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MECA COMMENTS ON
ENVIRONMENT AND CLIMATE CHANGE CANADA'S
PROPOSED AMENDMENTS TO THE PASSENGER AUTOMOBILE AND LIGHT TRUCK
GREENHOUSE GAS EMISSION REGULATIONS

MECA appreciates the opportunity to provide comments on Environment and Climate Change Canada's Proposed Amendments to the Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations. To date, technology neutral performance-based standards have consistently proven to result in the most robust strategies to cost-effectively reduce GHGs. In particular, an important opportunity exists between now and 2035 for multiple solutions, including hybrid-electric vehicles (HEV) and battery electric vehicles (BEV), advanced powertrain technologies, and lower carbon fuels to continue to reduce GHGs as well as improve air quality in all segments of light and medium duty passenger vehicles.

MECA is a non-profit association of the world's leading manufacturers of technologies for clean mobility. Our members have nearly 50 years of experience and a proven track record in developing and manufacturing emission control, engine efficiency, battery materials, electric vehicle components and charging equipment as well as electric propulsion technology for a wide variety of on-road and off-road vehicles and equipment in all world markets. Our industry has played an important role in the emissions success story associated with light-, medium- and heavy-duty vehicles in North America, and has continually supported efforts to develop innovative, technology advancing, emission reduction programs to improve ambient and local urban air quality while reducing greenhouse gases.

MECA members represent over 70,000 of the nearly 300,000 North American jobs building the technologies that improve vehicle fuel economy and reduce their emissions. Emission control, engine efficiency and electric technology manufacturers invest billions of dollars each year in developing the technologies that reduce emissions from mobile sources. In fact, automotive technology suppliers account for approximately 40% of the auto R&D conducted in North America each year[1].

[1] Motor & Equipment Manufacturers Association

Several pathways are available through a combination of technologies provided by MECA members to simultaneously meet future GHG (CO_2, CH_4, N_2O, etc.) and criteria pollutant (NOx, PM, HC and CO) emission targets. These include full electrification via battery electric and hydrogen fuel cells as well as electrified powertrains with engines employing advanced combustion components such as turbochargers, EGR systems, cylinder deactivation, fuel injection, exhaust emission control catalysts, substrates and evaporative control system architectures. MECA member companies continue to invest in battery, fuel cell and electric powertrain technologies. This includes research and development in critical battery materials and the design and production of batteries, electric motors and electric powertrain components and management technologies. It is clear that the investments in technology, announcements of ZEV vehicle introduction and rigorous CO_2 targets being set by countries around the world supports the implementation of stringent targets.

Of particular note, technology suppliers rely upon their legacy businesses to make investments in technology development and manufacturing to prepare for the future needs of their customers. Finalization of the proposed amendments will provide regulatory certainty to suppliers. However, current supply chain disruptions continue to impair vehicle production volumes and present risk to supplier investments. We urge the Canadian government to continue to monitor the transportation market and make decisions that will reinforce market stability to obtain the greatest cost-effective criteria pollutant and greenhouse gas reductions from the entire transportation sector.

Summary

MECA supports ECCC's proposed regulations and is providing some comments, which could help to further address potential gaps in the proposed regulations. Our suggestions for ECCC's consideration are summarized here and explained in greater detail in the text that follows:

1. As the current ZEV sales rate in Canada varies significantly between the provinces and is overall considerably lower than California, Canada will require additional strategies to support transportation sector decarbonization targets on the currently proposed timeline.
2. Canada should allow more flexibility for PHEVs to contribute greater than 20% of a manufacturer's ZEV compliance to provide additional affordable ZEV consumer vehicle choices and to serve as a buffer while charging infrastructure and critical battery material supply chains develop. This is especially important with regards to larger light duty trucks (pick-ups and SUV).
3. Canada should consider additional performance-based standards and other strategies to support the accelerated market penetration of new non-plug-in hybrid electric vehicles and other vehicles that provide significant GHG reduction and mitigate risk during the build-out of infrastructure and transition to full ZEV sales requirements.

4. We also support the adoption of ZEV assurance measures (battery performance and warranty) that will advance ZEV technology and ensure improved durability and operability that will benefit all owners of electric vehicles (first, second and third) and ensure the intended emission reductions.

ZEV Proposal

The California Air Resources Board (CARB) first adopted the ZEV requirement in 1990[2] as part of the Low Emission Vehicle regulation. Over the last 30 years, the ZEV regulation combined with significant consumer purchase incentives have yielded a new ZEV sales penetration of 18.8%[3] in 2022. In Canada, only 7.2% of new light-duty vehicles sold across the country in the first half of 2022 were zero-emission vehicles (ZEV) [4]. The lower current ZEV sales penetration rate in Canada will undoubtedly remain a challenge and needs to nearly triple to meet the ECCC proposed 20% penetration rate in 2026. Further, the Canadian proposal requires significantly higher ZEV sales growth rates from 2028 to 2033 - 38 to 89% higher than the target growth rate in California. In addition, the proposed target ZEV sales penetration rate is projected to exceed California requirements by 2032 as shown in Figure 1 below.

Model Year	California ZEV Sales Requirement	California ZEV Sales Requirement Increase	Canada ZEV Sales Requirement	Canada ZEV Sales Requirement Increase
2022	18.8% (Actual)		7.2% (Actual)	
2026	35%		20%	
2027	43%	+8%	23%	+3%
2028	51%	+8%	34%	+11%
2029	59%	+8%	43%	+9%
2030	68%	+9%	60%	+17%
2031	76%	+8%	74%	+14%
2032	82%	+6%	83%	+9%
2033	88%	+6%	94%	+11%
2034	94%	+6%	97%	+3%
2035	100%	+6%	100%	+3%

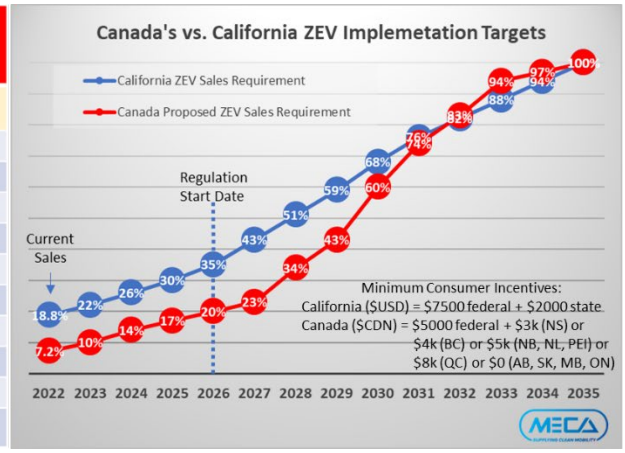

Figure 1. *A Comparison of California and Canada ZEV Sales Requirements.*

A further challenge is represented by the ratio of the average new EV sales price to the average Canadian salary. According to the Canadian Automobile Association, there were 80 battery-electric vehicles on sale in Canada in 2022 with an average price is $82,000 CAD[5] which represents ~134% of the average Canadian salary[6]. This compares to ~105% for California residents based upon the November Kelley Blue Book average new EV sales price[7] and reported average California salary[8].

[2] California Air Resources Board Zero-Emission Vehicle Program.
[3] California ZEV Sales Near 19% of All New Car Sales in 2022, California Air Resources Board, Jan. 20, 2023.
[4] Electric Vehicles Accounted for 10 Percent of Global Sales in 2022, The Car Guide, Jan. 17, 2023.
[5] Canada EV Sales Up By A Third In 2022, Still Behind The Rest Of The World, InsideEVs, Nov. 26, 2022.
[6] The Average Canadian Salary in 2022,
[7] Electric Car Prices Soar In November 2022: Average Price $65K, Inside-EVs, Dec. 14, 2022.
[8] What is the average salary in California 2022?, Calendar-Canada,

California residents also have access to higher value purchase incentives than Canadian residents. Currently, California residents are entitled to a $7500 federal tax incentive and a minimum $2000 state Clean Vehicle Rebate. Further, the California Air Resources Board provides supplementary financial incentives under their Clean Cars 4 All and Clean Vehicle Assistance Programs[9] that in total could amount to as much as an additional $7000 USD for lower income new car purchasers.

Given the more ambitious Canadian ZEV sales proposal and the absence of ZEV incentives in Alberta, Saskatchewan, Manitoba and Ontario, it is apparent that additional federal strategies will be needed to support a uniform national program or address the provincial variations that exist.

In addition, MECA is concerned about the rate of a uniform charging infrastructure build-out., Within California, there is a cross government collaborative effort between the governor's office, CARB, the California Energy Commission (CEC) and California Public Utilities Commission (CPUC). To ensure success of a Canadian program, there will need to be an even broader collaborative effort including the equivalent federal and provincial departments and agencies. In particular, it is important that the federal government ensure that the build-out of infrastructure ensures equity for lower income areas in all provinces.

As a result, we ask that ECCC schedule, review and publish progress updates on ZEV and infrastructure implementation rates as well as identify potential challenges to ensure the availability of accurate public information regarding projected ZEV progress in Canada.

We also ask that Canada consider additional in-parallel strategies such as faster deployment of full hybrid vehicles and lower carbon fuels as discussed in the following sections of our comments.

Post 2026 Credit Qualifications for PHEVs and HEVs

MECA commends ECCC's proposal to adopt CARB's changes to PHEV minimum manufacturer requirements. In particular, we support ECCC's provision of the transitional credit allowance in 2026-2028 with all-electric range requirement of >50 kms to 79km.

MECA agrees that PHEVs, as defined by the proposed minimum requirements, will continue to be an important compliance strategy which can integrate and optimize the best of combustion and electric technologies to increase vehicle efficiency and facilitate the transition to fully zero tailpipe emissions vehicles as the charging infrastructure and supply chains develop. In addition, PHEVs have enjoyed particular popularity with lower income subscribers under CARB's Clean Cars 4 All Program.

[9] Clean Transportation Equity Incentives, California Air Resources Board.

Table 1. *Comparison of Battery Capacities of Conventional, Full Hybrid, Plug-in Hybrid and Battery Electric Vehicles.*

	2022 Toyota RAV4 AWD 2.5L, 4cyl.	2022 Toyota RAV4 AWD Hybrid 2.5L, 4cyl.	2022 Toyota RAV4 Prime AWD PHEV 2.5L, 4cyl.	2022 Tesla Model Y Long Range AWD BEV
				
EPA Fuel Economy (MPGe)	28	40	Elec + Gas: 94 Gas only: 38	Electric 122
Tailpipe & Upstream GHG (grams/mile)	381	267	AB, SK, NS: ≥210 BC, ON, QC: ≤120	AB, SK, NS: ≥130 BC, ON, QC: ≤30
CO_2 Avoided (grams/mile) ***with respect to RAV4 AWD conventional gasoline vehicle	-na-	114	AB, SK, NS: ≥171 BC, ON, QC: ≤261	AB, SK, NS: ≤251 BC, ON, QC: 350
Vehicle Battery Capacity (kWh)	-na-	1.6	18.1	100
Vehicles Produced from 100 kWh battery capacity	-na-	62	5	1
CO_2 Avoided per kWh Battery Capacity (grams/mile)	-na-	71.2	9.4 – 14.4	2.5 – 3.5

Table 1 above provides a comparison of the tailpipe & upstream greenhouse gas emissions for similar sized conventional, full hybrid, plug-in hybrid and full electric vehicles using available data from Figure 4 of the Canadian House of Commons Report "The Road Ahead: Encouraging the Production and Purchase of Zero-Emission Vehicles in Canada"[10] and the U.S. EPA/DOE fueleconomy.gov website. The comparison makes clear that the benefits obtained from plug-in electric vehicles varies significantly with the carbon intensity of the supplying electricity grid.

With regards to ZEVs, the data in Table 1 shows that 5 PHEVs could be deployed using the same total battery capacity as one BEV, resulting in a far greater cumulative amount of avoided CO_2 (5PHEVs =5 x 261 g/mile = 1305 g/mile of avoided CO_2 vs. 1BEV@350 g/mile) while using an equivalent amount of battery materials.

Based on this comparison, we ask that ECCC raise the 20% cap that PHEVs can contribute to a manufacturers ZEV obligation in the early years of its ZEV program. MECA believes that the proposed PHEV minimum requirements address the shortcomings of some earlier generation PHEVs. Allowing a higher PHEV cap in the early years of the ECCC ZEV program should serve to stabilize new ZEV vehicle production providing improved consumer access to a broader range of affordable electrified vehicles and increase the potential for ZEV sales while supply chains are developed. In addition, it has the potential to yield greater greenhouse gas reduction per kWh of available battery capacity- an important consideration should battery critical minerals remain constrained as the transition occurs.

[10] The Road Ahead: Encouraging the Production and Purchase of Zero-Emission Vehicles in Canada, Report of the Standing Committee on Environment and Sustainable Development, April 2021, Figure 4, page 36.

MECA also suggests that ECCC consider additional incentives for full hybrid electric vehicles and comparably fuel-efficient vehicles under the next round of GHG standards to ensure the remaining IC powered vehicles to enter the Canadian fleet are as efficient as possible. In addition, ECCC should consider requirements on public and private vehicle fleets to purchase increasingly more efficient vehicles such as hybrids, PHEVs and BEVs. In particular, private fleets that routinely turnover their vehicles have a significant potential to generate more affordable used vehicle sales in as little as two years which can advantage a broader range of Canadian consumers.

Electrification of Medium-duty Trucks and Passenger Vehicles

Due to the wide range of operating conditions and duty cycles experienced by medium-duty vehicles, several vocations may be more challenging to fully electrify in the near term. Plug-in hybrids (PHEVs) and full hybrids can be practical for medium- duty trucks (e.g., Class 2b through 3) and medium-duty passenger vehicles while preserving the ability to tow or operate over longer distances under conventional power when necessary. In addition, serial plug-in hybrids which employ an engine operating only as a generator to charge the traction battery to extend range, offer operational flexibility for commercial vehicles while full electric vehicles and their needed infrastructure are established.

It is worth noting that both HEVs and PHEVs are able to achieve significant GHG benefits compared to their conventional vehicle counterparts by employing relatively low-capacity batteries as shown in Table 1. For example, a popular HEV crossover utility vehicle with a 1.6 kWh battery provides up to 30% lower CO_2 emissions compared to an equivalent non-hybrid version. A PHEV version equipped with larger 18.1 kWh battery that enables a modest all electric range of 42 miles (67.5 kms) can provide even steeper CO_2 reductions of 60% or greater. Both of these powertrain configurations can be employed with larger medium duty trucks and passenger vehicles to offer reduced GHG and criteria pollutant emissions.

Medium-duty Vehicles with Renewable Natural Gas, Diesel and Hydrogen Fueled Engines

ECCC should also consider allowing medium-duty vehicles operating on lower carbon and renewable fuels (e.g., renewable natural gas, diesel and hydrogen) as transitional ZEV technologies available to medium duty fleets that have access to these fuels. Suppliers are working with their customers to commercialize these renewable fuels and including this compliance pathway would encourage technology innovation and add flexibility in challenging applications including Class 2b and 3 work trucks that are heavily used under higher loads and towing in fleet applications.

Based on demonstration programs conducted by ECCC with technical support from MECA, medium-duty vehicles readily have the ability to meet stringent criteria emission limits on the order of SULEV 30. Therefore, it is vital to set more stringent criteria emission standards in concert with GHG requirements for this sector.

MECA supports the strategy of parallel GHG reduction pathways from lower carbon fuels to maximize near and long term GHG transportation emissions. These pathways can provide additional near term and long term GHG reductions from in-use medium and heavy-duty vehicles and off-road equipment which face additional challenges and costs to establish electric charging infrastructures.

2026 and Later ZEV Assurance Measures

As the sales of ZEVs increase, it is important to ensure that equivalent consumer protections, as afforded on traditional LDV's, are implemented. MECA believes the assurance and warranty measures finalized under California's Advanced Clean Cars II (ACC II) regulation are reasonable and should be adopted under Canada's ZEV program.

MECA applauds ECCC's direct involvement in the United Nations Economic Commission for Europe's (UNECE) Working Party on Pollution and Energy (GRPE) Informal Working Group on Electric Vehicles and the Environment. Canada serves as the secretary with U.S. EPA and the European Commission as co-chairs. This international working group has developed Global Technical Regulations (GTRs) for battery durability and EV power determination. ECCC's participation offers an opportunity to incorporate ECCC's experience in testing and certification of battery electric vehicles into the process for developing harmonized battery durability standards across global regions in order to reduce certification costs and accelerate consumer acceptance and adoption of ZEV technology.

Beyond these initial ZEV assurance measures, we encourage ECCC to continue to explore performance standards for ZEV and PHEV vehicles to drive technology innovation for further reductions in their well to wheel emissions. Such metrics could incorporate the per kWh upstream CO_2 emissions, and miles/kWh vehicle in-use consumption. This will ensure a continued focus on further electric efficiency improvements as opposed to power and acceleration which can drive up the overall CO_2 footprint of electric vehicles. Higher efficiency electric vehicles will also provide resiliency to the supply chain and lower demand on the electricity grid while aiding in consumer acceptance.

<u>Future ECCC GHG Proposal for Non-plug-in Vehicles</u>

MECA believes that a successful GHG reduction program will require the parallel approaches of increasing EV penetration and tightening conventional vehicle emission standards to reduce the environmental impact of transportation. A parallel approach of reducing the GHG emissions from conventional vehicles also serves to reinforce environmental justice by affording further protections of frontline communities as well as minimizing the impact of any delays that result from unforeseen market disruptions.

Our review of currently available U.S. EPA certification data supports that vehicle manufacturers are making substantial progress on the path to the SULEV30 fleet average level with only the inclusion of a modest number of HEVs, PHEVs and BEVs. It has now been over twenty years since the first vehicle was certified to the SULEV30 standard and seven years since the first SULEV20.

The use of existing engine, hybrid powertrains and exhaust emission control architectures have facilitated achieving the lowest SULEV20 and SULEV30 emission levels and significant CO_2 reductions cost-effectively. Today, even larger SUVs and mini-vans with conventional and hybrid powertrains are being certified to the SULEV30 limit while further technology improvements continue to be incorporated into new production vehicles to enable compliance with the declining fleet average for emissions.

MECA recently contracted AVL to conduct a carbon lifecycle analysis (LCA) combined with a total cost of ownership (TCO) analysis. The report of this study is available on the MECA website[11]. In addition to CO_2, life-cycle emissions of nitrogen oxides (NOx) and methane (CH4) were modeled. Three representative vehicle classes were studied: City Sedan, Family SUV, and Pickup Truck. The technology pathways for the 2030 vehicle design space are based on those available in GREET 2020 (Argonne National Lab's Lifecycle Analysis Tool).

Figure 2 provides a comparison of modeled single and multiple technology penetration strategies to attain the U.S. GHG reduction target of 50-52% below 2005 levels. A key highlight of such analyses is that multiple technology penetration strategies can assist to identify robust approaches to GHG reduction which can de-risk attaining desired targets.

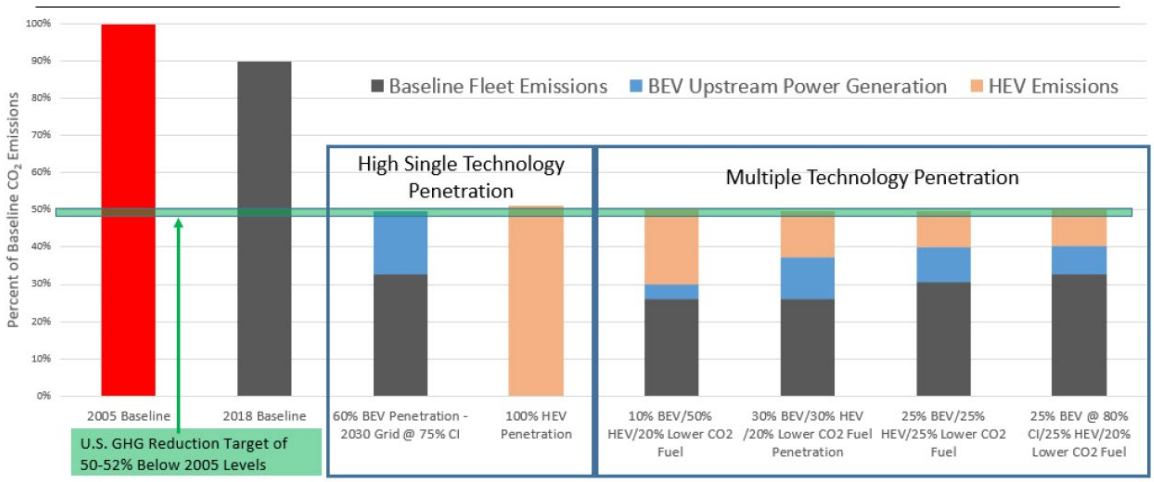

Figure 2. *Comparison of life cycle CO_2 emissions from the U.S. population of vehicles in operation. Baseline years for 2005 and 2018 (left) are shown as well as two "high single technology" (middle) and several "multiple technology" (right) penetration scenarios aimed at reducing fleet CO2 emissions. Note that vehicle percentages are actual vehicles in operation in 2030 and not sales of new vehicles in 2030.*

The U.S. EPA will release GHG reduction proposals for light-duty and heavy-duty vehicles in March 2023. Prior to finalizing this proposal, MECA recommends that ECCC employ concepts from both CARB and EPA strategies that can maximize near and long term GHG reductions while taking into consideration the diverse realities of the entire Canadian transportation sector.

[11] Lifecycle Carbon Analysis and Total Cost of Ownership for 2030 Light Duty Vehicle Fleet, AVL study for MECA, March 2022.

Conclusion

In conclusion, MECA appreciates ECCC's work in developing the proposed ZEV regulation. We support the proposal with modifications based on our comments to consider Canadian specific environmental, geographic and consumer needs in setting an achievable end of combustion vehicle sale date. The proposal coupled with our suggested modifications would result in cost effective air quality benefits for millions of Canadians. Our industry is developing and commercializing components for battery-electric and fuel-cell electric vehicles to advance electrification of new vehicles as the fleet transitions to these technologies. Simultaneously, suppliers continue to deliver cost-effective and durable advanced emission control and efficiency technologies to the light-duty sector to assist in reducing criteria and GHG emissions from the remaining internal combustion engine-equipped vehicles.

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