46.9 megatonnes from 79.7 megatonnes while EV adoption reaches 92%, reducing reliance on fossil fuels and directly contributing to Canada's climate goals.

- By accelerating the switch to zero-emission vehicles, the EVAS improves air quality and public health. The resulting reductions in air pollution could deliver over $90 billion in health benefits across Canada over 25 years, including preventing up to 11,000 premature deaths.[3]

[1] Clean Energy Canada, "Charging an EV equal to paying 40 cents a litre for gas: report," June 2024. https://cleanenergycanada.org/charging-an-ev-equal-to-paying-40-cents-a-litre-for-gas-report

[2] Ernst & Young LLP, "Electrifying progress: A complete economic outlook of the Canadian EV industry," prepared for Electric Mobility Canada, April 2025. https://emc-mec.ca/news-post/electric-mobility-canadas-response-to-the-federal-governments-announcement-regarding-the-electric-vehicle-availability-standard

[3] The Atmospheric Fun, "Cancelling EV sales targets could cost 11,000 Canadian lives, climate and health experts warn," July 2025. https://taf.ca/cancelling-ev-sales-targets-could-cost-11000-canadian-lives-climate-and-health-experts-warn/

The EVAS is central to Canada's climate and economic competitiveness

Climate competitiveness is the ability of a country or industry to thrive in a low-carbon global economy. It shows that climate and economic goals can reinforce each other and depends on aligning industrial strategy with climate objectives. For Canada's auto industry, this means diversifying trade and investment beyond the United States, which is aggressively rolling back EV supports even as global EV demand accelerates.

Globally, EV adoption continues to rise rapidly. EVs account for 47% of new sales in China and 20% in Europe, and they are projected to make up one-quarter of all global vehicle sales in 2025.[4] EVs are a climate competitive opportunity for Canada. They allow Canada to develop a future-oriented auto sector aligned with global decarbonization, capture new trade and investment, and create high-quality jobs while reducing emissions.

Building a globally competitive EV supply chain requires investing in both the supply side (parts, vehicle and battery manufacturing) and demand side. While governments have focused heavily on attracting investments in local production and assembly, programs to support EV adoption have been scaled back or face serious uncertainty. Without strong domestic demand, Canada risks underutilizing its manufacturing capacity and undermining its competitiveness.[5]

The low-carbon transition is about growing something new, not simply protecting legacy production. Even before the EVAS was implemented, Canada's auto industry faced significant decline: between 2014 and 2024, total vehicle production fell by more that 50%, and Canada's share of global production also halved.[6] Additionally, sales of gasoline and diesel vehicles have fallen in Canada since 2017,[7] while global EV demand continues to surge (Figure 1). Aligning our industry with this global shift is essential to protect jobs and attract new investment.

[4] IEA, "Global EV Outlook 2025," 2025. https://www.iea.org/reports/global-ev-outlook-2025/trends-in-electric-car-markets-2

[5] Chris Severson-Baker and Adam Thorn (Pembina Institute), "Who's killing Canada's EV dreams? It's not just Trump and his tariffs," *The Globe and Mail*, October 31, 2025. https://www.theglobeandmail.com/business/commentary/article-canada-electric-vehicles-trump-tariffs-carney/

[6] International Organization of Motor Vehicle Manufacturers, "2024 Statistics: Production Statistics." https://oica.net/category/production-statistics/2024-statistics/

[7] Government of Canada, "Table 20-10-0025-01: New motor vehicle registrations, quarterly, by geographic level," September 8, 2025. https://doi.org/10.25318/2010002501-eng

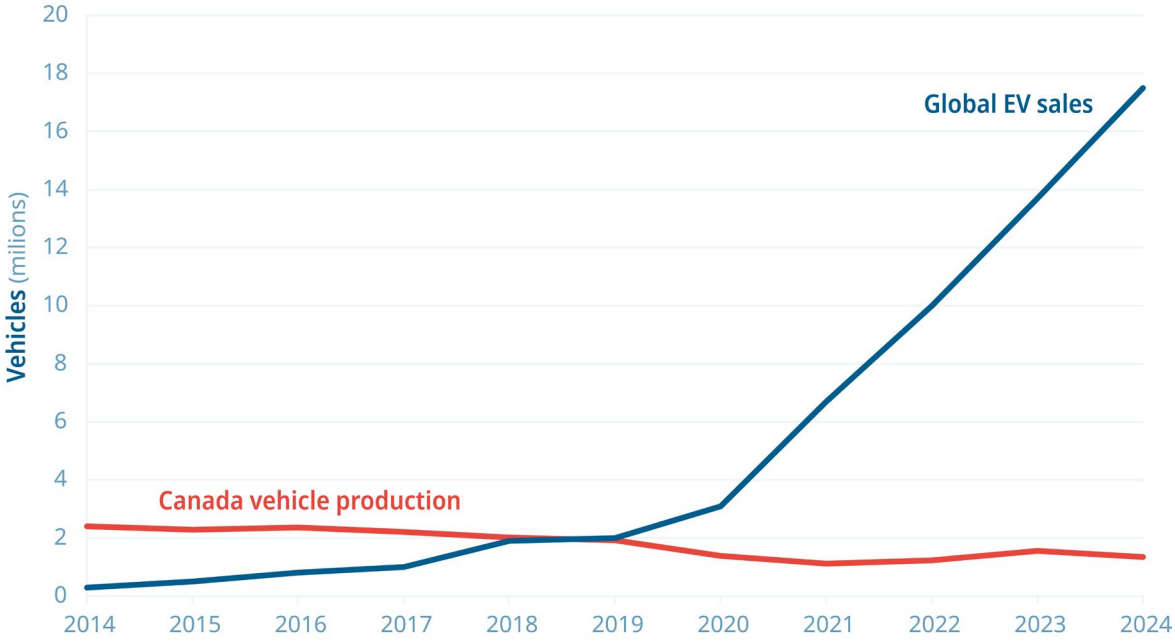

Figure 1. Canadian vehicle production compared to global EV sales

Given the increasing unreliability of the U.S. market and the strategic choices of U.S. automakers, Canada cannot depend on cross-border demand to build a globally competitive EV supply chain. Developing a robust domestic EV market is therefore essential to establishing a resilient, diversified supply chain that underpins long-term competitiveness and economic stability.

Canada is well positioned to succeed, with advantages such as a skilled workforce, clean and reliable electricity and access to critical minerals. Critical minerals represent a significant opportunity to develop Canada's economy; however, their growth potential depends on strong demand for batteries and vehicles. EVs and battery storage are expected to account for roughly half of the mineral demand growth from clean energy technologies over the next two decades.[8]

Maintaining the EVAS is therefore central to an effective industrial strategy. It provides the policy certainty needed to build a stable domestic market that attracts investment and secures Canada's position in the global clean economy. While providing some compliance flexibility is warranted given current trade and market uncertainty, any amendments should preserve the regulation's core benefits: making EVs affordable for consumers and reducing emissions from passenger vehicles in Canada.

The recommendations we present below aim to achieve that balance between maintaining ambition and being adaptable.

[8] IEA, "The Role of Critical Minerals in Clean Energy Transitions," May 2021. https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/mineral-requirements-for-clean-energy-transitions

Discussion and recommendations

We modelled five scenarios to inform our recommendations. Modelling results and assumptions are presented in Appendix A.

Our overall finding is that maintaining and strengthening the EVAS is the most effective path to decreasing Canada's emissions (Figure 2) while improving affordability for Canadian drivers.

Under a revised EVAS, median EV prices fall about 12% by 2035 compared to business-as-usual (BAU), driven by more models and greater market competition. These cheaper prices will accelerate EV adoption, bringing sales to 92% of new vehicle sales by 2035, and reducing total emissions from light-duty vehicles to 46.9 megatonnes (Mt) from 79.7 Mt.

Delaying or weakening the regulation would lead to higher EV costs, slower adoption, and significantly lower improvements in emissions.

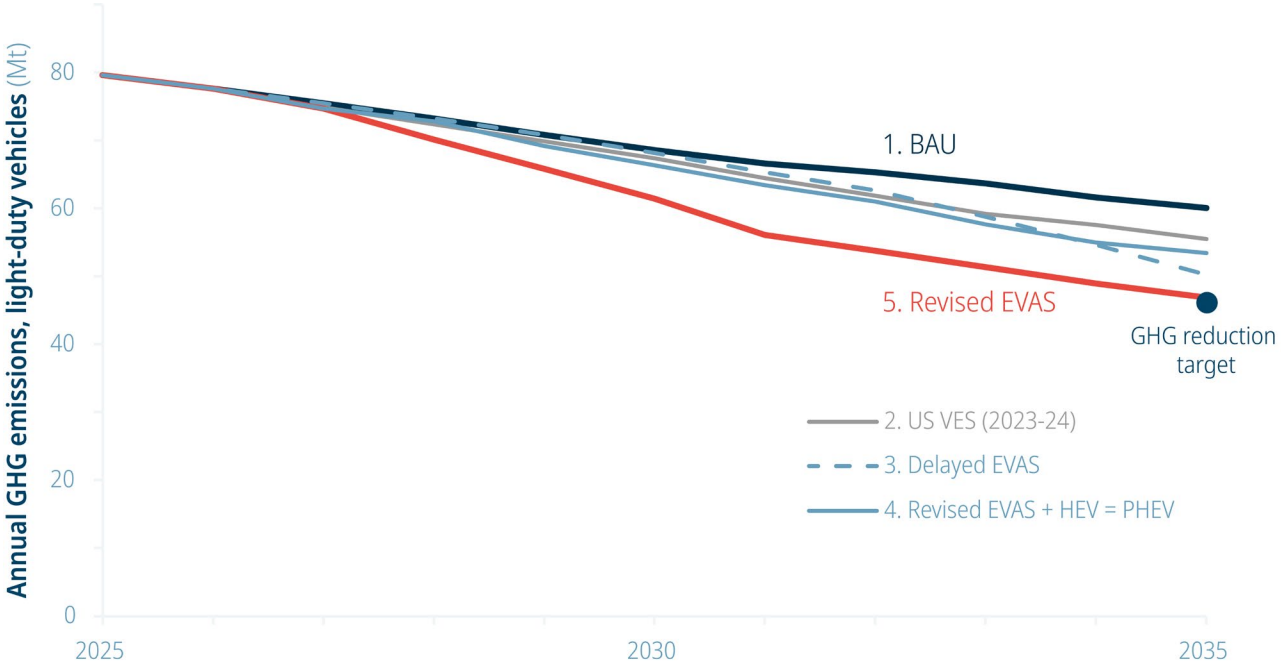

Figure 2. Annual greenhouse gas emissions (GHG) from Canada's light-duty vehicles under different policy scenarios

Abbreviations: VES: vehicle emissions standard; HEV: hybrid electric vehicle; PHEV: plug-in hybrid electric vehicle

Recommendation 1: Maintain timely implementation to drive affordability and emissions reductions

The current EVAS implementation timeline should be kept. The early years of the regulation are disproportionately important for driving down EV prices and realizing economic and health benefits. Because vehicle stock turnover in Canada is slow (historically around 5% per year), any

delays or weakening of early targets would have long-term impacts on affordability and emissions.

Under the EVAS, the average price of an EV in 2035 is projected to be around $40,000, compared with $46,000 under a BAU scenario — a reduction of nearly **$6,000 (12%) per vehicle**. Households would also save an additional $30,000–40,000 per vehicle over 10 years in reduced fuel and maintenance costs.

Delaying implementation of the regulation will cost Canadian consumers. Figure 3 clearly illustrates the potential impact of a delay on EV prices relative to alternative policies.

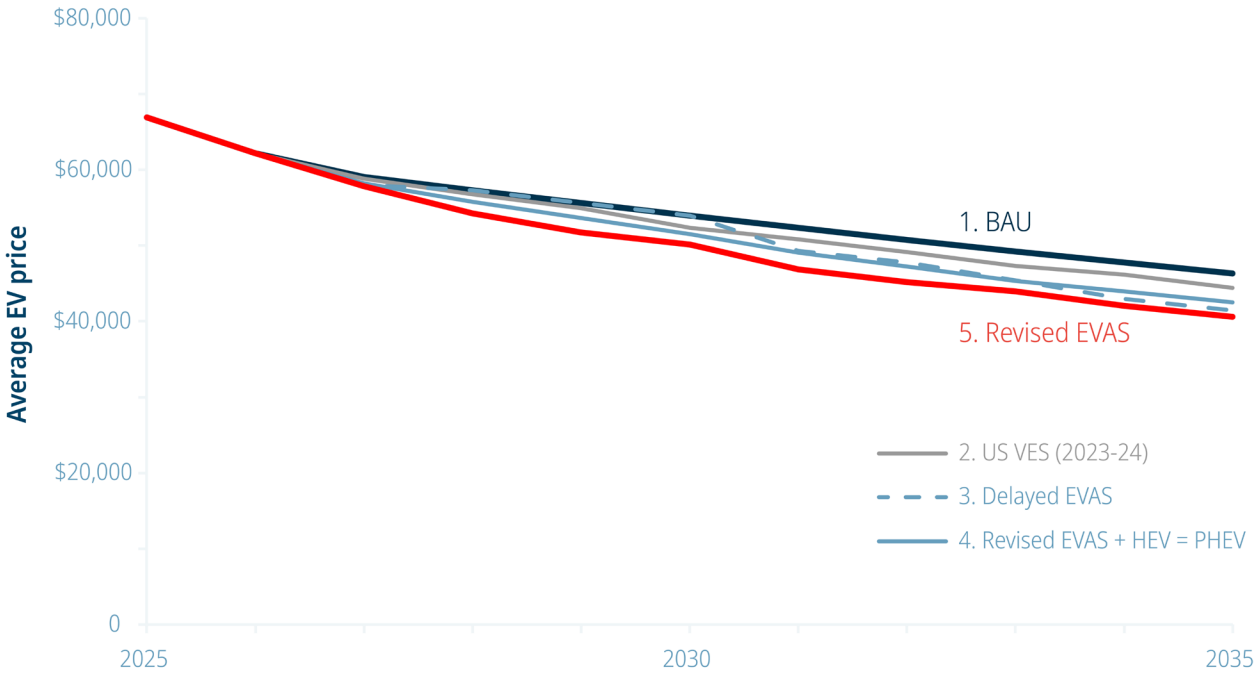

Figure 3. Projected median new EV prices in Canada under different policy scenarios

Postponing implementation does more than shift outcomes by a few years; it wipes out Canada's cumulative emissions reductions this decade, as shown in Figure 4. The federal government has committed to reducing greenhouse gas emissions by 40–45% below 2005 levels by 2030, and 45–50% by 2035, on the path to net-zero by 2050. Canada's light-duty vehicle sector emitted 84 Mt carbon dioxide equivalent (CO_2e) in 2005.[9] Assuming reduction targets are applied uniformly across all sectors of the economy, emissions from this sector need to fall to approximately 46 Mt or lower by 2035.

[9] Government of Canada, "Greenhouse gas emissions." https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/greenhouse-gas-emissions.html#transport

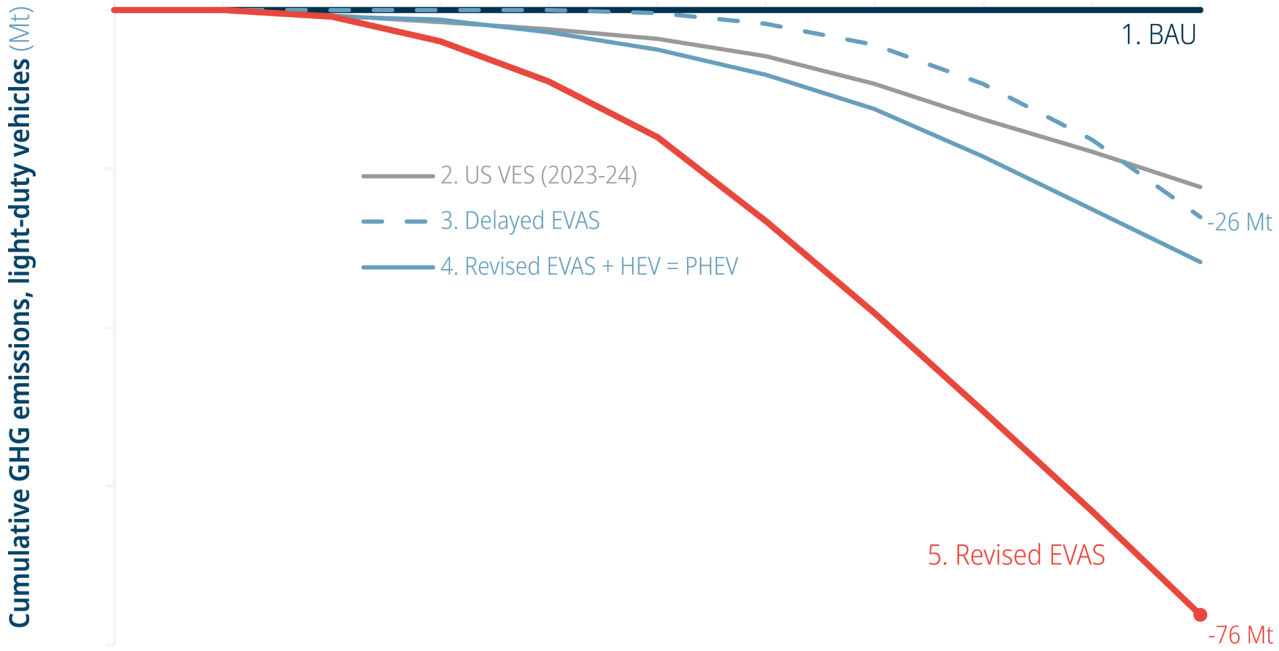

Figure 4. Cumulative greenhouse gas emissions reductions from Canada's light-duty vehicles under different policy scenarios

Modelling shows that achieving this level requires an EV market share of at least 85–90% by 2035.[10] Under the BAU scenario (without the EVAS or the vehicle emissions standard), annual emissions do decrease but remain significantly above the 2035 target (Figure 2). **Delaying the EVAS until 2030 would result in an additional 50 Mt CO_2e emitted between 2026 and 2035, significantly eroding the regulation's cumulative impact (Figure 4).**

Recommendation 2: Exclude conventional hybrids to protect emission outcomes

The EVAS should remain focused on speeding up the adoption of zero-emission vehicles (ZEVs) and continue to exclude conventional (non-plug-in) hybrids.

Allowing new fossil-fuel vehicles by including hybrids would more than halve expected emissions reductions. Each conventional hybrid vehicle sold today locks in fossil-fuel use for another decade or more, directly displacing EVs, raising cumulative emissions and delaying cost parity and infrastructure readiness.

[10] Chandan Bhardwaj and Jonn Axsen. "How Stringent Should Vehicle Emission Standards Be? Simulating Impacts on Greenhouse Gas Emissions, Zero-Emissions Vehicle Sales, and Cost-Effectiveness," *Canadian Public Policy* 50, no. 1 (2024). https://doi.org/10.3138/cpp.2023-002

The variation arises due to uncertainty over battery costs, consumer preferences, vehicle travel and annual vehicle sales.

Figure 4 shows that including conventional hybrids (scenario 4) achieves a 31.7 Mt reduction in emissions, compared to 76.2 Mt under the ZEV-only scenario 5. Scenario 4 also delays cost parity between internal combustion engine vehicles and battery electric vehicles by two years (Figure 3).

Recommendation 3: Set strong targets — at least 50% by 2030 and 90% by 2035

The 2030 targets should remain at or above 50% and 2035 targets at or above 90%, with appropriate adjustments to the intervening years to ease compliance for the automakers. This represents the minimum level of ambition needed to keep Canada competitive with global peers and aligned with its national climate commitments, which remain in place.

Any discussion about targets should consider the following:

- The regulatory flexibilities contained in the regulation, as well as those under consideration (see below), mean headline targets overstate the share of EVs automakers must actually deliver. For example, automakers can earn early action credits for EV sales before the targets are in effect. They can then use these credits to offset future compliance obligations. Some estimates suggest that the original 2026 target of 20% EV sales would translate to roughly 15% actual EV sales when early action credits are applied.

- The early targets of the EVAS are especially important for reducing costs and achieving long-term emissions reductions. Figures 3 and 4 both illustrate the significance of being ambitious early on.

- Clear sales targets play an essential role in providing certainty for those planning and investing in charging infrastructure. A 2024 Natural Resources Canada study found that sales targets give utilities a credible signal about the pace of electrification and help them prepare for future EV load growth:

  > "The consensus we heard from utilities across the country is that Canada's ZEV regulated sales targets are feasible. In fact, mandatory ZEV adoption targets (such as those already in place in B.C. and Quebec and recently published by the federal government) give utilities a clear picture of the likely pace of transportation electrification, helping them prepare for the challenges of future EV load growth."[11]

[11] Dunsky Energy + Climate Advisors, "Electric Vehicle Charging Infrastructure for Canada," prepared for Natural Resources Canada, February 2024. https://natural-resources.canada.ca/energy-efficiency/transportation-energy-efficiency/resource-library/electric-vehicle-charging-infrastructure-canada#a6

- Eliminating the 100% target for 2035 addresses public and automaker concerns that internal combustion engine vehicles would be completely "banned." Maintaining a clear 90% target preserves ambition and reduces misunderstandings.

Recommendation 4: Apply flexibility carefully to preserve the integrity of the EVAS

Compliance options can help automakers with the transition but must not undermine the standard's intent. **Any new or extended flexibilities should remain narrowly focused**, preserving the core requirement to sell zero-emission vehicles.

Currently, flexibilities can reduce the effective compliance obligations by at least 10%. For instance, a 60% target in 2030 could be met with 54% actual EV sales, with the remaining 6% covered by credits (equivalent to 10% of the 60% target). Lowering the target to 50% would reduce effective EV sales to roughly 45%, slowing market development and weakening consumer benefits just as global competition accelerates.

Flexibilities being considered

Several new flexibilities have been proposed during the consultation period. Each should be evaluated against its potential impact on EV uptake and regulatory integrity:

- *Auto supply chain investment credit:* Rewarding automakers for investments in Canada is positive in principle, but investment credits are difficult to verify and do not guarantee vehicle production or sales. Several automakers previously announced retooling their plants for manufacturing EVs with investments and other supports from federal and provincial governments; many of those projects have since been stalled or cancelled. For this reason, production-linked incentives or credits for made-in-Canada EVs are preferable (discussed below) to broad auto investment credits.

- *Affordability credit:* This would provide a partial credit for vehicles below a set manufacturer's suggested retail price, recommended around $45,000. Given how few EVs are currently below that threshold, the direct effect on regulatory stringency would be limited. However, it would send a valuable signal to industry, encouraging manufacturers to prioritize lower-cost models.

- *Made-in-Canada credit:* Offering enhanced credits for EVs manufactured in Canada under the EVAS could encourage domestic production. For example, issue 1.5 credits per light-duty EV or multiple credits for medium-duty EVs. Because Canada currently produces almost no light-duty EVs, the near-term impact would likely be small, but the policy would send a clear market signal that could help attract future investment.

Flexibility options we recommend

To help automakers transition to EVs while maintaining regulatory integrity, we advise providing flexibility in two areas:

1. **Plug-in hybrid electric vehicles (PHEVs):** We recommend increasing the allowable PHEV contribution to compliance, especially for mid- and longer-range PHEVs. Currently, a company's ability to meet its compliance obligation with PHEVs is capped at 45% in 2026, 30% in 2027, and 20% from 2028 onward. We recommend increasing the PHEV cap for 2027 to 2030 to 45% (see Table 1 below). PHEVs offer a number of benefits.[12] These include higher driving range that helps address range anxiety, greater acceptance among some consumer segments relative to all-electric vehicles, and reduced infrastructure costs for governments responsible for deploying public charging. They also lower compliance costs for automakers and reduce demand for critical minerals.

   Earlier modelling shows that even if PHEVs represent up to 50% of all EVs by 2030, Canada can still achieve its 2030 GHG reduction targets, factoring in variations in electric-drive utilization rates.[13]

   About half of Canada's auto industry stands to benefit directly from this proposed relaxation. And because the sector is made up of global automakers, those gains flow to companies offering some of Canada's top selling PHEVs.[14] We continue to emphasize though that the regulation should not include conventional hybrids as these provide no real reductions in emissions or air pollution.

[12] Chandan Bhardwaj, "Why we like plug-ins: 5 reasons for sticking with hybrid passenger cars a little longer," *Pembina Institute*, June 2024. https://www.pembina.org/blog/why-we-plug-ins

[13] Jonn Axsen, Chandan Bhardwaj, and Curran Crawford. "Comparing policy pathways to achieve 100% zero-emissions vehicle sales by 2035," Transportation Research Part D: Transport and Environment 112 (2022). https://doi.org/10.1016/j.trd.2022.103488

[14] Timothy Cain, "Canada's best-selling cars, trucks, SUVs, auto brands in 2025's first quarter," *Driving.ca*, April 2025. https://driving.ca/column/driving-by-numbers/best-selling-cars-trucks-suvs-brands-canada-2025-q1

Toyota Canada, "Toyota Canada Releases March and Q1 Sales Results." https://www.toyota.ca/en/discover/news/2025/toyota-canada-releases-march-and-q1-sales-results/

Timothy Cain, "Best-Selling Cars: Canada's best-selling EVs and PHEVs in 2024's first eight months," *Driving.ca*, October 2024. https://driving.ca/column/best-selling-ev-phev-2024-first-eight-months

Table 1. Proposed adjustments to the PHEV cap

Year	PHEV cap		Estimated reduction in compliance costs for automakers
	Current	Recommended	
2026	45%	45%	–
2027	30%	45%	1–3%
2028, 2029, 2030	20%	45%	5–10%
2031 and later	20%	20% (to review in 2030)	–

2. **EV charging infrastructure credits:** We recommend introducing an EV charging infrastructure credit of 5% of the total annual EV credits after 2030; currently no infrastructure credits are available post-2030 (Table 2). Investments in charging infrastructure will support market growth by ensuring sufficient charging capacity. It also gives automakers flexible ways to reduce compliance costs while contributing to the broader electrification ecosystem.

   A 2024 study by Natural Resources Canada estimates that the charging infrastructure needed to support the federal EV targets will require significant capital investments by both governments and private actors between now and 2040.[15]

   The study estimates that capital costs for light-duty vehicle chargers will remain constant, at about $1 billion annually, between 2025 and 2040. Around 1.5 million light-duty vehicles are sold in Canada each year, and we assumed that the same number of vehicles will be sold in 2035.

   Under the current regulation, 100% of vehicles sold will need to be EVs. This means that between 750,000 and 1.5 million EV credits will be created in 2035, depending on the share of PHEVs and battery electric vehicles. Providing a credit limit for investments in EV charging infrastructure of 5% can generate between 37,500 and 75,000 credits. At a rate of one credit per $20,000 invested, automakers would need to invest between $750 million and $1.5 billion in 2035 to earn these EV credits. This is in line with the $1 billion annual investment needed as estimated above.

[15] Government of Canada, "Electric Vehicle Charging Infrastructure for Canada," February 2024. https://natural-resources.canada.ca/energy-efficiency/transportation-energy-efficiency/resource-library/electric-vehicle-charging-infrastructure-canada

Table 2. Recommended credit caps for EV infrastructure

Year	Infrastructure cap		Potential incremental contribution by automakers to charging infrastructure
	Current	Recommended	
2026 to 2030	10%	10% (no change suggested)	–
2031 and beyond	0%	5%	~$1 billion annually

Recommendation 5: Increase transparency in EV credit trading

As Canada's EV market matures, transparency in credit trading will become increasingly important to maintain public confidence and accountability. Automakers should be required to report annual credit trading activity and prices, including the effect of early action credits on compliance.

California's Zero-emission Vehicle Regulation offers a useful example, as the California Air Resources Board publishes annual credit balances for each manufacturer. Adopting a similar system in Canada would ensure that the EVAS remains flexible without compromising its integrity.

Conclusion

The Pembina Institute appreciates the opportunity to contribute to the review of the EVAS. We look forward to continued collaboration with the federal government to ensure that the standard remains a strong, credible and effective driver of affordability, competitiveness and emissions reduction.

Appendix A: Modelling

Model description

The AUtomaker-Consumer Model (AUM) was used to simulate the long-term impacts of the Electric Vehicle Availability Standard (EVAS) and other policy scenarios on Canada's light-duty vehicle sector. The model was developed by Dr. Chandan Bhardwaj (a contributor to this submission) in collaboration with Prof. Jonn Axsen at Simon Fraser University.

The AUM is unique in that it models the long-term dynamics between consumers and automakers. On the consumer side, it represents consumer heterogeneity through three distinct consumer segments. The parameters for consumer vehicle choice are empirically informed from survey data, thus accounting for consumer preferences, rather than only financial cost considerations in technology choice.

On the automaker side, the AUM includes a detailed view of the mechanisms used by automakers to comply with policies, including investing in ZEV-related research and development, changing prices, improving technology, increasing model variety, and deploying infrastructure.

This submission provides only a high-level description of the AUM. The detailed model structure (which includes model calibration) is available in "Simulating automakers' response to zero emissions vehicle regulation."[16] The AUM has subsequently been applied in several climate policy analyses.[17]

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[16] Chandan Bhardwaj, Jonn Axsen, and David McCollum, "Simulating automakers' response to zero emissions vehicle regulation," *Transportation Research Part D: Transport and Environment* 94 (2021), 102789. https://doi.org/10.1016/j.trd.2021.102789

[17] For example, see:

Chandan Bhardwaj, Jonn Axsen, and David McCollum, "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* 117 (2022), 152–168. https://doi.org/10.1016/j.tranpol.2021.12.012

Chandan Bhardwaj, Jonn Axsen, and David McCollum, "Which 'second-best' climate policies are best? Simulating cost-effective policy mixes for passenger vehicles," *Resource and Energy Economics* 70 (2022), 101319. https://doi.org/10.1016/j.reseneeco.2022.101319

Jonn Axsen, Chandan Bhardwaj, and Curran Crawford, "Comparing policy pathways to achieve 100% zero-emissions vehicle sales by 2035," *Transportation Research Part D: Transport and Environment* 112 (2022), 103488. https://doi.org/10.1016/j.trd.2022.103488

Chandan Bhardwaj, Jonn Axsen, and Curran Crawford, "Simulating long-term emissions from private automated vehicles under climate policies," *Transportation Research Part D: Transport and Environment* 118 (2023), 103665. https://doi.org/10.1016/j.trd.2023.103665

Key scenarios and findings

Scenarios modelled

We modelled the following five scenarios to assess the impacts of the EVAS on emissions and EV affordability. Table 3, below, presents the summary results for each scenario.

1. **Business as usual (BAU):** Includes climate policies in place as of October 2025:
    - *Clean Fuel Regulations:* Requires the carbon intensity of liquid fuels to decline annually, reaching 14 grams of CO_2 equivalent per megajoule (gCO_2e/MJ) by 2030. This means that the gasoline intensity equals 93.9 gCO_2e/MJ in 2021 and 2022; 91.5 gCO_2e/MJ in 2023; and 81.0 gCO_2e/MJ in 2030. We also accounted for the more stringent B.C. low-carbon fuel standard (reaching 76 gCO_2e/MJ by 2030), for a Canada-wide average of 80.5 gCO_2e/MJ in 2030.
    - *Charging deployment:* Assumes 60% of drivers have access to charging by 2030, rising to 90% by 2035.
    - *Vehicle emissions standard (VES):* Aligned with the U.S. VES, with fleet-wide requirements improving from 140 gCO_2e/km in 2021 to 107 gCO_2e/km in 2025 and held flat at 102 gCO_2e/km from 2026 to 2035. (Starting in 2026, non-ZEV fuel economy is held constant.)
    - *Provincial ZEV standards:* Includes B.C. (90% ZEV sales by 2030, 100% by 2035) and Quebec (60% by 2030, 90% by 2035).
    - *Purchase incentives:* No federal purchase incentive is included.
2. **US VES (2023-24):** Identical to BAU but applies a more stringent VES, requiring a 50% reduction in new light-duty vehicle emissions between 2027 and 2032 (a 10% annual reduction in emissions intensity, to roughly 50 gCO_2/km, in 2032), which then remains flat through 2035.
3. **Delayed EVAS:** Identical to BAU, but it introduces the EVAS only after 2030, with sales targets of 35% ZEVs in 2031, rising rapidly to 90% by 2035.

Chandan Bhardwaj and Jonn Axsen, "How Stringent Should Vehicle Emission Standards Be? Simulating Impacts on Greenhouse Gas Emissions, Zero-Emissions Vehicle Sales, and Cost-Effectiveness." *Canadian Public Policy* 50, no. 1 (2024), 149–170. https://doi.org/10.3138/cpp.2023-002

Chandan Bhardwaj and Jonn Axsen, "Purchase subsidies for 100% zero-emissions vehicle sales goals: Effectiveness, government cost, and supplier capture." Transportation Research Interdisciplinary Perspectives 29 (2025), 101305. https://www.sciencedirect.com/science/article/pii/S2590198224002914

Jonn Axsen and Chandan Bhardwaj, "Subsidies, Standards, or Both? Trade-Offs among Policies for 100% Zero-Emissions Vehicle Sales." *Environmental Science & Technology* 59, no. 4 (2025), 1932–1941. https://pubs.acs.org/doi/full/10.1021/acs.est.4c11772

4. **Revised EVAS with conventional hybrids (Revised EVAS + HEV = PHEV):** Identical to BAU, but it includes the EVAS with 50% ZEV sales by 2030 and 90% by 2035. Allows conventional hybrids, treating them like plug-in hybrids under the EVAS. Convention hybrids can earn 0.75 credits per vehicle until 2035, which can be used to cover up to 20% of annual credits.

5. **Recommended scenario (Revised EVAS):** Identical to the BAU except EVAS begins in 2027, with targets of 50% ZEV sales by 2030 and 90% by 2035 (aligned with the standard as originally designed).

Table 3. Modelled EVAS scenarios and high-level results

Scenario	Description	EVAS sales targets	2027–2035 cum. GHG reductions rel. to BAU (Mt)	2035 median EV price change rel. to BAU
1. BAU	Includes the Clean Fuel Regulations and a VES that is flattened at 2026 levels.	No EVAS	–	–
2. US VES (2023-24)	BAU with US VES (2023-24) (–10% in emissions intensity per year to 50 gCO_2/km for light-duty vehicles in 2032).	No EVAS	–22.31	–4%
3. Delayed EVAS	Scenario 5, but start of the EVAS delayed until 2030.	50% by 2030 90% by 2035	–26.05	–11%
4. Revised EVAS + HEV = PHEV	Scenario 5, but includes conventional hybrids and treats them like PHEVs under the EVAS.	50% by 2030 90% by 2035	–31.75	–8%
5. Revised EVAS	Original EVAS with one-year delay (starting in 2027 instead) and lower targets for 2030 and 2035.	50% by 2030 90% by 2035	–76.21	–12%

Key emissions findings

- BAU scenario: Total light-duty vehicle emissions reach 60 Mt by 2035, driven by the Clean Fuel Regulations and lower vehicle emission standards for new vehicles. While ZEV market share reaches 54% by 2035, emissions remain well above the 46 Mt national target for 2035.

- US VES (2023-24) scenario: The slow turnover of the vehicle stock delays emissions reductions across the fleet. The rapid reductions from new vehicles take time to be reflected in total light-duty vehicle emissions. Emissions fall by about 5 Mt relative to BAU, reaching 55 Mt by 2035. Increasing the stringency of the VES further, such as by aligning with the European Union VES, would yield deeper reductions, approaching the performance of the EVAS.

- Delayed EVAS: Postponing implementation of the EVAS until 2030 results in rapid emissions decline once it takes effect, but cumulative emissions remain too high to meet the 2035 target.
- Revised EVAS + HEV= PHEV scenario: Battery electric and plug-in hybrid vehicles make up 75% of sales by 2035, but a high share of conventional hybrids prevents achieving the emissions reduction target.
- Revised EVAS: Achieves 92% ZEV sales by 2035, reducing emissions to 46.9 Mt, consistent with Canada's 2035 target.

Key affordability findings

- Under the BAU scenario, the decline in EV prices is largely influenced by external factors, such as global trends in reduced battery costs.
- The Revised EVAS scenario results in a 12% incremental decline in EV prices in 2035 relative to the BAU scenario. Other scenarios lead to smaller price declines, with the magnitude of reduction directly proportional to the stringency of the policy.
- The policy-driven declines in EV prices occur through at least the following three automaker compliance mechanisms:
    - Automakers cross-subsidize or adjust vehicle prices. That is, they reduce EV prices to encourage EV adoption. They offset this by increasing prices for internal combustion engine vehicles. Automakers reduce their profit margins, say from 10% to 8%, effectively offering EVs at a discount. Cross-price subsidization explains about 90% of the total policy-induced price declines.
    - Automakers offer a greater variety of models, increasing the number of cheaper EV models.
    - Automakers increase investment in research and development, which leads to production cost declines. However, the impact of this mechanism is small (~3%).