



HOUSE OF COMMONS  
CHAMBRE DES COMMUNES  
CANADA

# **THE ROAD AHEAD: ENCOURAGING THE PRODUCTION AND PURCHASE OF ZERO-EMISSION VEHICLES IN CANADA**

**Report of the Standing Committee on Environment and  
Sustainable Development**

**Francis Scarpaleggia, Chair**

**APRIL 2021  
43<sup>rd</sup> PARLIAMENT, 2<sup>nd</sup> SESSION**

---

Published under the authority of the Speaker of the House of Commons

**SPEAKER'S PERMISSION**

The proceedings of the House of Commons and its Committees are hereby made available to provide greater public access. The parliamentary privilege of the House of Commons to control the publication and broadcast of the proceedings of the House of Commons and its Committees is nonetheless reserved. All copyrights therein are also reserved.

Reproduction of the proceedings of the House of Commons and its Committees, in whole or in part and in any medium, is hereby permitted provided that the reproduction is accurate and is not presented as official. This permission does not extend to reproduction, distribution or use for commercial purpose of financial gain. Reproduction or use outside this permission or without authorization may be treated as copyright infringement in accordance with the *Copyright Act*. Authorization may be obtained on written application to the Office of the Speaker of the House of Commons.

Reproduction in accordance with this permission does not constitute publication under the authority of the House of Commons. The absolute privilege that applies to the proceedings of the House of Commons does not extend to these permitted reproductions. Where a reproduction includes briefs to a Standing Committee of the House of Commons, authorization for reproduction may be required from the authors in accordance with the *Copyright Act*.

Nothing in this permission abrogates or derogates from the privileges, powers, immunities and rights of the House of Commons and its Committees. For greater certainty, this permission does not affect the prohibition against impeaching or questioning the proceedings of the House of Commons in courts or otherwise. The House of Commons retains the right and privilege to find users in contempt of Parliament if a reproduction or use is not in accordance with this permission.

Also available on the House of Commons website  
at the following address: [www.ourcommons.ca](http://www.ourcommons.ca)

**THE ROAD AHEAD: ENCOURAGING  
THE PRODUCTION AND PURCHASE OF  
ZERO-EMISSION VEHICLES IN CANADA**

**Report of the Standing Committee on  
Environment and Sustainable Development**

**Francis Scarpaleggia  
Chair**

**APRIL 2021**

**43<sup>rd</sup> PARLIAMENT, 2<sup>nd</sup> SESSION**

## **NOTICE TO READER**

### **Reports from committees presented to the House of Commons**

Presenting a report to the House is the way a committee makes public its findings and recommendations on a particular topic. Substantive reports on a subject-matter study usually contain a synopsis of the testimony heard, the recommendations made by the committee, as well as the reasons for those recommendations.

# **STANDING COMMITTEE ON ENVIRONMENT AND SUSTAINABLE DEVELOPMENT**

## **CHAIR**

Francis Scarpaleggia

## **VICE-CHAIRS**

Dan Albas

Monique Pauzé

## **MEMBERS**

Yvan Baker

Laurel Collins

Matt Jeneroux

Lloyd Longfield

Cathy McLeod

Brad Redekopp

Raj Saini

Ya'ara Saks

Peter Schiefke

## **OTHER MEMBERS OF PARLIAMENT WHO PARTICIPATED**

Taylor Bachrach

Chris Bittle

Kelly Block

Ted Falk

Joël Godin

Randy Hoback

Michael Kram

Elizabeth May

Michael V. McLeod

John Nater

Jennifer O'Connell

Yasmin Ratansi  
Tony Van Bynen

**CLERKS OF THE COMMITTEE**

Isabelle Duford  
Alexandre Roger

**LIBRARY OF PARLIAMENT**

**Parliamentary Information and Research Service**

Alison Clegg, Analyst  
Natacha Kramski, Analyst  
Ross Linden-Fraser, Analyst

# **THE STANDING COMMITTEE ON ENVIRONMENT AND SUSTAINABLE DEVELOPMENT**

has the honour to present its

## **THIRD REPORT**

Pursuant to its mandate under Standing Order 108(2), the committee has studied zero-emission vehicles and has agreed to report the following:



## TABLE OF CONTENTS

---

SUMMARY.....	1
LIST OF RECOMMENDATIONS .....	3
THE ROAD AHEAD: ENCOURAGING THE PRODUCTION AND PURCHASE OF ZERO-EMISSION VEHICLES IN CANADA.....	7
Introduction.....	7
Background.....	7
Factors in the Adoption of Zero-Emission Vehicles .....	13
Purchase Price .....	13
Production and Supply.....	18
Producing Zero-Emission Vehicles in Canada.....	18
Vehicle Supply .....	23
Targeted Regulations to Accelerate the Deployment of Zero-Emission Vehicles .....	24
Charging and Refuelling Networks.....	28
Electricity Production, Distribution and Metering.....	33
Consumer Awareness .....	36
Hydrogen-powered Vehicles.....	38
Conclusion.....	39
APPENDIX A LIST OF WITNESSES.....	41
APPENDIX B LIST OF BRIEFS.....	43
REQUEST FOR GOVERNMENT RESPONSE .....	45



## SUMMARY

---

Zero-emission vehicles (ZEVs) can function without emitting greenhouse gases (GHGs) while in operation. Given that the transportation sector is Canada's second-largest source of GHGs, the use of ZEVs is an important pathway to cutting Canada's emissions. With that in mind, the Standing Committee on Environment and Sustainable Development (the Committee) studied how Canada could encourage the production and purchase of ZEVs in Canada. The Committee held four meetings on this subject, beginning on 26 October 2020, and has prepared 13 recommendations for the Government of Canada.

The Government of Canada has set ambitious targets to get more ZEVs on Canadian roads. Ultimately, it aims for ZEVs to make up 100% of new light-duty vehicle sales by 2040. However, the Committee heard that Canada will not fulfill the federal sales targets unless it takes additional measures to encourage the adoption of ZEVs. To identify these measures, the Committee analyzed factors that affect the purchase and production of ZEVs. It finds that the federal government can, and should, play a more active role in promoting the uptake of ZEVs.

The relatively higher purchase price of ZEVs, relative to conventional vehicles, makes it harder for some Canadians to afford them. Witnesses noted that the existing federal purchase incentive program, known as iZEV, could be amended to make ZEVs more affordable. The Committee has recommended several changes to the iZEV program, including expanding its coverage to used vehicles, creating a program to trade in old vehicles for scrap, and collecting more data to better understand the demographics of users of the incentive.

Although Canada produces some ZEVs and has a strong automotive sector, witnesses said the country could do more to encourage the domestic manufacture of ZEVs and their components. Based on this testimony, the Committee has identified some areas where the federal government could support expanded domestic manufacturing, including the production and recycling of ZEV batteries.

However, it will not be enough to produce ZEVs in Canada: they must also be offered for sale in the country. Several witnesses encouraged the federal government to adopt a policy, known as a ZEV standard, that could help increase vehicle supply by requiring producers to sell ZEVs in Canada. The Committee has made a recommendation to the Government of Canada about working with industry and the provinces and territories to develop a national ZEV standard.

The Committee has also made recommendations about improving the availability of charging and refueling infrastructure, raising consumer awareness, and identifying opportunities for a low-carbon transition in the trucking sector. All these actions can help support the adoption of ZEVs.

There are clear advantages to putting more ZEVs on the road. These vehicles can help Canada address climate change, reduce air pollution, create jobs and strengthen the country's economy. By taking additional measures to encourage the uptake of ZEVs, the Government of Canada will be helping to deliver tangible and lasting benefits to Canadians.

# LIST OF RECOMMENDATIONS

---

*As a result of their deliberations committees may make recommendations which they include in their reports for the consideration of the House of Commons or the Government. Recommendations related to this study are listed below.*

## **Recommendation 1**

**The Committee recommends that the Government of Canada collect data about the means of users of the iZEV program, including household income and the number of other vehicles that the household owns or leases. .... 15**

## **Recommendation 2**

**The Committee recommends that the Government of Canada continue to fund ZEV incentive programs, such as the iZEV program, while making the following adjustments to improve the accessibility of the program:**

- **Allowing used ZEVs to be eligible for incentives;**
- **Adding a scrappage initiative;**
- **Scaling the incentive to income; and**
- **Reviewing the price cap of the program, in light of the pricing strategy adopted by automakers, including Tesla. .... 17**

## **Recommendation 3**

**The Committee recommends that the Government of Canada review and build on existing programs, such as the Strategic Innovation Fund, to facilitate the continued development of domestic supply chains for the full lifecycle of ZEV components, including batteries. .... 21**

**Recommendation 4**

The Committee recommends that the Government of Canada build on existing initiatives, like the Green Mining Innovation program, to improve the environmental performance of Canadian minerals, including those used in battery and hydrogen fuel cell production. .... 22

**Recommendation 5**

The Committee recommends that the Government of Canada work with provincial and territorial governments to develop recycling and end of life management strategies for ZEV batteries. .... 22

**Recommendation 6**

The Committee recommends that the Government of Canada study opportunities to support automotive sector workers while facilities are transitioning to produce ZEVs, and consider dedicated funding to retrain automotive sector workers for ZEV production. .... 22

**Recommendation 7**

The Committee recommends that the Government of Canada work with industry and the provinces and territories to establish a national ZEV standard, while respecting constitutional responsibilities and the deep integration of the North American automotive market. .... 28

**Recommendation 8**

The Committee recommends that the Government of Canada work with provinces and territories to revise building codes, including the forthcoming national model building codes, to encourage the installation of charging infrastructure in newly constructed commercial and multi-unit residential buildings, and encourage the voluntary installation of charging infrastructure in newly-constructed single-family residential dwellings. .... 33

**Recommendation 9**

The Committee recommends that the Government of Canada review its charging station incentive programs to encourage the installation of smart charging infrastructure, and to expand access to vehicle chargers in multi-unit residential buildings and remote and rural areas. .... 33

**Recommendation 10**

The Committee recommends that the Government of Canada consider revising the *Electricity and Gas Inspection Act*, the *Weights and Measures Act*, and their associated regulations to remove barriers to innovative vehicle charging technologies and to improve transparency for electricity providers and users..... 34

**Recommendation 11**

The Committee recommends that the Government of Canada identify additional opportunities for collaboration with provinces and territories, industry, and Indigenous peoples to facilitate the interprovincial trade of electricity, with a view to:

- Reducing overall GHG emissions from the electricity sector; and
- Ensuring that the electricity sector is prepared to meet the anticipated electricity demand associated with a rising number of ZEVs..... 35

**Recommendation 12**

The Committee recommends that the Government of Canada seek opportunities, in partnership with industry and the provinces and territories, to better inform consumers and dealers about ZEVs. .... 37

**Recommendation 13**

The Committee recommends that the Government of Canada convene a working group bringing together representatives from government, industry and other relevant groups to study how the heavy-duty vehicle sector will transition to a net-zero future. .... 39





# THE ROAD AHEAD: ENCOURAGING THE PRODUCTION AND PURCHASE OF ZERO-EMISSION VEHICLES IN CANADA

---

## INTRODUCTION

Between 26 October and 25 November 2020, the Standing Committee on Environment and Sustainable Development (the Committee) conducted a study on zero-emission vehicles (ZEVs), in accordance with the following motion:

That pursuant to Standing Order 108(2), the committee undertake a study in connection with the desire expressed in the Speech from the throne to put in place a plan that will make it possible to surpass Canada's climate objectives and that to do so the committee examine further measures that could be taken to incentivize the production and purchase of zero emission vehicles, including a zero emission vehicle law; that a report be presented to the House and that four meetings be devoted to it starting at the next meeting of this committee with the appearance of Environment and Climate Change Canada officials and other relevant officials and stakeholders.<sup>1</sup>

The Committee heard from a range of witnesses on several topics directly related to the motion including purchase challenges and existing incentives, Canadian production and manufacturing opportunities, infrastructure and its potential for development, as well as potential policy frameworks and regulations in Canada. The Committee thanks the witnesses for their contributions, and is pleased to present its final report, which includes the study's findings and recommendations to the Government of Canada.

## Background

ZEVs can help Canada achieve its climate change objectives, primarily by helping to reduce greenhouse gas (GHG) emissions. The Government of Canada has pledged to reduce GHG emissions to at least 30% below 2005 levels by 2030, and to achieve net-zero emissions by 2050. To achieve these goals, it will be important to reduce emissions from transportation, which represented 22% of all GHG emissions in Canada in 2018, the latest year for which data are available. This made the transportation sector Canada's second largest source of GHG emissions.

---

1 House of Commons, Standing Committee on Environment and Sustainable Development [ENVI], [Minutes](#), 19 October 2020.



Road vehicles are the largest emitters in the transportation sector. Between 2005 and 2018, GHG emissions from cars and light trucks rose 9%. In 2018, about half of the sector's emissions came from passenger vehicles, also known as light-duty vehicles, while 35% of emissions came from heavy-duty vehicles (Figure 1).<sup>2</sup> These emissions are linked with significant air pollution, which reduces air quality and threatens human health.<sup>3</sup> In 2018, transportation and mobile equipment produced 56% of Canada's carbon monoxide emissions and 51% of its nitrogen oxide emissions, along with significant emissions of volatile organic compounds.<sup>4</sup>

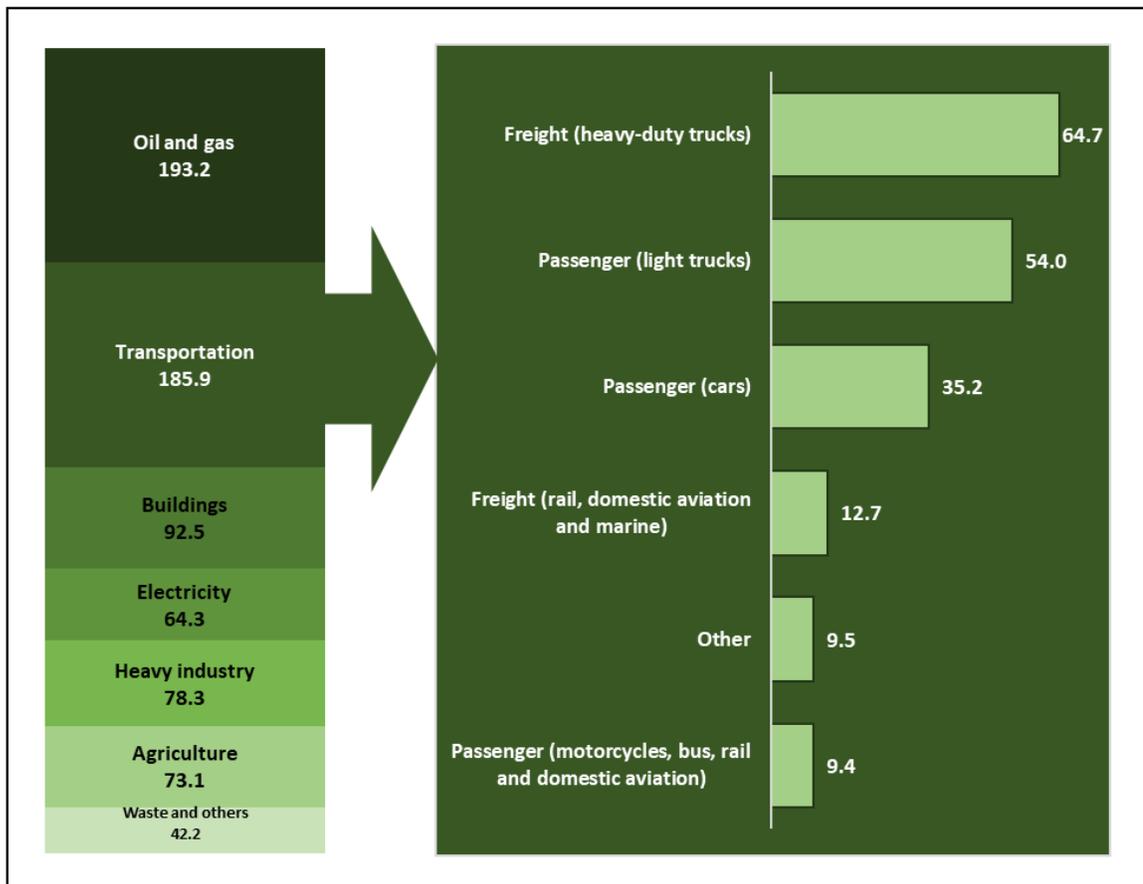
---

2 Government of Canada, [Greenhouse gas emissions](#); and ENVI, [Evidence](#), 26 October 2020, 1715 (Megan Nichols, Director General, Environmental Policy, Department of Transport).

3 Government of Canada, [Air pollution from cars, trucks, vans and SUVs](#).

4 Helen Ryan, Department of the Environment, [Opening Remarks](#), Brief submitted to ENVI, October 2020.

**Figure 1 – Greenhouse Gas Emissions by Canadian Economic Sector and Greenhouse Gas Emissions in the Canadian Transportation Sector, 2018 (Megatonnes of Carbon Dioxide Equivalent)**



Note: Carbon dioxide (CO<sub>2</sub>) equivalent is a standard metric for measuring total greenhouse gas (GHG) emissions. Various GHGs, such as CO<sub>2</sub>, nitrous oxide or methane, have different effects on the atmosphere and stay there for different lengths of time. A gas’s capacity to contribute to global warming is measured in terms of its global warming potential (GWP). CO<sub>2</sub> equivalent accounts for the GWP of various GHGs, and the time they spend in the atmosphere, by expressing the impact of all gases in terms of an equivalent quantity of CO<sub>2</sub>.

Source: Created by the Committee based on data from Government of Canada, [Greenhouse gas emissions](#).

Canada could reduce these emissions by increasing the share of vehicles that are ZEVs.<sup>5</sup> A ZEV is a vehicle that can function without producing GHGs while in operation. Some ZEVs are powered only by non-emitting sources, like electric batteries or hydrogen fuel

<sup>5</sup> Megan Nichols, Department of Transport, [Opening Remarks](#), Brief submitted to ENVI, October 2020.



cells. Other ZEVs, like plug-in hybrid electric vehicles, can operate using either a rechargeable electric battery or a conventional internal combustion engine.<sup>6</sup>

**“EVs [electric vehicles], from light to heavy-duty, can help Canada meet its goals on climate change, lower air pollution and help Canadian citizens' health as well.”**

Daniel Breton, President and Chief Operating Officer, Electric Mobility Canada<sup>7</sup>

Witnesses explained that ZEVs offer many benefits. Because they produce fewer GHG emissions and less air pollution than conventional internal combustion engine vehicles (ICEVs), ZEVs are better for the environment, the climate and the health of Canadians.<sup>8</sup> In fact, even when considering the GHG emissions created by producing ZEVs and charging them from the electricity grid, these vehicles' lifecycle emissions are lower than those of an ICEV, regardless of where they are used in Canada.<sup>9</sup> ZEVs also present a significant economic opportunity. By supporting the production of ZEVs, their components, and their associated infrastructure in Canada, the country can attract investment, create sustainable jobs, and make its automotive sector more competitive.<sup>10</sup> The Committee agreed that policies regarding ZEVs should be developed with regard to the environmental impacts from mining raw materials, including the comparative impacts from international and Canadian mining.

---

6 In some places, including Quebec and the European Union, a zero-emission vehicle [ZEV] is defined as a vehicle whose power source emits no greenhouse gas emissions. In these locations, plug-in electric vehicles are defined as “low-emission vehicles.”

Witnesses used the terms electric vehicle [EV] and ZEV interchangeably.

7 ENVI, [Evidence](#), 25 November 2020, 1540 (Daniel Breton, President and Chief Operating Officer, Electric Mobility Canada).

8 ENVI, [Evidence](#), 23 November 2020, 1630 (Patrick Bateman, Interim President, WaterPower Canada); and ENVI, [Evidence](#), 25 November 2020, 1540 (Daniel Breton).

9 ENVI, [Evidence](#), 23 November 2020, 1640 (Patrick Bateman); and ENVI, [Evidence](#), 25 November 2020, 1550 (Daniel Breton).

10 ENVI, [Evidence](#), 23 November 2020, 1640 (Patrick Bateman); ENVI, [Evidence](#), 25 November 2020, 1550 (Daniel Breton); Joanna Kyriazis, Clean Energy Canada, [Opening Remarks](#), Brief submitted to ENVI, November 2020; ENVI, [Evidence](#), 23 November 2020, 1600 (Suzanne Goldberg, Director of Public Policy, Canada, ChargePoint); ENVI, [Evidence](#), 23 November 2020, 1620 (Cedric Smith, Analyst, The Pembina Institute); ENVI, [Evidence](#), 23 November 2020, 1620 (Angelo DiCaro, Director of Research, Unifor); and ENVI, [Evidence](#), 25 November 2020, 1545 (Nicolas Pocard, Director, Marketing, Ballard Power Systems Inc.).

The federal government, the provinces and the territories have committed to expanding the number of ZEVs on Canadian roads. This commitment is reflected in the 2016 *Pan-Canadian Framework on Clean Growth and Climate Change*, and in measures taken by various governments to encourage the adoption of ZEVs. Cedric Smith, analyst at the Pembina Institute, explained that:

In terms of our forecast on GHG emissions right now, transportation emissions are at about 186 megatonnes CO<sub>2</sub> equivalent in 2018 for the transportation sector. We do actually see that declining somewhat out to 2030, largely due to the impact of the passenger automotive greenhouse gas emissions standard. Nevertheless, it's still quite significant even out to 2030, which does indicate that there's more work to be done.<sup>11</sup>

At the provincial level, witnesses drew the Committee's attention to policies adopted in British Columbia (B.C.) and Quebec. Both provinces offer ZEV purchase incentives and require a certain proportion of the vehicles sold in the province to be ZEVs.<sup>12</sup> Together, B.C. and Quebec accounted for 78% of the ZEVs sold in Canada in 2020, as of 30 September of that year.<sup>13</sup> At the federal level, the Government of Canada has set national targets for increasing ZEV sales. Its goal is for ZEVs to make up 10% of all new light-duty vehicle sales in Canada by 2025, 30% by 2030, and 100% by 2040.<sup>14</sup> To help achieve these goals, the federal government has established a range of programs,<sup>15</sup> described in more detail elsewhere in this report. Altogether, the number of ZEVs on the road in Canada has risen rapidly, growing at an average annual rate of 72% from 2015 to 2019.<sup>16</sup> ZEVs represented 3% of total new vehicle sales in Canada in 2019 and 3.4% in the first half of 2020.<sup>17</sup>

---

11 ENVI, [Evidence](#), 23 November 2020, 1650 (Cedric Smith).

12 ENVI, [Evidence](#), 23 November 2020, 1605 (Maxime Charron, President, LeadingAhead Energy); Megan Nichols, Department of Transport, [Opening Remarks](#), Brief submitted to ENVI, October 2020; Travis Allan, AddÉnergie Technologies Inc., [Opening Remarks](#), Brief submitted to ENVI, November 2020; and Joanna Kyriazis, Clean Energy Canada, [Opening Remarks](#), Brief submitted to ENVI, November 2020.

13 ENVI, [Evidence](#), 26 October 2020, 1645 (Megan Nichols).

14 New vehicles represent only a portion of all the vehicles on the road. The total number of vehicles on the road is known as the vehicle stock. The vehicle stock changes over time as people buy or lease new vehicles and retire old vehicles.

15 Helen Ryan, Department of the Environment, [Opening Remarks](#), Brief submitted to ENVI, October 2020; Paula Vieira, Department of Natural Resources, [Opening Remarks](#), Brief submitted to ENVI, October 2020; Sharon Irwin, Department of Industry, [Opening Remarks](#), Brief submitted to ENVI, October 2020; and Megan Nichols, Department of Transport, [Opening Remarks](#), Brief submitted to ENVI, October 2020.

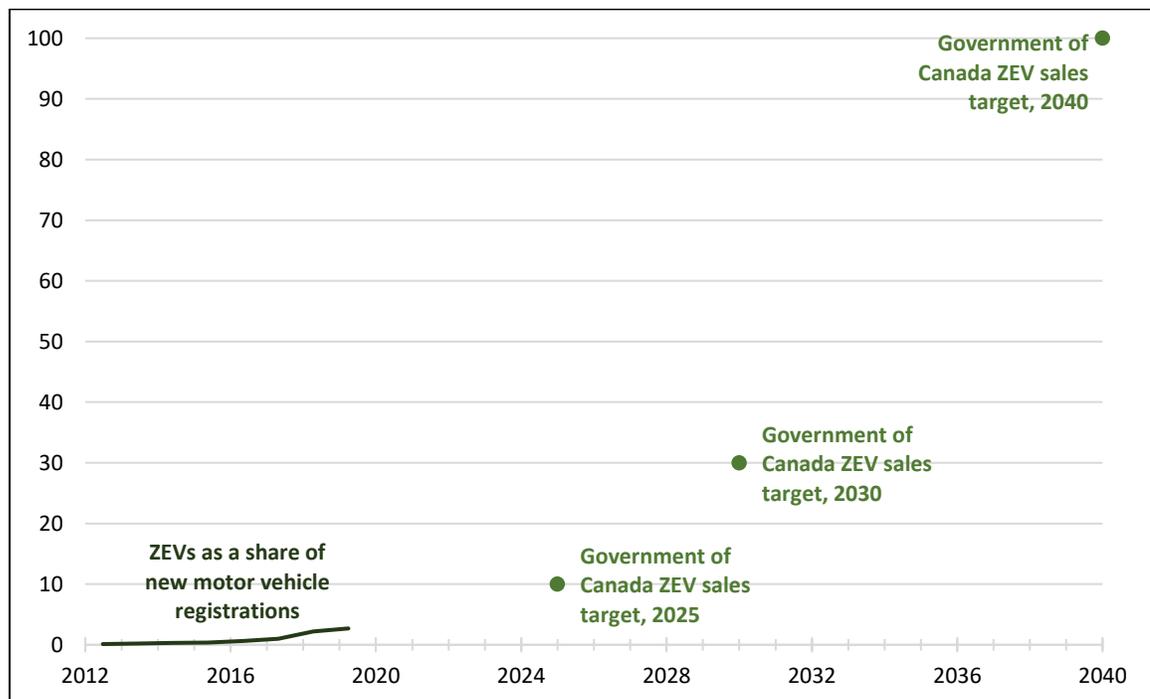
16 Brian Kingston, Canadian Vehicle Manufacturers' Association [CVMA], [Opening Remarks](#), Brief submitted to ENVI, November 2020.

17 ENVI, [Evidence](#), 26 October 2020, 1650 (Megan Nichols).



However, the Committee heard that Canada is not on track to achieve the federal ZEV sales targets (Figure 2).<sup>18</sup> To reach these goals, witnesses agreed, the Government of Canada, along with the provinces and territories, should take additional measures to encourage ZEV uptake.<sup>19</sup> The following sections of this report analyze the key factors that affect the adoption of ZEVs, as identified by witnesses, and present recommendations to the Government of Canada.

**Figure 2 – Zero-Emission Vehicles (ZEVs) as a Share of New Motor Vehicle Registrations in Canada, and Government of Canada Sales Targets for ZEVs, 2012–2040 (%)**



Source: Figure prepared by the Committee based on data obtained from Statistics Canada, "[Table 20-10-0021-01 – New motor vehicle registrations](#)," Database, accessed 22 March 2021.

18 Transport Canada analysis has shown that, without additional measures, ZEVs could reach 4%–6% of new light-duty vehicle sales by 2025, and 5%–10% by 2030. See: Transport Canada, "[Canada’s ZEV sales targets](#)," *Zero-emission vehicles*.

19 ENVI, *Evidence*, 2 November 2020, 1635 (Joanna Kyriazis, Senior Policy Advisor, Clean Energy Canada); ENVI, *Evidence*, 23 November 2020, 1620 (Cedric Smith); ENVI, *Evidence*, 25 November 2020, 1540 (Daniel Breton); and Megan Nichols, Department of Transport, *Opening Remarks*, Brief submitted to ENVI, October 2020.

## FACTORS IN THE ADOPTION OF ZERO-EMISSION VEHICLES

### Purchase Price

An important factor in the purchase of any vehicle is its price. In most cases, while the operating costs of a ZEV may be lower than those of an ICEV, the purchase price of a ZEV is higher than that of an ICEV. In a written brief to the Committee, Toyota Canada Inc. explained that the average 2019 purchase price of a sedan ICEV in Canada was \$28,000 while the average 2019 purchase price of a ZEV, nearly all of which are sedans, was around \$56,000 before incentives – double the price of the average ICEV.<sup>20</sup>

Witnesses agreed that higher battery costs were the main cause of the higher price of ZEVs.<sup>21</sup> They also agreed that these costs will come down as battery technology advances, leading to price parity between ICEVs and ZEVs. However, there were different estimates as to when this might happen. For example, Joanna Kyriazis, Senior Policy Advisor at Clean Energy Canada, estimated that price parity might be reached as early as 2024,<sup>22</sup> while Brian Kingston, President of the Canadian Vehicle Manufacturers' Association, expected it to be reached towards the end of the decade.<sup>23</sup>

**“We are in a transition period because the cost of technology is so high. The government's role right now is to help accelerate that transition period by offering incentives to bring that price point down.”**

Brian Kingston, President, Canadian Vehicle Manufacturers' Association<sup>24</sup>

---

20 Toyota Canada Inc., [Toyota submission to the ENVI Committee Zero Emissions Vehicle Study](#), Brief submitted to ENVI, November 2020.

These data are from 2019. The prices of ZEVs are evolving rapidly.

21 ENVI, [Evidence](#), 25 November 2020, 1625 (David Adams, President and Chief Executive Officer, Global Automakers of Canada); and Megan Nichols, Department of Transport, [Opening Remarks](#), Brief submitted to ENVI, October 2020.

22 ENVI, [Evidence](#), 2 November 2020, 1715 (Joanna Kyriazis).

23 ENVI, [Evidence](#), 2 November 2020, 1620 (Brian Kingston, President, Canadian Vehicle Manufacturers' Association).

24 ENVI, [Evidence](#), 2 November 2020, 1700 (Brian Kingston).



A way to compensate for high ZEV purchase prices until price parity is reached is to offer incentives, that is, to offer a sum of money to consumers who purchase a ZEV.<sup>25</sup> Since 1 May 2019, Transport Canada has incentivized the purchase or leasing of eligible ZEVs through the Incentives for Zero-Emission Vehicles (iZEV) program. Consumers who buy or lease an eligible ZEV can receive an incentive of \$2,500 or \$5,000 after purchasing the vehicle, depending on the vehicle's autonomous range, which is the distance that it can cover using non-emitting power alone. To be eligible for the incentive, ZEVs with six or fewer seats must have a base model price of less than \$45,000. If the base model of the ZEV is eligible for the incentive, then higher priced versions of these vehicles, up to a maximum price of \$55,000, are also eligible. ZEVs with seven or more seats with a base model price of less than \$55,000, and higher priced versions up to \$60,000, are eligible for the incentive.<sup>26</sup>

The iZEV program, announced in Budget 2019 with a budget of \$300 million, was expected to run for three years.<sup>27</sup> However, the funds may not last that long. Megan Nichols, Director General of Environmental Policy at Transport Canada, explained in her opening remarks that “[w]e have seen significant uptake of the iZEV program, since it was launched in May 2019. Over 60,000 Canadians or Canadian businesses have taken advantage of the program to date, totalling over \$255M in incentive claims by the end of September 2020.”<sup>28</sup> On 11 December 2020, the Government of Canada announced that it would invest an additional \$287 million in the iZEV program over two years, so that the program can continue until March 2022.<sup>29</sup>

Transport Canada collects some data about individuals who have received incentives through the iZEV program, including their date of birth and their postal code. Megan Nichols shared some analysis of this data, stating that the majority of purchases were made by individual Canadians rather than businesses and that “[a]bout 61% of the purchasers were between the ages of 35 and 59. About 86% of claims were from Canadians living in centres with a population of 30,000 people or more.”<sup>30</sup> However, Ms. Nichols indicated that data was not available for other indicators such as the average

---

25 Megan Nichols, Department of Transport, *Opening Remarks*, Brief submitted to ENVI, October 2020.

26 Department of Transport, Zero-emission vehicles, *Purchase and Lease Incentives*.

Some costs, including delivery, freight and other fees, such as vehicle colour and add-on accessories, do not count toward the purchase price of a ZEV for the purposes of the iZEV program.

27 ENVI, *Evidence*, 23 November 2020, 1615 (Cedric Smith).

28 Megan Nichols, Department of Transport, *Opening Remarks*, Brief submitted to ENVI, October 2020.

29 Government of Canada, “*Making Clean, Affordable Transportation and Power Available in Every Canadian Community*,” *A Healthy Environment and a Healthy Economy*.

30 ENVI, *Evidence*, 26 October 2020, 1740 (Megan Nichols).

household income of people using the incentive<sup>31</sup> or whether the consumers were buying a ZEV while keeping their existing ICEV.<sup>32</sup>

### Recommendation 1

**The Committee recommends that the Government of Canada collect data about the means of users of the iZEV program, including household income and the number of other vehicles that the household owns or leases.**

Witnesses agreed that incentives are an effective way to encourage ZEV purchases. Megan Nichols informed the Committee that significant increases in sales had been observed across the country, despite low inventory of some ZEVs at Canadian dealerships, since the beginning of the iZEV program: “For example, in Saskatchewan in 2019 we saw sales increase by 95%. In Manitoba they were up by 71%. In Alberta, they were up by 53% from 2018 numbers.”<sup>33</sup> Provincial incentives can also play an important role. Brian Kingston explained that ZEV sales declined significantly in Ontario when a provincial incentive was discontinued in 2018 and started increasing in 2019 as the federal iZEV program was launched.<sup>34</sup> He noted that 96% of ZEV sales have been made in the three Canadian provinces that had (Ontario) or have a provincial incentive (B.C. and Quebec).<sup>35</sup>

While witnesses generally supported the federal incentive program, several suggested that it could be improved. Several witnesses supported expanding the iZEV program to cover the purchase or lease of a used ZEV.<sup>36</sup> Megan Nichols recognized that there is an opportunity to make ZEVs more accessible to all Canadians given that “[a]bout 60% of vehicles acquired annually are done through the secondary market, so Transport Canada is currently exploring options to expand the program to include used vehicles.”<sup>37</sup>

---

31 ENVI, [Evidence](#), 26 October 2020, 1740 (Megan Nichols).

32 ENVI, [Evidence](#), 26 October 2020, 1740 (Megan Nichols).

33 ENVI, [Evidence](#), 26 October 2020, 1720 (Megan Nichols).

34 ENVI, [Evidence](#), 2 November 2020, 1630 (Brian Kingston).

35 Brian Kingston, CVMA, [Opening Remarks](#), Brief submitted to ENVI, November 2020.

36 ENVI, [Evidence](#), 2 November 2020, 1640 (Joanna Kyriazis); Travis Allan, AddÉnergie Technologies Inc., [Opening Remarks](#), Brief submitted to ENVI, November 2020; ENVI, [Evidence](#), 25 November 2020, 1540 (Daniel Breton); and ENVI, [Evidence](#), 23 November 2020, 1650 (Cedric Smith).

37 ENVI, [Evidence](#), 26 October 2020, 1705 (Megan Nichols).



Several witnesses recommended linking ZEV incentives to scrappage programs, that is, offering an incentive to purchase a ZEV if the buyer trades in an ICEV to be scrapped.<sup>38</sup> Because older cars emit the most GHGs, this would be a way to get older vehicles off the road and reduce overall fleet emissions.<sup>39</sup> Brian Kingston noted that 35% of vehicles on the road are 12 years old or older, meaning that scrappage programs are “critically important” to making the fleet of vehicles on the road more efficient.<sup>40</sup> Paula Vieira, Executive Director of the Fuel Diversification Division of the Clean Fuels Branch at Natural Resources Canada (NRCan), agreed that scrappage programs could be an effective tool, depending on whether the federal government’s objective was to accelerate fleet turnover by encouraging consumers to make a purchase decision earlier than they naturally would, or simply to incentivize ZEV purchases.<sup>41</sup>

Aaron Wudrick, Federal Director at the Canadian Taxpayers Federation, did not support the iZEV program. He said it was inefficient, and worried that the iZEV program was not actually leading to a higher uptake of ZEV vehicles but was instead being used by those who were already planning to purchase a ZEV. At the very least, according to Mr. Wudrick, the price cap should be lowered to avoid supporting purchases of luxury vehicles. He said that “[p]resumably the purpose of setting a cut-off price was precisely to avoid having these subsidies go to more expensive vehicles, and yet that’s exactly what happened [in the case of the Tesla Model 3].”<sup>42</sup> He gave the example of a version of the Tesla Model 3, available only in Canada, that was priced at \$44,999 – one dollar under the iZEV program cap.

This Canada-only base model, called the “Standard Range,” had software installed to give it a lower autonomous range than other Tesla Model 3 vehicles, at 150 kilometres per charge. Because this base model was priced below the iZEV program price cap, more expensive versions of the Tesla Model 3 also became eligible for the iZEV incentive. Only 126 Standard Range base models were sold between May 2019 and the end of March 2020, while 12,000 higher priced Standard Range Plus models, costing \$53,700, were also purchased using the incentive.<sup>43</sup> One witness, when asked about the use of

---

38 ENVI, [Evidence](#), 2 November 2020, 1650 (Brian Kingston); ENVI, [Evidence](#), 23 November 2020, 1655 (Angelo DiCaro); and ENVI, [Evidence](#), 25 November 2020, 1715 (David Adams).

39 Brian Kingston, CVMA, [Opening Remarks](#), Brief submitted to ENVI, November 2020.

40 ENVI, [Evidence](#), 2 November 2020, 1650 (Brian Kingston).

41 ENVI, [Evidence](#), 26 October 2020, 1650 (Paula Vieira, Executive Director, Fuel Diversification Division, Clean Fuels Branch, Department of Natural Resources).

42 ENVI, [Evidence](#), 25 November 2020, 1535 (Aaron Wudrick, Federal Director, Canadian Taxpayers Federation).

43 Ibid.

software to limit the range of ZEVs, expressed the hope that such measures could be “as much as possible...cleared out over time.”<sup>44</sup> Other witnesses agreed that the iZEV program should avoid supporting the purchase of luxury vehicles. Joanna Kyriazis noted that a means test or an incentive scaled to income have been used in other jurisdictions to address this problem.<sup>45</sup> Angelo DiCaro, Director of Research at Unifor, also expressed interest in a means-tested approach to ZEV incentives.<sup>46</sup>

Witnesses reminded the Committee that the overall cost of owning a vehicle is not only linked to its purchase price. Daniel Breton, President and Chief Operating Officer of Electric Mobility Canada, stated that:

Total cost of ownership is really important. Very often people think about the purchase price, but they forget the energy price, the insurance price, the maintenance price and the resale value. [...] When you start to add all the calculations, in the end an [electric vehicle] can be just as affordable as a Honda Civic.<sup>47</sup>

## Recommendation 2

**The Committee recommends that the Government of Canada continue to fund ZEV incentive programs, such as the iZEV program, while making the following adjustments to improve the accessibility of the program:**

- **Allowing used ZEVs to be eligible for incentives;**
- **Adding a scrappage initiative;**
- **Scaling the incentive to income; and**
- **Reviewing the price cap of the program, in light of the pricing strategy adopted by automakers, including Tesla.**

---

44 ENVI, *Evidence*, 23 November 2020, 1740 (Cedric Smith).

45 ENVI, *Evidence*, 2 November 2020, 1655 (Joanna Kyriazis).

46 ENVI, *Evidence*, 23 November 2020, 1655 (Angelo DiCaro).

47 ENVI, *Evidence*, 25 November 2020, 1700 (Daniel Breton).



## Production and Supply

### Producing Zero-Emission Vehicles in Canada

**“From the development of intellectual property, to manufacturing, supply chain opportunities for assemblers, parts and batteries, to upstream supply of minerals, metals and petroleum products, we are at a special moment in history in which a technological change will create significant opportunities.”**

Travis Allan, Vice-President, Public Affairs and General Counsel,  
AddÉnergie Technologies Inc.<sup>48</sup>

There are many advantages to producing ZEVs in Canada. ZEVs are expected to dominate the light-duty vehicle market in the coming decades: Angelo DiCaro said that they will represent up to 60% of the world’s new car sales by 2040.<sup>49</sup> According to Electric Mobility Canada, the sale of ZEVs, charging infrastructure and the associated electricity could bring in approximately \$190 billion in cumulative revenues in Canada between 2021 and 2030.<sup>50</sup> The challenge, as Joanna Kyriazis put it, is to “prepare our auto sector to capture that economic benefit.”<sup>51</sup>

The automotive sector is one of Canada’s most important industries. It contributed an estimated \$19 billion to the country’s gross domestic product (GDP) in 2018, directly employing more than 125,000 people, and indirectly employing another 400,000.<sup>52</sup>

The associations representing large automakers that testified before the Committee – the Canadian Vehicle Manufacturers’ Association and Global Automakers of Canada – recognize that ZEVs are becoming an increasingly important part of the light-duty vehicle market. The representatives of these organizations told the Committee that their members are committed to electrifying their vehicles, are making significant investments

---

48 Travis Allan, AddÉnergie Technologies Inc., [Opening Remarks](#), Brief submitted to ENVI, November 2020.

49 ENVI, [Evidence](#), 23 November 2020, 1625 (Angelo DiCaro).

50 Electric Mobility Canada, [The case for EV adoption and a Canadian EV industry](#), Brief submitted to ENVI, November 2020.

51 ENVI, [Evidence](#), 2 November 2020, 1645 (Joanna Kyriazis).

52 Government of Canada, [Canadian automotive industry](#).

in ZEVs, and expect to bring new models to market in the coming years.<sup>53</sup> Notably, Ford, Fiat Chrysler Automobiles and General Motors have recently made investments to start producing ZEVs in Canada, with support from the federal and provincial governments.<sup>54</sup>

Some witnesses told the Committee that Canada has made less progress developing ZEV supply chains than other countries.<sup>55</sup> While automakers are investing billions of dollars in ZEVs, only a small fraction of those investments has reached Canada. In 2019, none of the estimated \$300 billion that major automakers budgeted for ZEV technologies was to be spent in Canada.<sup>56</sup> Of the approximately 2 million light-duty vehicles assembled in Canada in 2018, only 0.4% were ZEVs, compared to an average of 2.3% among other producing countries.<sup>57</sup>

Some countries are including investment in ZEV production in their strategies for economic recovery from the impacts of the COVID-19 pandemic. Joanna Kyriazis gave the example of countries like Germany, France, Spain and the U.K. that “have also introduced new purchase subsidies, tax breaks, and charging infrastructure investments as part of their recovery package to accelerate the transition to [electric vehicles].”<sup>58</sup>

Some witnesses called for the federal government to develop an industrial strategy focused on ZEVs. Such a strategy would support the creation of domestic supply chains, from raw materials to parts to production and assembly.<sup>59</sup> Angelo DiCaro added that the

- 
- 53 Brian Kingston, CVMA, [Opening Remarks](#), Brief submitted to ENVI, November 2020; and ENVI, [Evidence](#), 25 November 2020, 1600 (David Adams).
- 54 Brian Kingston, CVMA, [Opening Remarks](#), Brief submitted to ENVI, November 2020; ENVI, [Evidence](#), 25 November 2020, 1600 (David Adams); and General Motors, [“General Motors To Invest C\\$1 Billion To Convert CAMI into Canada’s First Large-Scale Commercial Electric Vehicle Manufacturing Plant,”](#) 15 January 2021.
- 55 ENVI, [Evidence](#), 2 November 2020, 1735 (Joanna Kyriazis); Travis Allan, AddÉnergie Technologies Inc., [Opening Remarks](#), Brief submitted to ENVI, November 2020; and ENVI, [Evidence](#), 23 November 2020, 1655 (Angelo DiCaro).
- 56 Clean Energy Canada, [Focus: A National Zero-Emission Vehicle Standard](#), Brief submitted to ENVI, November 2020.
- 57 Ben Sharpe et. al (International Council on Clean Transportation and Pembina Institute), [Power Play: Canada’s Role in the Electric Vehicle Transition](#), April 2020.
- 58 Joanna Kyriazis, Clean Energy Canada, [Opening Remarks](#), Brief submitted to ENVI, November 2020.
- 59 Joanna Kyriazis, Clean Energy Canada, [Opening Remarks](#), Brief submitted to ENVI, November 2020; ENVI, [Evidence](#), 23 November 2020, 1625 (Angelo DiCaro); and ENVI, [Evidence](#), 25 November 2020, 1610 (Daniel Breton).



federal government could support domestic production by requiring government fleet purchases to include local content.<sup>60</sup>

**“We have all of the metals and minerals we need to build electric vehicles here in Canada, and we have a very strong auto parts supply chain that is showcasing its readiness to feed into electric vehicle production.”**

Joanna Kyriazis, Senior Policy Advisor, Clean Energy Canada<sup>61</sup>

Several witnesses agreed that Canada is well positioned to develop supply chains for ZEV components, especially batteries.<sup>62</sup> Researchers at Canadian universities and research institutes are working with vehicle producers and electricity distributors to develop new battery technologies.<sup>63</sup> Sharon Irwin, Senior Director of the Industry Sector in the Automotive, Transportation and Digital Technology Branch at Innovation, Science and Economic Development Canada (ISED), noted that the country has a rich supply of the raw materials used in battery-making – “the only nation in the Western hemisphere,” she said, “with an abundance of cobalt, graphite, lithium and nickel, the minerals needed to make next-generation electric batteries.”<sup>64</sup> And, as David Adams, President and Chief Executive Officer of Global Automakers of Canada, said, “it makes sense...to have battery manufacturing in Canada too, because it's too expensive to move those from one jurisdiction to another.”<sup>65</sup>

In fact, because batteries are so costly, and most are currently produced in East Asia, it may become difficult for battery-powered ZEVs to secure tariff-free access to the

---

60 ENVI, [Evidence](#), 23 November 2020, 1625 (Angelo DiCaro).

61 ENVI, [Evidence](#), 2 November 2020, 1735 (Joanna Kyriazis).

62 Sharon Irwin, Department of Industry, [Opening Remarks](#), Brief submitted to ENVI, October 2020; ENVI, [Evidence](#), 2 November 2020, 1735 (Joanna Kyriazis); Travis Allan, AddÉnergie Technologies Inc., [Opening Remarks](#), Brief submitted to ENVI, November 2020; ENVI, [Evidence](#), 23 November 2020, 1630 (Patrick Bateman); and ENVI, [Evidence](#), 23 November 2020, 1635 (Angelo DiCaro).

63 ENVI, [Evidence](#), 25 November 2020, 1710 (Daniel Breton).

64 Sharon Irwin, Department of Industry, [Opening Remarks](#), Brief submitted to ENVI, October 2020.

See also: Joanna Kyriazis, Clean Energy Canada, [Opening Remarks](#), Brief submitted to ENVI, November 2020; ENVI, [Evidence](#), 23 November 2020, 1630 (Patrick Bateman); and ENVI, [Evidence](#), 23 November 2020, 1635 (Angelo DiCaro).

65 ENVI, [Evidence](#), 25 November 2020, 1720 (David Adams).

markets of the *Canada–United States–Mexico Agreement* – unless the signatories to the agreement develop local battery production.<sup>66</sup> Daniel Breton suggested that existing federal measures, including the Strategic Innovation Fund and purchase incentives, could help to fund elements of a battery supply chain.<sup>67</sup>

### Recommendation 3

**The Committee recommends that the Government of Canada review and build on existing programs, such as the Strategic Innovation Fund, to facilitate the continued development of domestic supply chains for the full lifecycle of ZEV components, including batteries.**

Battery production is energy- and resource-intensive. However, manufacturers are finding more efficient ways to make batteries, using new production techniques and new battery designs that require less energy and different materials. Daniel Breton told the Committee that the environmental impact of battery production has dropped by 60% since 2013. By 2030, the lifecycle GHG emissions from batteries should decline by a factor of eight.<sup>68</sup> The Government of Canada has also initiated a program, Green Mining Innovation, that focuses on reducing the environmental impacts from mining various minerals, including those used in battery production.<sup>69</sup>

Canadians can find other ways to reduce the environmental impacts of batteries. Over time, a battery loses its ability to fully recharge. By the time a battery can only charge to 80% of its original capacity, it is no longer useful to power a vehicle. However, witnesses said that there are ways to keep using these batteries.<sup>70</sup> David Adams noted that ZEV batteries can be reused for purposes other than charging vehicles, adding that “there are standards being developed” for these secondary uses.<sup>71</sup> In some cases, recyclers can

---

66 The Canada–United States–Mexico Agreement requires 75% of the value of a vehicle to originate in one of the three signatory countries. However, the agreement includes a five-year transition arrangement allowing lithium-ion batteries to avoid tariffs if they are assembled in North America. See Global Affairs Canada, “Chapter 4: Rules of Origin,” in *Canada–United States–Mexico Agreement*, art. 8.

67 ENVI, *Evidence*, 25 November 2020, 1650 (Daniel Breton).

68 ENVI, *Evidence*, 25 November 2020, 1550 (Daniel Breton).

69 See: Government of Canada, *Green Mining Innovation*.

70 ENVI, *Evidence*, 25 November 2020, 1555 (Nicolas Pocard); ENVI, *Evidence*, 25 November 2020, 1640 (Daniel Breton); and ENVI, *Evidence*, 25 November 2020, 1715 (David Adams).

71 ENVI, *Evidence*, 25 November 2020, 1715 (David Adams).



recover up to 95% of the raw materials from a vehicle battery – and the same for a hydrogen fuel cell.<sup>72</sup>

#### **Recommendation 4**

**The Committee recommends that the Government of Canada build on existing initiatives, like the Green Mining Innovation program, to improve the environmental performance of Canadian minerals, including those used in battery and hydrogen fuel cell production.**

#### **Recommendation 5**

**The Committee recommends that the Government of Canada work with provincial and territorial governments to develop recycling and end of life management strategies for ZEV batteries.**

Witnesses cautioned that it will be challenging to reorient Canada’s automotive sector to produce ZEVs. It takes time for producers to bring vehicles to market, and to retool facilities and retrain workers to produce ZEVs.<sup>73</sup> Angelo DiCaro suggested that the Government of Canada should ensure that the employment insurance system will support workers during plant retooling. He also noted that the transition to ZEVs could threaten jobs in Canada’s automotive parts sector, especially among businesses that produce parts for the powertrains that propel ICEVs. To compensate, Mr. DiCaro said that Canadian governments should set rules about the afterlife of vehicles that could create jobs in vehicle disassembly and recycling.<sup>74</sup>

#### **Recommendation 6**

**The Committee recommends that the Government of Canada study opportunities to support automotive sector workers while facilities are transitioning to produce ZEVs, and consider dedicated funding to retrain automotive sector workers for ZEV production.**

---

72 ENVI, [Evidence](#), 25 November 2020, 1555 (Nicolas Pocard); and ENVI, [Evidence](#), 25 November 2020, 1640 (Daniel Breton).

73 ENVI, [Evidence](#), 26 October 2020, 1655 (Sharon Irwin, Senior Director, Industry Sector, Automotive, Transportation and Digital Technology Branch, Department of Industry); ENVI, [Evidence](#), 23 November 2020, 1710 (Angelo DiCaro); and ENVI, [Evidence](#), 25 November 2020, 1600 (David Adams).

74 ENVI, [Evidence](#), 23 November 2020, 1625 (Angelo DiCaro).

## Vehicle Supply

Given that about 80% of ZEVs are sold in the region where they are made, the location of production plays some role in vehicle availability.<sup>75</sup> However, it is not enough to make vehicles in Canada: the vehicles must also be made available for sale.

Several witnesses told the Committee that Canada has an insufficient supply of ZEVs.<sup>76</sup> They cited a study produced by Dunsky Energy Consulting for Transport Canada, which found that only one third of Canadian car dealerships had ZEVs in stock, and that outside of B.C., Ontario and Quebec, fewer than 20% of dealerships had at least one ZEV on their lots.<sup>77</sup> Witnesses mentioned that most dealerships had a three-to-six month wait time for ZEVs and had none available for test drives.<sup>78</sup> Megan Nichols said that this shortage is caused by “a number of factors, including [ZEVs’] higher manufacturing costs and battery production constraints.”<sup>79</sup>

Two witnesses from the automotive industry disputed that there is a supply shortage. In their submissions to the Committee, Brian Kingston and David Adams stated that there were enough ZEVs to meet demand, and that the supply levels of these vehicles were consistent with those of other niche products.<sup>80</sup>

---

75 ENVI, [Evidence](#), 23 November 2020, 1620 (Cedric Smith).

76 ENVI, [Evidence](#), 26 October 2020, 1800 (Megan Nichols); ENVI, [Evidence](#), 2 November 2020, 1620 (Joanna Kyriazis); ENVI, [Evidence](#), 23 November 2020, 1615 (Cedric Smith); and Electric Mobility Canada, [The case for EV adoption and a Canadian EV industry](#), Brief submitted to ENVI, November 2020.

77 Joanna Kyriazis, Clean Energy Canada, [Opening Remarks](#), Brief submitted to ENVI, November 2020; and ENVI, [Evidence](#), 25 November 2020, 1540 (Daniel Breton).

78 ENVI, [Evidence](#), 2 November 2020, 1620 (Joanna Kyriazis); ENVI, [Evidence](#), 23 November 2020, 1615 (Cedric Smith); and Electric Mobility Canada, [The case for EV adoption and a Canadian EV industry](#), Brief submitted to ENVI, November 2020.

79 Megan Nichols, Department of Transport, [Opening Remarks](#), Brief submitted to ENVI, October 2020.

80 ENVI, [Evidence](#), 2 November 2020, 1645 (Brian Kingston); and Global Automakers of Canada, [Remarks Before the Standing Committee of the Environment Regarding Zero Emission Vehicles](#), Brief submitted to ENVI, November 2020.



## Targeted Regulations to Accelerate the Deployment of Zero-Emission Vehicles

Various witnesses called for Canada to adopt a targeted regulation that would require producers to make or sell ZEVs in Canada.<sup>81</sup> Indeed, several witnesses identified such a regulation as the next step to ensure an effective transition in the transportation sector.<sup>82</sup> Regulations that require vehicle producers to make or sell ZEVs are typically called “ZEV standards” or “ZEV mandates.” The two terms are generally interchangeable, but for the purposes of this report this regulation is described as a “ZEV standard.”

The composition of ZEV standards varies from one jurisdiction to another. Typically, a ZEV standard issues credits to automakers for every ZEV they produce or sell and requires automakers to earn a fixed number of credits each year. Usually, the number of credits that an automaker must earn is based on the total number of vehicles it produces. The longer the ZEV’s range, the more credits it is worth. Automakers are required to earn a rising number of credits over time, incentivizing the increased production – and availability – of ZEVs. Some ZEV standards allow automakers to bank or trade excess credits. Other ZEV standards can levy financial penalties against automakers that do not earn the required number of credits. Witnesses who supported adopting a ZEV standard in Canada argued that such a regulation would ensure that there are enough ZEVs in Canada to meet demand, help achieve the federal government’s sales targets, and accelerate the automotive industry’s transition toward ZEVs.<sup>83</sup>

B.C., Quebec, 11 U.S. states, and several countries have ZEV standards. In the U.S., some states have adopted a standard pioneered by California, which first established a ZEV requirement in 1990. Witnesses described this requirement, which California calls a ZEV

---

81 Joanna Kyriazis, Clean Energy Canada, [Opening Remarks](#), Brief submitted to ENVI, November 2020; Travis Allan, AddÉnergie Technologies Inc., [Opening Remarks](#), Brief submitted to ENVI, November 2020; ENVI, [Evidence](#), 23 November 2020, 1620 (Cedric Smith); LeadingAhead Energy, [ENVI – Zero Emission Vehicle – Brief: November 23, 2020](#), Brief submitted to ENVI, November 2020; and ENVI, [Evidence](#), 25 November 2020, 1540 (Daniel Breton).

82 ENVI, [Evidence](#), 23 November 2020, 1735 (Suzanne Goldberg); ENVI, [Evidence](#), 23 November 2020, 1735 (Maxime Charron); ENVI, [Evidence](#), 23 November 2020, 1735 (Faisal Kazi, President and Chief Executive Officer, Siemens Canada Limited); ENVI, [Evidence](#), 23 November 2020, 1735 (Cedric Smith); ENVI, [Evidence](#), 23 November 2020, 1735 (Angelo DiCaro); and ENVI, [Evidence](#), 23 November 2020, 1735 (Patrick Bateman).

83 Joanna Kyriazis, Clean Energy Canada, [Opening Remarks](#), Brief submitted to ENVI, November 2020; Travis Allan, AddÉnergie Technologies Inc., [Opening Remarks](#), Brief submitted to ENVI, November 2020; ENVI, [Evidence](#), 23 November 2020, 1620 (Cedric Smith); LeadingAhead Energy, [ENVI – Zero Emission Vehicle – Brief: November 23, 2020](#), Brief submitted to ENVI, November 2020; and ENVI, [Evidence](#), 25 November 2020, 1540 (Daniel Breton).

“mandate,” as an example of a best practice for encouraging the adoption of ZEVs.<sup>84</sup> Other jurisdictions have designed their ZEV standards differently. For example, China’s New-Energy Vehicle policy sets fixed production targets. The policy required 10% of an automaker’s total production to be ZEVs by 2019, rising by 2% every year until reaching 18% in 2023. In contrast, the European Union (EU) has set voluntary ZEV quotas. This policy offers an incentive to manufacturers that exceed the quota: if manufacturers produce more ZEVs than specified by the quota, the EU will apply slightly more relaxed CO<sub>2</sub> emission standards to that manufacturer’s fleet of vehicles.

The Committee heard that locations with ZEV standards have higher sales of ZEVs, and more supply.<sup>85</sup> Witnesses said this holds true within Canada. Joanna Kyriazis said that B.C. and Quebec accounted for 76% of all the ZEVs available for sale in Canada in 2019.<sup>86</sup> According to Daniel Breton this is because “manufacturers send the vehicles where there are mandates.”<sup>87</sup> He continued:

I can give you two examples. Right now, if you want to purchase a Toyota RAV4 Prime, you'll be able to get it in Quebec because there's a ZEV mandate. You won't be able to get it elsewhere in Canada.

I can give you an even better example than that. In 2011, the federal government and the Ontario government financed the assembly of the Toyota RAV4 EV. It was built in Woodstock, Ontario. Because there was no mandate in Canada but there was a mandate in California, all these vehicles were shipped to California and no one in Canada had access to these vehicles.<sup>88</sup>

By requiring vehicle makers to produce or sell more ZEVs, a ZEV standard might also increase the number of ZEV models available for sale and help to reduce prices. According to Clean Energy Canada, as of 2019, only 40 of the 279 ZEV models available around the world could be purchased in Canada. The greater the range of choices available to consumers, the more likely they are to find a ZEV that meets their needs.<sup>89</sup> ZEV standards do not need to be limited to light-duty vehicles. Suzanne Goldberg, Director of Public Policy, Canada at ChargePoint, suggested that Canada consider

---

84 ENVI, [Evidence](#), 23 November 2020, 1750 (Cedric Smith); and ENVI, [Evidence](#), 23 November 2020, 1750 (Suzanne Goldberg).

85 ENVI, [Evidence](#), 2 November 2020, 1705 (Joanna Kyriazis); ENVI, [Evidence](#), 23 November 2020, 1705 (Cedric Smith); and ENVI, [Evidence](#), 25 November 2020, 1640 (Daniel Breton).

86 ENVI, [Evidence](#), 2 November 2020, 1705 (Joanna Kyriazis).

87 ENVI, [Evidence](#), 25 November 2020, 1640 (Daniel Breton).

88 Ibid.

89 Clean Energy Canada, [Focus: A National Zero-Emission Vehicle Standard](#), Brief submitted to ENVI, October 2020.



adopting a “clean truck rule,” modelled after California’s, that would encourage the adoption of heavy-duty ZEVs.<sup>90</sup>

Witnesses from the automotive industry were opposed to a ZEV standard. The Global Automakers of Canada and the Canadian Automobile Dealers Association argued, in briefs to the Committee, that there is insufficient evidence that standards drive ZEV uptake. Both noted that ZEVs achieved nearly 10% market penetration in B.C. before the province created its standard.<sup>91</sup> In its submission, Toyota Canada Inc. wrote that, from an original equipment manufacturer’s perspective, “one of the most frustrating aspects” of a standard was the “focus on the act of selling a specific vehicle technology.” It said that the company would prefer to let consumers determine the composition of the on-road fleet.<sup>92</sup>

Martin Olszynski, Professor at the Faculty of Law at the University of Calgary, disputed this perspective in a brief submitted to the Committee. He wrote that large automakers, who have known for decades about the impacts of emissions on climate change, cannot claim that they are simply giving the consumer what they want by offering emission-intensive vehicles. He noted that “[t]he top five manufacturers (General Motors, Ford, Toyota, Fiat Chrysler et Honda) spent roughly \$10 billion on advertising, in 2019. That is an inordinate amount of money to spend on something that the industry claims to not be able to control.”<sup>93</sup>

Toyota Canada Inc. and Honda Canada Inc. suggested that a ZEV standard might make local production more expensive and less competitive, and that automakers might need to rely on imported vehicles to comply with the policy.<sup>94</sup> In their briefs to the Committee, Global Automakers of Canada and the Canadian Automobile Dealers

---

90 ENVI, *Evidence*, 23 November 2020, 1750 (Suzanne Goldberg).

91 Global Automakers of Canada, *Remarks Before the Standing Committee of the Environment Regarding Zero Emission Vehicles*, Brief submitted to ENVI, November 2020; and Canadian Automobile Dealers Association, *Submission For the ZEV Study*, Brief submitted to ENVI, December 2020.

92 Toyota Canada Inc., *Toyota submission to the ENVI Committee Zero Emissions Vehicle Study*, Brief submitted to ENVI, November 2020.

93 Martin Olszynski, *Initiatives to Encourage Zero Emission Vehicles Adoption*, Brief submitted to ENVI, November 2020.

94 Honda Canada Inc., *RE: Written brief to the House of Commons Standing Committee on Environment and Sustainable Development – Study on Zero Emissions Vehicles*, Brief submitted to ENVI, November 2020; and Toyota Canada Inc., *Toyota submission to the ENVI Committee Zero Emissions Vehicle Study*, Brief submitted to ENVI, November 2020.

Association said that the Government of Canada should assess the supply and demand for ZEVs in Canada before considering adopting a vehicle standard.<sup>95</sup>

If the Government of Canada wished to adopt a ZEV standard, it would have to study the best way to do so within federal jurisdiction. In its brief to the Committee, Clean Energy Canada proposed that the federal government adopt a “national zero-emission vehicle standard” as a “backstop” while provinces develop their own vehicle standards, as it did with carbon pricing.<sup>96</sup>

The witnesses who supported a ZEV standard said that it should be considered as part of a larger framework of policies, including purchase incentives, supply-side measures, consumer education, and investment to expand vehicle charging and refuelling networks.<sup>97</sup>

**“Our experience has been consistent: we see the most adoption, and the most innovation and economic benefit in regions that adopt a comprehensive suite of policies that supports ZEV adoption.”**

Travis Allan, Vice-President, Public Affairs and General Counsel,  
AddÉnergie Technologies Inc.<sup>98</sup>

One alternative to a ZEV standard would be to tighten Canada’s vehicle emissions regulations.<sup>99</sup> The current *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations* include multiplier provisions to encourage producers to introduce

---

95 Global Automakers of Canada, [Remarks Before the Standing Committee of the Environment Regarding Zero Emission Vehicles](#), Brief submitted to ENVI, November 2020; and Canadian Automobile Dealers Association, [Submission For the ZEV Study](#), Brief submitted to ENVI, December 2020.

96 Clean Energy Canada, [Focus: A National Zero-Emission Vehicle Standard](#), Brief submitted to ENVI, October 2020.

97 ENVI, [Evidence](#), 2 November 2020, 1635 (Joanna Kyriazis); Travis Allan, AddÉnergie Technologies Inc., [Opening Remarks](#), Brief submitted to ENVI, November 2020; ENVI, [Evidence](#), 23 November 2020, 1620 (Cedric Smith); and ENVI, [Evidence](#), 25 November 2020, 1540 (Daniel Breton).

98 Travis Allan, AddÉnergie Technologies Inc., [Opening Remarks](#), Brief submitted to ENVI, November 2020.

99 Clean Energy Canada, [Focus: A National Zero-Emission Vehicle Standard](#), Brief submitted to ENVI, October 2020; and Noel Melton, Jonn Axsen and Barbar Moawad, “Which plug-in electric vehicle policies are best? A multi-criteria evaluation framework applied to Canada,” *Energy Research & Social Science*, vol. 64, 2020.



advanced technology vehicles, including ZEVs.<sup>100</sup> Setting even more stringent fleet-wide emissions regulations would enhance the incentive for automakers to produce non-emitting vehicles.<sup>101</sup> However, Canada's normal practice is to harmonize these regulations with the United States. David Adams argued against making unilateral changes, saying that this would undermine the integration of the North American automotive sector.<sup>102</sup>

### Recommendation 7

**The Committee recommends that the Government of Canada work with industry and the provinces and territories to establish a national ZEV standard, while respecting constitutional responsibilities and the deep integration of the North American automotive market.**

## Charging and Refuelling Networks

ZEVs need access to a charger to recharge their electric batteries, or a fuelling station to refill their hydrogen reservoir. The Committee mainly heard evidence regarding charging networks for battery-powered vehicles.

There are three main types of charger for battery-powered vehicles. The more powerful the charger, the more quickly the battery is recharged. Level 1 chargers are alternating current (AC) chargers that plug into regular household 120V wall outlets. Level 2 chargers are AC chargers that use 208V or 240V wall outlets, like the ones used for clothes dryers. They can charge a ZEV up to four times more quickly than a Level 1 charger. Level 2 chargers are often used as a quicker charging option in retail or public parking lots and can also be installed in homes by an electrician.<sup>103</sup> Level 1 and Level 2 chargers both use a J1772 "connector," or plug, which is the industry standard for all ZEVs produced for the North American market.<sup>104</sup> Level 3 chargers, or DC fast chargers, use direct current (DC) and charge batteries the quickest. These are often found along highways. There are three types of connectors for Level 3 chargers, one of which is proprietary to Tesla, and two which are offered by other automakers. Not all Level 3 chargers have all types of connectors. Discussing these differences, Suzanne Goldberg

---

100 Helen Ryan, Department of the Environment, [Opening Remarks](#), Brief submitted to ENVI, October 2020.

101 ENVI, [Evidence](#), 2 November 2020, 1650 (Joanna Kyriazis).

102 ENVI, [Evidence](#), 25 November 2020, 1705 (David Adams).

103 Natural Resources Canada [NRCan], [Plugging in](#).

104 Electric Mobility Canada, Residential Charging, [EV Charging Levels](#).

said while ideally, all connectors would be standardized, it was important for all publicly funded Level 3 charging stations to offer ports for the two non-proprietary types of connector.<sup>105</sup>

The cost of installing chargers can vary. The Committee heard that the average cost of installation in a home was between \$300 and \$500, plus roughly \$1000 for a Level 2 charger, while the average installation cost for a multi-unit dwelling or a business was between \$5,000 and \$7,000 in addition to a Level 2 charger costing roughly \$5,000.<sup>106</sup>

Several witnesses said that “range anxiety” was a barrier to ZEV uptake in Canada.<sup>107</sup> Range anxiety is the fear that a ZEV will run out of electric charge far from a charging station, stranding the driver. Accordingly, witnesses described the importance of developing strong charging networks. Paula Vieira stated that NRCan is spending over \$300 million on ZEV infrastructure programs to ensure Canadians can charge their ZEVs across the country.<sup>108</sup> Both the installation of vehicle chargers and the purchase of Level 2 and Level 3 chargers are being incentivized by federal initiatives, such as the Zero Emission Vehicle Infrastructure Program.<sup>109</sup>

The level of charging is not the only consideration when designing government incentives. Travis Allan, Vice-President of Public Affairs and General Counsel at AddÉnergie Technologies Inc., said that there was “a strong argument for incentivizing smart charging,” because smart charging stations allow utilities and users to manage the timing and speed of charging, optimizing the load on the electricity grid.<sup>110</sup> Faisal Kazi, President and Chief Executive Officer of Siemens Canada Limited, agreed that Canada should emphasize the installation of smart charging equipment. He also raised the question of cybersecurity. The Government of Canada should ensure that charging networks are protected from cyber threats, he said, “to ensure the integrity and the security of the operations but also to ensure that the transactions are also secured.”<sup>111</sup>

---

105 ENVI, [Evidence](#), 23 November 2020, 1705 (Suzanne Goldberg).

106 ENVI, [Evidence](#), 23 November 2020, 1655 (Suzanne Goldberg).

107 ENVI, [Evidence](#), 26 October 2020, 1715 (Paula Vieira); ENVI, [Evidence](#), 2 November 2020, 1655 (Travis Allan, Vice-President, Public Affairs and General Counsel, AddÉnergie Technologies Inc.); ENVI, [Evidence](#), 23 November 2020, 1615 (Cedric Smith); ENVI, [Evidence](#), 2 November 2020, 1700 (Brian Kingston); and ENVI, [Evidence](#), 23 November 2020, 1605 (Maxime Charron).

108 ENVI, [Evidence](#), 26 October 2020, 1715 (Paula Vieira).

109 ENVI, [Evidence](#), 26 October 2020, 1750 (Paula Vieira).

110 ENVI, [Evidence](#), 2 November 2020, 1725 (Travis Allan).

111 ENVI, [Evidence](#), 23 November 2020, 1610 (Faisal Kazi).



Joanna Kyriazis told the Committee that, as of 2019, Canada had 290 charging stations per one million residents, while Norway, which has achieved 50% ZEV sales and adoption,<sup>112</sup> has 1,700 charging stations per million residents.<sup>113</sup> Speaking about the situation in November 2020, Cedric Smith noted that the number of charging stations compared unfavourably with the country's roughly 12,000 gasoline stations.<sup>114</sup> As of March 2021, Canada's public ZEV-charging network had approximately 6,000 charging stations with around 13,300 charging outlets.<sup>115</sup>

Chargers are not distributed evenly throughout the country (Figure 3). Travis Allan stated that while important progress has been made in infrastructure development, particularly in Quebec and British-Columbia, there are still "numerous places in Canada where it is challenging to find the appropriate level of charging, either DC fast charging or level two."<sup>116</sup> He suggested that it would likely be necessary to double or triple the number of charging stations to reach a level of charging infrastructure at which Canadians are comfortable.<sup>117</sup> Suzanne Goldberg added that installing widespread charging infrastructure in rural areas, remote areas and in Canada's North was important to ensure that Canadians can drive ZEVs coast to coast to coast. She said that it was important to evaluate NRCan's infrastructure program using these criteria.<sup>118</sup>

---

112 ENVI, [Evidence](#), 2 November 2020, 1730 (Travis Allan).

113 ENVI, [Evidence](#), 2 November 2020, 1730 (Joanna Kyriazis).

114 ENVI, [Evidence](#), 23 November 2020, 1615 (Cedric Smith).

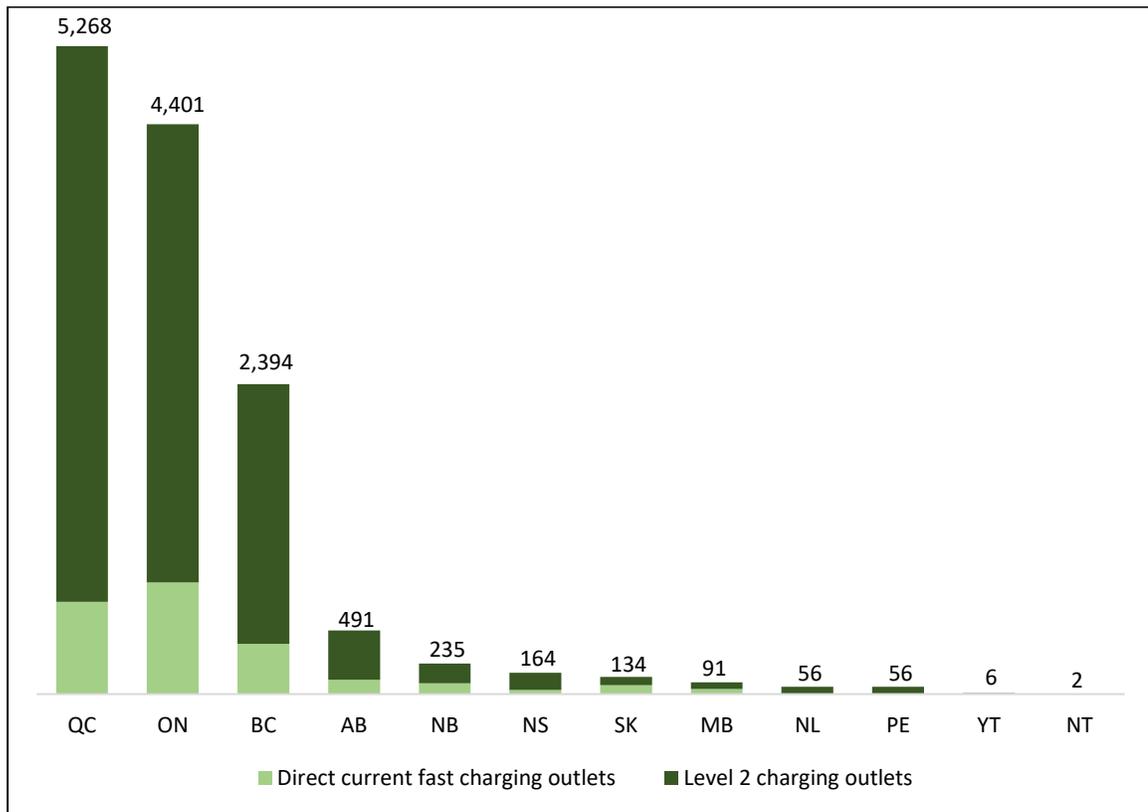
115 NRCan, [Electric Charging and Alternative Fuelling Stations Locator](#), database, accessed 23 March 2021.

116 ENVI, [Evidence](#), 2 November 2020, 1730 (Travis Allan).

117 Ibid.

118 ENVI, [Evidence](#), 23 November 2020, 1715 (Suzanne Goldberg).

**Figure 3 – Publicly accessible electric vehicle charging outlets in Canada, by location and type**



Note: Nunavut has no publicly accessible electric vehicle charging outlets.

Source: Figure prepared by the Committee using data obtained from Natural Resources Canada, [Electric Charging and Alternative Fuelling Stations Locator](#), database, accessed 23 March 2021.

Witnesses noted that roughly 80% of ZEV charging happens overnight at home.<sup>119</sup> This can cause difficulties for people living in multi-unit dwellings who do not have easy access to chargers.

119 ENVI, [Evidence](#), 26 October 2020, 1715 (Paula Vieira); ENVI, [Evidence](#), 2 November 2020, 1730 (Joanna Kyriazis); and ENVI, [Evidence](#), 25 November 2020, 1725 (Daniel Breton).



**“[A]bout one third of Canadians live in multi-unit residential buildings, such as apartment buildings or “garage orphans”—dwellings with no access to garages or driveways—and face unique difficulties with home charging.”**

Cedric Smith, Analyst at the Pembina Institute<sup>120</sup>

Maxime Charron, President of LeadingAhead Energy, predicted that these “garage orphans” will become an increasingly significant barrier to further adoption of ZEVs. He said that while early adopters were wealthier and had access to overnight charging at home, people who live in older, multi-unit buildings that are expensive to retrofit – or who park on the street – would not have access to at-home charging. Mr. Charron added that this “is why it's also important to provide public charging stations, whether they are fast chargers or level 2.”<sup>121</sup>

Potential solutions suggested by witnesses to address the charging difficulties faced by Canadian “garage orphans” were to continue to offer higher incentives for the installation of chargers in multi-unit dwellings,<sup>122</sup> to encourage workplaces to install ZEV charging stations,<sup>123</sup> or to amend Canada’s model building codes to ensure that new multi-unit buildings<sup>124</sup> – or indeed all buildings<sup>125</sup> – have the required infrastructure to allow for the eventual installation of ZEV chargers.

Travis Allan explained that some businesses have installed charging stations in order to attract ZEV users to their locations.<sup>126</sup> He said that there is still a need for incentives to install chargers but that this need will decline over time as more people adopt ZEVs.<sup>127</sup>

---

120 ENVI, [Evidence](#), 23 November 2020, 1615 (Cedric Smith).

121 ENVI, [Evidence](#), 23 November 2020, 1700 (Maxime Charron).

122 ENVI, [Evidence](#), 23 November 2020, 1745 (Cedric Smith).

123 ENVI, [Evidence](#), 23 November 2020, 1705 (Suzanne Goldberg).

124 Global Automakers of Canada, [Remarks Before the Standing Committee of the Environment Regarding Zero Emission Vehicles](#), Brief submitted to ENVI, November 2020.

125 LeadingAhead Energy, [ENVI – Zero Emission Vehicle – Brief: November 23, 2020](#), Brief submitted to ENVI, November 2020.

126 ENVI, [Evidence](#), 2 November 2020, 1730 (Travis Allan).

127 ENVI, [Evidence](#), 2 November 2020, 1725 (Travis Allan).

## Recommendation 8

**The Committee recommends that the Government of Canada work with provinces and territories to revise building codes, including the forthcoming national model building codes, to encourage the installation of charging infrastructure in newly constructed commercial and multi-unit residential buildings, and encourage the voluntary installation of charging infrastructure in newly-constructed single-family residential dwellings.**

## Recommendation 9

**The Committee recommends that the Government of Canada review its charging station incentive programs to encourage the installation of smart charging infrastructure, and to expand access to vehicle chargers in multi-unit residential buildings and remote and rural areas.**

## Electricity Production, Distribution and Metering

As more ZEVs appear on Canadian roads and the country expands its charging network, the demand for electricity will change. According to Francis Bradley, President and Chief Executive Officer at the Canadian Electricity Association, utilities will be able to generate enough electricity to charge these vehicles.<sup>128</sup> However, ZEVs will create demand for electricity in new locations, at new times, and at higher levels than before. For example, as more Canadians charge vehicles at home, electricity networks will need to adapt to rising demand in residential areas. Distribution systems and transformers will need to be upgraded.<sup>129</sup> Witnesses from the electricity sector told the Committee that they are planning upgrades to meet some of these needs.<sup>130</sup>

The federal Clean Fuel Standard could be used to support these investments. Francis Bradley said that credits from the standard could help utilities to fund upgrades to their infrastructure. He called on the Government of Canada to ensure that utilities can earn fuel-switching credits from ZEV chargers.<sup>131</sup> Similarly, Maxime Charron said that credits from the Clean Fuel Standard could be used to fund investments in charging networks. He encouraged the Government of Canada to allow investors, as well as network

---

128 ENVI, *Evidence*, 2 November 2020, 1710 (Francis Bradley, President and Chief Executive Officer, Canadian Electricity Association).

129 Ibid.

130 ENVI, *Evidence*, 2 November 2020, 1710 (Francis Bradley); and ENVI, *Evidence*, 23 November 2020, 1630 (Patrick Bateman).

131 ENVI, *Evidence*, 2 November 2020, 1735 (Francis Bradley).



owners, to earn fuel-switching credits.<sup>132</sup> In his brief to the Committee, Mr. Charron noted that the current draft of the Clean Fuel Standard does not allow non-networked charger manufacturers to earn credits, which he said would deter new private investment and risked “further increasing [the] monopoly of network providers.”<sup>133</sup>

Two witnesses said that the federal *Electricity and Gas Inspection Act* should be modernized to meet the demands created by ZEVs and their infrastructure. Francis Bradley and Suzanne Goldberg said that the Act and its regulations make it difficult for utilities and charging station owners to track the electricity used by ZEVs, and for consumers to understand their billing.<sup>134</sup> Ms. Goldberg said that the Act and its regulations should be amended to:

- allow ZEV charging stations to be certified by Measurement Canada, so that station owners can charge users for the electricity they use rather than the time they spend charging their vehicle; and
- permit bi-directional charging, so that ZEV batteries can be used to power homes, buildings or the grid.<sup>135</sup>

## Recommendation 10

**The Committee recommends that the Government of Canada consider revising the *Electricity and Gas Inspection Act*, the *Weights and Measures Act*, and their associated regulations to remove barriers to innovative vehicle charging technologies and to improve transparency for electricity providers and users.**

Research suggests that the carbon intensity of electricity is one of the most important factors affecting the lifecycle emissions of ZEVs.<sup>136</sup> Fortunately, Canada has one of the cleanest electricity grids in the world, with more than 80% of its electricity generated

---

132 ENVI, *Evidence*, 23 November 2020, 1605 (Maxime Charron).

133 LeadingAhead Energy, *ENVI – Zero Emission Vehicle – Brief: November 23, 2020*, Brief submitted to ENVI, November 2020.

134 ENVI, *Evidence*, 2 November 2020, 1610 (Francis Bradley); and ENVI, *Evidence*, 23 November 2020, 1730 (Suzanne Goldberg).

135 ENVI, *Evidence*, 23 November 2020, 1730 (Suzanne Goldberg).

136 Maareten Messagie, “Life Cycle Analysis of the Climate Impact of Electric Vehicles,” Transport and Environment; and Anders Nordelöf et al., “Environmental impacts of hybrid, plug-in hybrid, and battery electric vehicles—what can we learn from life cycle assessment?,” *The International Journal of Life Cycle Assessment*, 2014.

from non-emitting sources.<sup>137</sup> Even though some parts of Canada's electricity grid are more carbon-intensive than others (Figure 4), witnesses said that the lifetime emissions from a ZEV in Canada should be lower than those of an ICEV, regardless of grid intensity.<sup>138</sup> Nonetheless, just as electrification will help to decarbonize Canada's transportation sector, it will be important to continue reducing GHG emissions from Canada's electricity sector.

### **Recommendation 11**

**The Committee recommends that the Government of Canada identify additional opportunities for collaboration with provinces and territories, industry, and Indigenous peoples to facilitate the interprovincial trade of electricity, with a view to:**

- **Reducing overall GHG emissions from the electricity sector; and**
- **Ensuring that the electricity sector is prepared to meet the anticipated electricity demand associated with a rising number of ZEVs.**

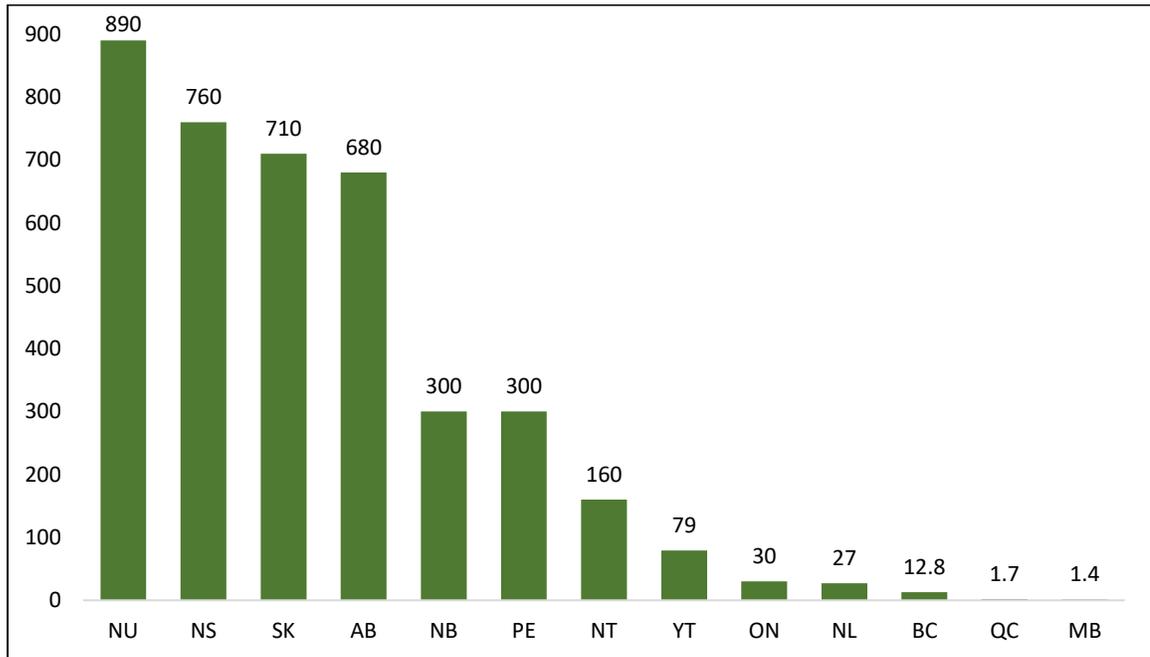
---

137 ENVI, [Evidence](#), 2 November 2020, 1610 (Francis Bradley).

138 ENVI, [Evidence](#), 23 November 2020, 1640 (Patrick Bateman); and ENVI, [Evidence](#), 25 November 2020, 1550 (Daniel Breton).



**Figure 4 – Carbon intensity of electricity consumption in Canada’s provinces and territories, 2019 (Grams of Carbon Dioxide Equivalent per Kilowatt-Hour)**



Notes: “Consumption intensity” indicates the carbon intensity of electricity as it is delivered to the consumer. It reflects greenhouse gas emissions associated with electricity generation as well as its transmission and distribution.

The carbon intensity of electricity consumption in Prince Edward Island (P.E.I.) is relatively high because the province imports much of its electricity from New Brunswick. Although 97% of the electricity generated in P.E.I. comes from wind power, New Brunswick uses a more carbon-intensive generation mix.

Source: Figure created by the Committee based on data obtained from United Nations Framework Convention on Climate Change, “Annex 13,” National Inventory Report 1990-2018: Greenhouse Gas Sources and Sinks in Canada, Part 3; United Nations Framework on Climate Change, Canada. See: Government of Canada, [National inventory report : greenhouse gas sources and sinks in Canada](#).

## Consumer Awareness

The Committee heard that it was important to raise consumer awareness to increase the adoption of ZEVs. According to the Global Automakers of Canada, “[o]ngoing collaborative efforts between government and industry need to be encouraged to

ensure basic ZEV literacy in order facilitate the uptake of ZEVs by Canadians.”<sup>139</sup> Brian Kingston identified “range capabilities, charging times, safety and the total cost of ownership” as areas where consumer concerns still need to be addressed.<sup>140</sup>

David Adams and Maxime Charron believed that it was important to inform not only consumers but also salespeople at dealerships to keep them aware of market developments.<sup>141</sup>

**“...from our experience the significant lack of education on EVs in general is clear, from range anxiety to the knowledge of existing charging infrastructure and the misunderstanding of the EV life cycle, all of which contribute to the spread of misinformation.”**

Maxime Charron, President, LeadingAhead Energy<sup>142</sup>

Francis Bradley said that opportunities to test drive ZEVs could play a part in addressing range anxiety, and general anxiety that consumers might have about ZEVs. He described a partnership between the Canadian Electricity Association and the organization Plug’n Drive that gives consumers the opportunity to try out ZEVs at their discovery centre in Toronto and during road shows that bring the vehicles out to consumers.<sup>143</sup>

## Recommendation 12

**The Committee recommends that the Government of Canada seek opportunities, in partnership with industry and the provinces and territories, to better inform consumers and dealers about ZEVs.**

---

139 Global Automakers of Canada, *Remarks Before the Standing Committee of the Environment Regarding Zero Emission Vehicles*, Brief submitted to ENVI, November 2020.

140 Brian Kingston, CVMA, *Opening Remarks*, Brief submitted to ENVI, November 2020.

There is a federal program, the Zero-Emission Vehicle Awareness Initiative, that supports projects that aim to increase awareness of ZEVs, and public charging and refueling infrastructure. See: NRCan, *Zero-Emission Vehicle Awareness Initiative*.

141 ENVI, *Evidence*, 25 November 2020, 1720 (David Adams); and ENVI, *Evidence*, 23 November 2020, 1645 (Maxime Charron).

142 ENVI, *Evidence*, 23 November 2020, 1605 (Maxime Charron).

143 ENVI, *Evidence*, 2 November 2020, 1735 (Francis Bradley).



## HYDROGEN-POWERED VEHICLES

Battery-powered vehicles are not the only kinds of ZEVs that can be produced and used in Canada. The Committee also heard evidence regarding ZEVs powered by hydrogen fuel cells. These cells combine hydrogen stored in a tank with oxygen from the air to produce electricity. While a hydrogen fuel cell does not emit GHGs, hydrogen production can create GHG emissions. The Committee heard that hydrogen can be divided into three types according to the carbon intensity of its production. These types are coded by colour:

- “Grey” hydrogen, associated with the highest emissions and produced from fossil fuels without using carbon capture and sequestration (CCS);
- “Blue” hydrogen, produced from fossil fuels with the use of CCS, which reduces the emission of GHGs; and
- “Green” hydrogen, produced from water by electrolysis using renewable electricity such as hydroelectricity, wind or solar – emitting no GHGs.<sup>144</sup>

**“To take action on greenhouse gas emissions, we need decarbonized hydrogen or low-carbon hydrogen.”**

Nicolas Pocard, Director, Marketing, Ballard Power Systems Inc.<sup>145</sup>

Hydrogen-powered vehicles may be better suited to certain uses than ZEVs powered by electric batteries. Hydrogen fuel cells are more energy dense than electric batteries, meaning that they produce more power relative to their size. During an appearance before the Committee for another study, the honourable Jonathan Wilkinson, Minister of the Environment and Climate Change, explained that hydrogen offers opportunities “with respect to a fuel for heavy-duty vehicles, for which batteries are going to be challenging.”<sup>146</sup> Nicolas Pocard, Director of Marketing at Ballard Power Systems Inc., agreed that hydrogen power could be particularly useful for heavy duty vehicles, such as freight trucks and delivery trucks, since the smaller hydrogen fuel cell leaves more room for the transportation of goods. He also added that vehicles such as taxis, which operate

144 Government of Canada, [Hydrogen Strategy for Canada](#), 2020, p. 20.

145 ENVI, [Evidence](#), 25 November 2020, 1655 (Nicolas Pocard).

146 ENVI, [Evidence](#), 2 December 2020, 1715 (Hon. Jonathan Wilkinson, Minister of Environment and Climate Change, Environment and Climate Change Canada).

in multiple shifts with little time to recharge, are also well suited to hydrogen power. Other vehicles types identified as being well suited to hydrogen power were coach buses, and even marine and air transportation.<sup>147</sup>

In a written brief to the Committee, the Global Automakers of Canada stated that “[h]ydrogen vehicles have different fuelling requirements and home charging is neither cost effective nor practical. Strategic hydrogen station investment in major urban centres will be pivotal to the growth of the hydrogen ZEV vehicle market in Canada.”<sup>148</sup> Paula Vieira indicated that hydrogen refuelling stations along long-haul freight corridors has been the focus of some NRCan programming since 2019.<sup>149</sup>

Nicolas Pocard argued that hydrogen-powered vehicles present an economic opportunity for Canada because of Canadian leadership in hydrogen technology development, the opportunities for hydrogen production in Canada and the potential for a Canadian value chain. He added that “[a]s long [as] it meets the objective of having zero-emissions, regardless of whether it's battery-electric or fuel-cell electric, it doesn't really matter.”<sup>150</sup> Sharon Irwin informed the Committee that ISED has programs such as the Strategic Innovation Fund that “support and incentivize research and development” for producers, parts manufacturers and others across the spectrum of heavy-duty vehicles.<sup>151</sup>

### **Recommendation 13**

**The Committee recommends that the Government of Canada convene a working group bringing together representatives from government, industry and other relevant groups to study how the heavy-duty vehicle sector will transition to a net-zero future.**

## **CONCLUSION**

There are good reasons to put more ZEVs on Canada’s roads. By increasing the proportion of vehicles produced and purchased in Canada that are ZEVs, the country can reduce GHG emissions, improve the competitiveness of its automotive sector, and

---

147 ENVI, *Evidence*, 25 November 2020, 1555 (Nicolas Pocard); ENVI, *Evidence*, 25 November 2020, 1635 (Nicolas Pocard); and ENVI, *Evidence*, 2 November 2020, 1610 (Francis Bradley).

148 Global Automakers of Canada, *Remarks Before the Standing Committee of the Environment Regarding Zero Emission Vehicles*, Brief submitted to ENVI, November 2020.

149 ENVI, *Evidence*, 26 October 2020, 1725 (Paula Vieira).

150 ENVI, *Evidence*, 25 November 2020, 1545 (Nicolas Pocard).

151 ENVI, *Evidence*, 26 October 2020, 1710 (Sharon Irwin).



HOUSE OF COMMONS  
CHAMBRE DES COMMUNES  
CANADA

deliver economic and environmental benefits to Canadians. The Government of Canada has recognized these opportunities, but it can do more to realize them. It can refine the incentives it provides to Canadians to buy ZEVs and install charging infrastructure. It can leverage new and existing programs to help develop domestic supply chains. Working with industry and the provinces and territories, it can identify regulatory measures that will ensure an adequate supply of vehicles. And it can better inform Canadians about ZEVs, addressing concerns and misinformation. Taken together, these steps should inform a more comprehensive approach to ZEVs, one that can drive Canada further toward its goal of net-zero emissions.

## APPENDIX A LIST OF WITNESSES

---

The following table lists the witnesses who appeared before the committee at its meetings related to this report. Transcripts of all public meetings related to this report are available on the committee’s [webpage for this study](#).

Organizations and Individuals	Date	Meeting
<b>Department of Industry</b> Sharon Irwin, Senior Director Industry Sector, Automotive, Transportation and Digital Technology Branch	2020/10/26	3
<b>Department of Natural Resources</b> Paula Vieira, Executive Director Fuel Diversification Division, Clean Fuels Branch	2020/10/26	3
<b>Department of the Environment</b> Marc D'Iorio, Director General Energy and Transportation Helen Ryan, Associate Assistant Deputy Minister Environmental Protection Branch	2020/10/26	3
<b>Department of Transport</b> Megan Nichols, Director General Environmental Policy	2020/10/26	3
<b>AddÉnergie Technologies Inc.</b> Travis Allan, Vice-President Public Affairs and General Counsel	2020/11/02	4
<b>Canadian Electricity Association</b> Francis Bradley, President and Chief Executive Officer	2020/11/02	4
<b>Canadian Vehicle Manufacturers' Association</b> Brian Kingston, President	2020/11/02	4
<b>Clean Energy Canada</b> Joanna Kyriazis, Senior Policy Advisor	2020/11/02	4

<b>Organizations and Individuals</b>	<b>Date</b>	<b>Meeting</b>
<b>ChargePoint</b> Suzanne Goldberg, Director of Public Policy Canada	2020/11/23	7
<b>LeadingAhead Energy</b> Maxime Charron, President	2020/11/23	7
<b>Siemens Canada Limited</b> Theresa Cooke, Head Strategy and E-Mobility Rocco Delvecchio, Vice-President Government Affairs Faisal Kazi, President and Chief Executive Officer	2020/11/23	7
<b>The Pembina Institute</b> Cedric Smith, Analyst	2020/11/23	7
<b>Unifor</b> Angelo DiCaro, Director of Research	2020/11/23	7
<b>WaterPower Canada</b> Patrick Bateman, Interim President	2020/11/23	7
<b>Ballard Power Systems Inc.</b> Nicolas Pocard, Director Marketing	2020/11/25	8
<b>Canadian Taxpayers Federation</b> Aaron Wudrick, Federal Director	2020/11/25	8
<b>Electric Mobility Canada</b> Daniel Breton, President and Chief Executive Officer	2020/11/25	8
<b>Global Automakers of Canada</b> David Adams, President and Chief Executive Officer	2020/11/25	8

## **APPENDIX B LIST OF BRIEFS**

---

The following is an alphabetical list of organizations and individuals who submitted briefs to the committee related to this report. For more information, please consult the committee's [webpage for this study](#).

**AddÉnergie Technologies Inc.**  
**Canadian Automobile Dealers Association**  
**Canadian Electricity Association**  
**Canadian Nuclear Association**  
**Canadian Vehicle Manufacturers' Association**  
**Clean Energy Canada**  
**Department of Industry**  
**Department of Natural Resources**  
**Department of the Environment**  
**Department of Transport**  
**Electric Mobility Canada**  
**Global Automakers of Canada**  
**Honda Canada Inc.**  
**LeadingAhead Energy**  
**Olszynski, Martin**  
**Ontario Power Generation Inc.**  
**Toyota Canada Inc.**



## REQUEST FOR GOVERNMENT RESPONSE

Pursuant to Standing Order 109, the committee requests that the government table a comprehensive response to this Report.

A copy of the relevant *Minutes of Proceedings* ([Meetings Nos. 3, 4, 7, 8, 12, 14, 15, 20, 21](#)) is tabled.

Respectfully submitted,

Francis Scarpaleggia  
Chair

