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Powering Up

A national and sub-national outlook on electric vehicle adoption, barriers, and impacts to the grid

Provincial Report: QUEBEC

August 2025

POWERING UP

A national and sub-national outlook on electric vehicle adoption, barriers, and impacts to the grid



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This report was prepared by Dunsky Energy + Climate Advisors, an independent firm focused on the clean energy transition and committed to quality, integrity and unbiased analysis and counsel. Our findings and recommendations are based on the best information available at the time the work was conducted as well as our experts' professional judgment.
Dunsky is proud to stand by our work.

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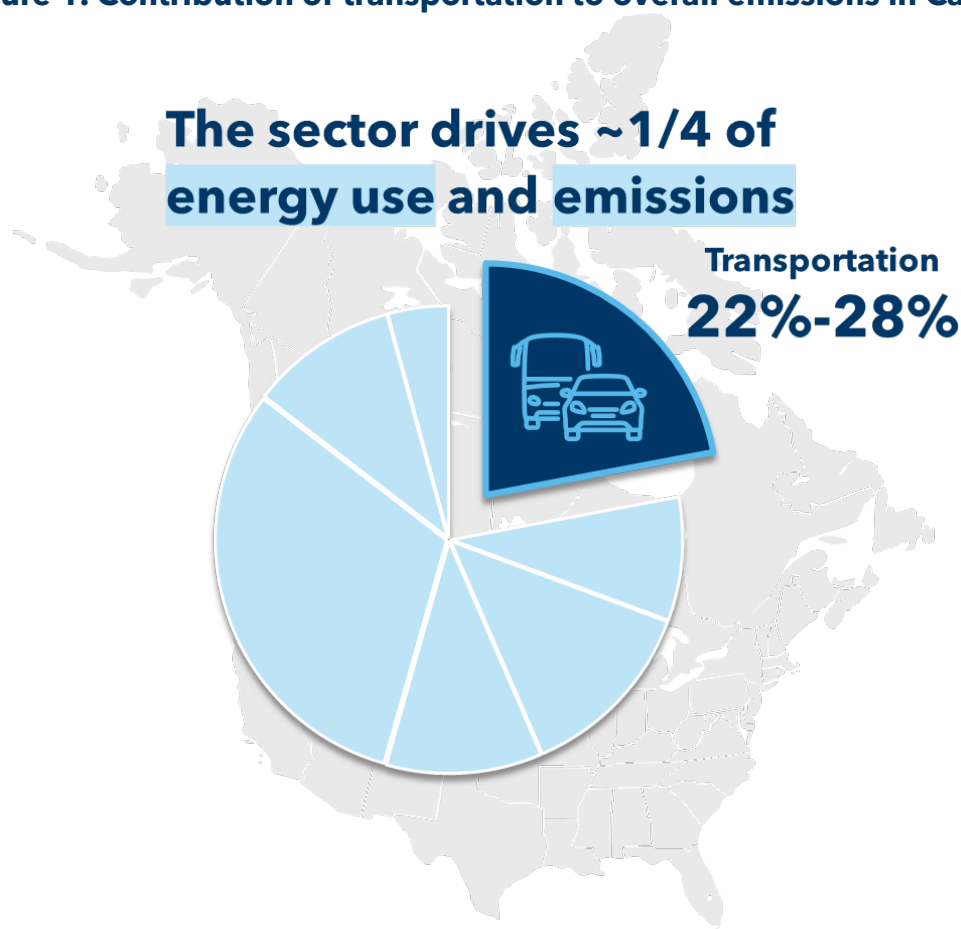


1. Background

1.1 Introduction

Powering Up: A national and sub-national outlook on electric vehicle adoption, barriers, and impacts to the grid, is a collaboration between Electric Mobility Canada and Dunskey Energy + Climate Advisors. Its goal is to provide robust data points for national and sub-national decision-making regarding the electrification of transportation. Light-duty vehicles (LDVs) were chosen as a focus because of their significant impact on total transportation greenhouse gas emissions (GHGs) in Canada.

Figure 1. Contribution of transportation to overall emissions in Canada



Addressing barriers to electric vehicle deployment is crucial to ensuring that Canada can meet its near-term climate targets (for 2030 and 2035) and maintain a realistic chance of achieving greater transportation decarbonization by 2050. By thoroughly examining key



barriers to Zero-emission Vehicle¹ (ZEV) adoption—including regionally tailored assessments of consumer affordability, customer economics, and electricity system impacts—our reports aim to identify policies and interventions that would enable the transition to electric mobility.

In this report, we outline the policy landscape and historical trajectory surrounding the adoption of light-duty ZEVs and provide a forecast of ZEV adoption under multiple scenarios between 2025 and 2040. We then analyze the implications of this adoption on electricity demand and how utilities, policymakers, and private actors can support a transition to ZEVs that is reliable, affordable, and predictable.

The key will be to transition to electric transportation in a way that is reliable, affordable and predictable

Primary benefits of ZEV adoption for Canadians:

- **Cleaner air** due to reduced emissions as the transportation energy source shifts from fossil fuel to electricity, which is becoming greener, and from reduced tailpipe emissions, improves air quality and helps to reduce the effects of climate change.
- **Improved affordability** due to savings on a total-cost-of-ownership basis – electricity is much cheaper than gasoline across Canada, offering operational savings from fuel as well as from maintenance, which has lower costs for ZEVs than for internal combustion engine vehicles (ICEVs).
- **Downward pressure on electricity rates** due to beneficial electrification, which creates opportunities for utilities to increase revenues, invest in infrastructure, and manage peaks and valleys in demand across their systems to reduce costs over time.

¹ Includes fully-electric or battery-electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs).

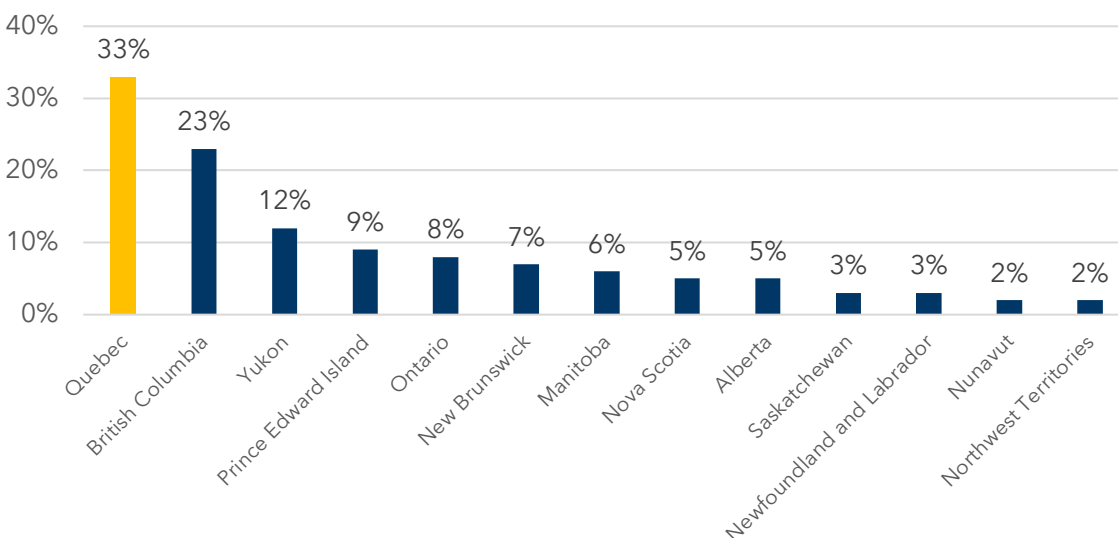


1.2 Historical ZEV Adoption

ZEV adoption in Quebec is the highest of all provinces and territories in Canada. Quebec's sales increased markedly in 2024 and represented a significant driver of the Canada-wide average of 15.4% of new vehicle sales in 2024.

Figure 2. 2024 ZEV share of new vehicle sales by province and territory²

▣ ZEVs represented 33% of new vehicle sales in 2024.



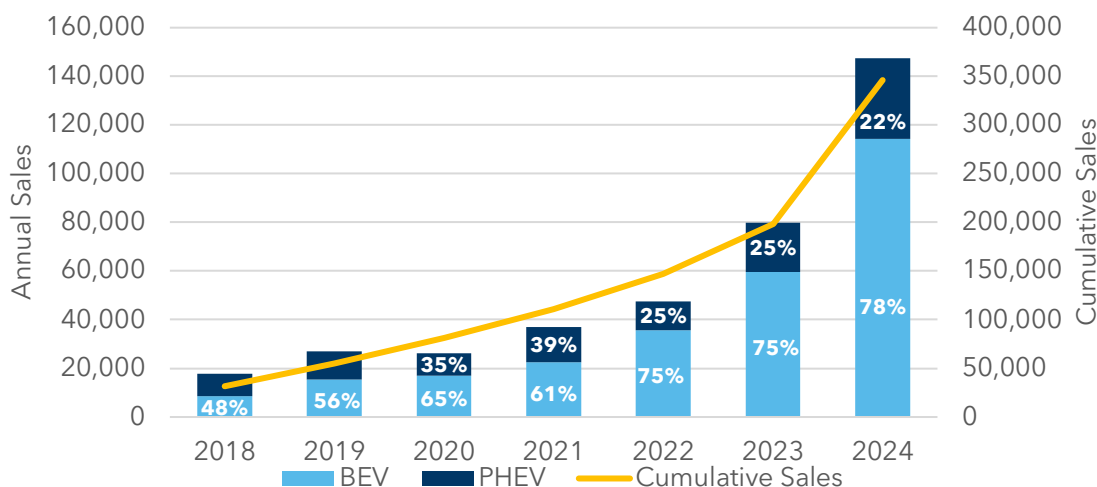
ZEV adoption in Quebec is the highest in Canada.

² S&P Global. Q4 2024. [Automotive Insights: Q4 2024 Canadian ZEV Information and Analysis](#).



Figure 3. Historical ZEV sales, Quebec

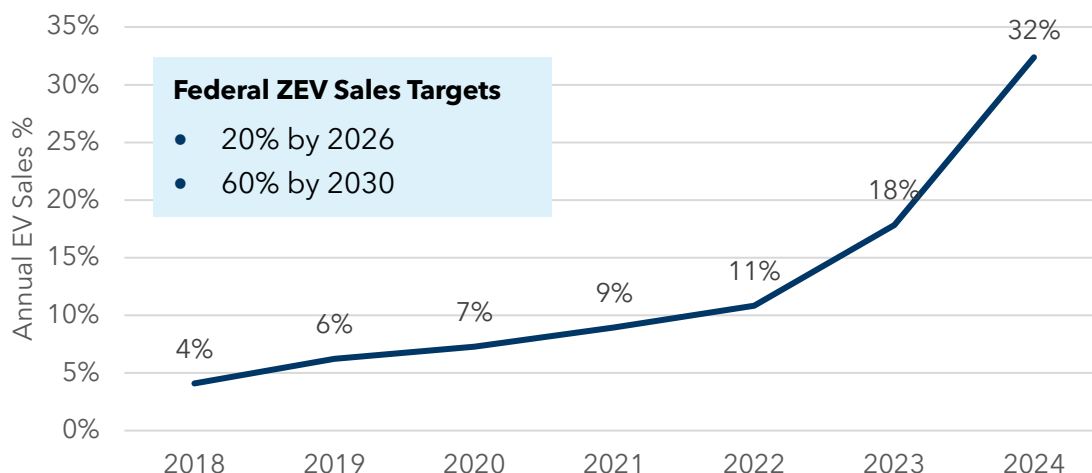
■ Nearly 347,000 ZEVs have been sold in the province as of 2024.³



In Quebec, the adoption of ZEVs has grown significantly since 2018. PHEV sales as a share of overall ZEV sales have historically been strong in the province, however, BEVs have represented an increasing share over time, growing from 48% to 78% of all ZEV sales between 2018 and 2024.

Figure 4. Historical ZEV sales %, Quebec⁴

■ Since 2018, ZEV market share has grown year-over-year by an average of 45% each year.



³ Sources include Statistics Canada. [New motor vehicle registrations, quarterly, by geographic level](#). Accessed January 2025 and Statistics Canada. [Vehicle registrations, by vehicle type and fuel type](#). Accessed January 2025.

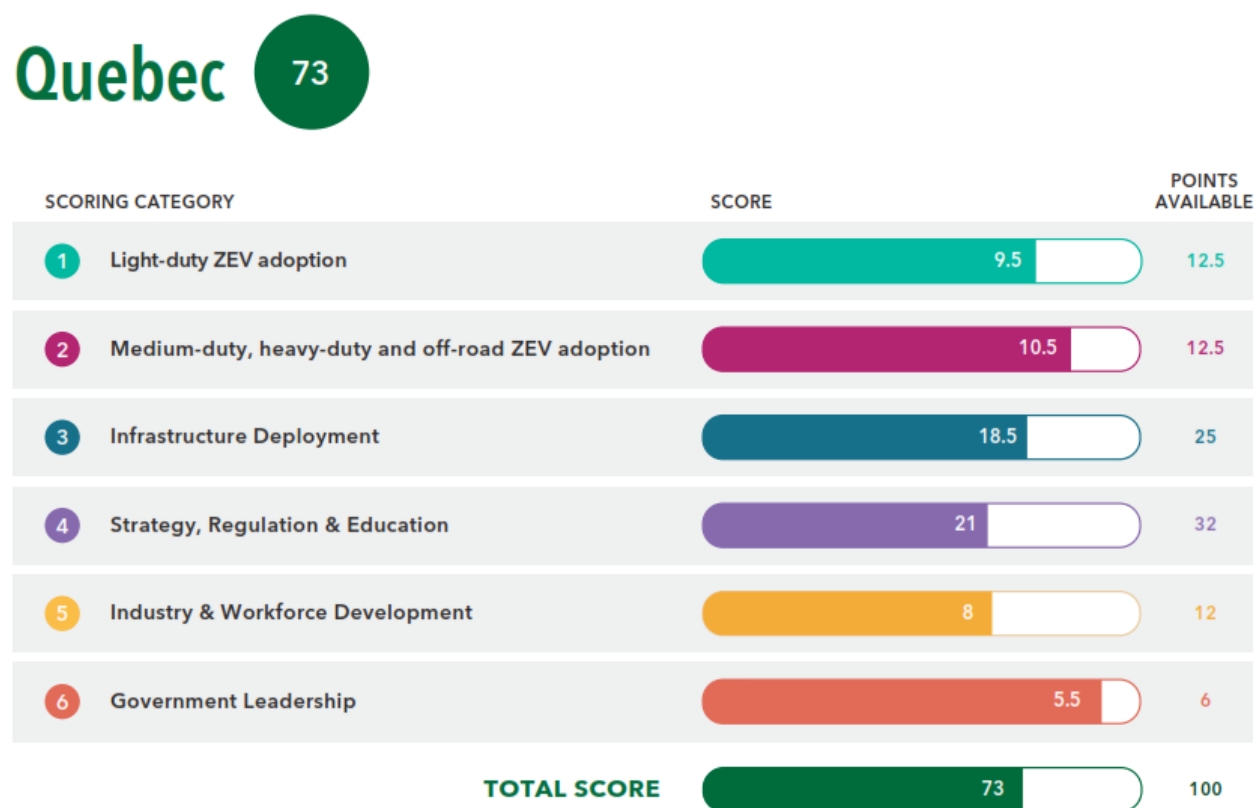
⁴ Annual ZEV Sales percentage are calculated leveraging car and light truck new vehicle sales from Natural Resources Canada. [Comprehensive Energy Use Database: Transportation Sector](#). Note that new vehicle sales are not available for 2023 and 2024 and forecasted new sales are leveraged for those years calculations. Varying methodologies or source for 2023 and 2024 light-duty new vehicle sales may result in different annual ZEV Sales percentages for those years.



1.3 Policy Landscape

In 2022, Dunsky developed a Provincial and Territorial Zero-Emission Vehicle Scorecard for Electric Mobility Canada. At the time, Quebec had a ZEV mandate in place with a target of 16% of new sales by 2026, the highest ZEV purchase incentives in Canada, a strong existing ZEV charging network thanks to a strong mandate from its electricity regulator for Hydro-Quebec to invest in the charging network, leading to accelerated deployments. Quebec placed second among all provinces and territories, sitting at 73 points in the “Canadian Leader” category.⁵

Figure 5. Quebec ZEV Scorecard, 2021-22



In that scorecard, we also outlined several key opportunities for Quebec to improve its score and thereby encourage higher rates of ZEV adoption in the coming years, as shown in the table below. Major updates against these potential opportunities include requiring its utility to create an action plan for shifting ZEV charging outside of peak periods in 2024.

⁵ Electric Mobility Canada. 2021-22. [Provincial and Territorial Zero-Emission Vehicle Scorecard](#).



Table 1. Opportunities for ZEV policy and program improvement and updates since 2022, Quebec

Opportunities highlighted in ZEV Scorecard (2022) ⁶	Major progress or updates in 2023-2024
Incorporating equity considerations into its incentives and investments. This could include directing specific incentives to equity deserving communities and Indigenous Nations and setting specific targets for infrastructure deployment in these areas, as well as offering culturally appropriate education initiatives in a wide range of languages.	N/A
Implementing greater disincentives for the purchase and use of ICEVs (e.g. sales taxes, vehicle registration fees, road tools, etc.), building on Quebec's existing higher registration fees for large ICEVs.	The Government of Quebec announced a ban on new light-duty ICEV sales as of 2035. Additionally, as of January 1, 2034 new light-duty ICEVs cannot be placed on the market for model years 2035 and later. ⁷
Requiring smart charging through the structure of funding for home charging, to support load management across the electricity system as demand grows.	Hydro-Quebec's subsidiary, Hilo, offers a smart charging solution using network-connected EVSEs. Hydro-Quebec has been asked by the Régie de l'énergie to "specify and present its action plan aimed at moving the charging of ZEVs outside peak periods during its next tariff file." ⁸
Strengthening its support for ZEV-ready retrofits of multi-unit residential buildings by structuring the program to require or encourage 100% ZEV-ready installations, thereby reaping the economies of scale that are possible through this approach.	The Government of Quebec launched its 2023-2030 ZEV Charging Strategy, including a target of 35% of parking spaces in multi-residential buildings, or around 600,000 spaces, and which will be adapted to allow the installation of charging stations by 2030. Specific program details to be announced. ⁹ Additionally, in Q1 2025, the Government of Quebec changed the building code to require all new residential buildings of 5+ dwelling to have 100% ZEV-Ready parking stalls. ¹⁰
Supporting the growth of economic activity around recycling ZEVs and their batteries and moving toward extended producer responsibility on these products.	N/A

⁶ Electric Mobility Canada. 2021-22. [Provincial and Territorial Zero-Emission Vehicle Scorecard](#).

⁷ Government of Quebec. December 16, 2024. [Vente de véhicules légers neufs zéro émission en 2035](#).

⁸ Régie de l'énergie. December 20, 2023. [Decision: Request for approval of the Distributor's 2023-2032 supply plan, Phase 2](#).

⁹ Government of Quebec. 2023. [Stratégie Québécoise Sur La Recharge De Véhicules Électriques](#).

¹⁰ Government of Quebec. 2025. [Bâtiment : mise à jour du Code de construction et du Code de sécurité](#)



Additional ZEV policy progress highlights in Quebec from 2023-2024 include:

- Quebec announced plans to invest \$3.8 billion over the next five years to accelerate transportation electrification and encourage more sustainable modes of travel.¹¹ Highlights from the plan announcement include:
 - The government will unveil a charging strategy with a budget of \$514 million.
 - The government has also planned investments in the electrification of heavy vehicles of \$96 million.
 - The government has a goal of having two million electric vehicles on Quebec roads by 2030.
 - It has also set a goal that all Quebec municipalities will have a climate risk assessment and adaptation plan by 2030.
- The Government of Quebec launched its 2023-2030 ZEV Charging Strategy.¹² Supported by \$764M over five years, the Strategy is designed to ensure ample charging infrastructure is available to accommodate the rapid growth in ZEVs now required by law in the province. Some highlights include:
 - In 2030, Quebec will have 6,700 public fast charging stations and 110,000 level 2 public charging stations.
 - The government is also planning to add more than 116,000 public charging stations to the province – an investment of more than \$514 million over the next five years.
- In its 2024 budget, the Province indicated that due to a maturing ZEV market, the maximum rebates will be declining and the program will close in 2027.¹³ As of January 1, 2025, the available rebates will be \$4,000 for new fully electric or fuel cell vehicles, \$2,000 for new plug-in hybrid vehicles costing less than \$65,000, \$2,000 for used fully electric vehicles, and \$1,000 for electric motorcycles.

¹¹ Government of Quebec. May 19, 2023. [*2023-2028 Implementation Plan of the 2030 Green Economy Plan.*](#)

¹² Government of Quebec. 2023. [*Stratégie Québécoise Sur La Recharge De Véhicules Électriques.*](#)

¹³ Government of Quebec. March 2024. [*Budget 2024-2025: Priorities Health, Education Budget Plan.*](#)



1.4 Vehicle and Housing Market Overview

Apart from a significant dip in the overall LDV fleet in 2020, sales in Quebec have been steadily increasing over the last six years, reaching over 5.9 million LDVs on the road in 2024. This market growth has implications for not only the potential for total ZEV sales but also the grid impact of an increasing number of vehicles being electrified.

Figure 6. Historical light-duty vehicle stock on the road, Quebec¹⁴

▶ The vehicle market in Quebec is growing, reaching a stock of over 5.9 million in 2024.

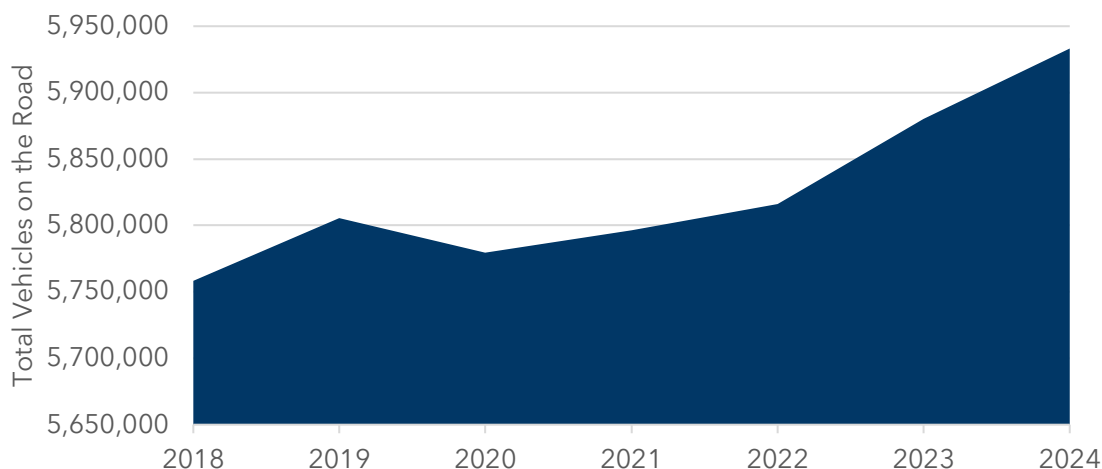
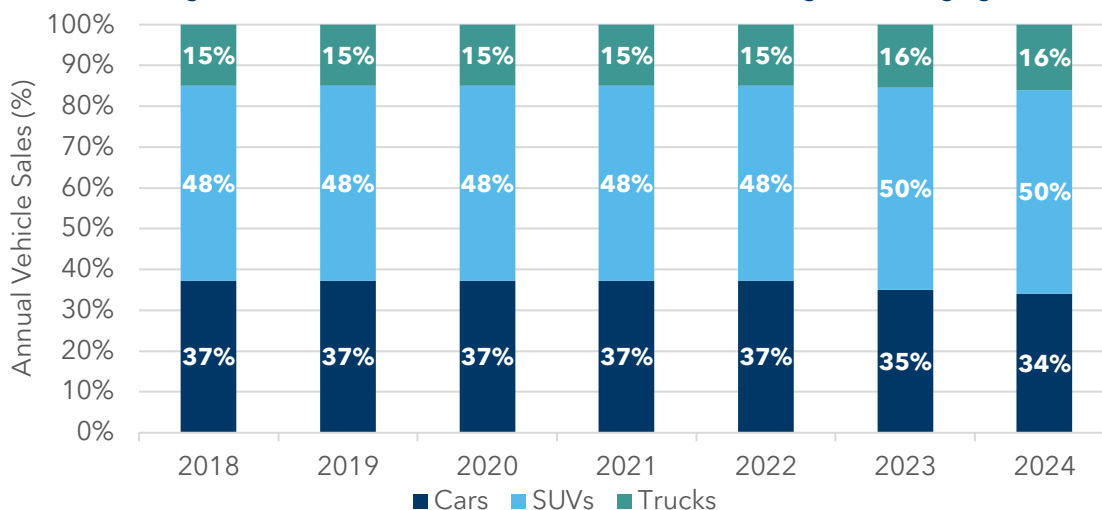


Figure 7. Historical light-duty vehicle segment mix, Quebec¹⁴

▶ The current segment mix is 50% SUVs and 34% cars, the remaining 16% being light trucks.



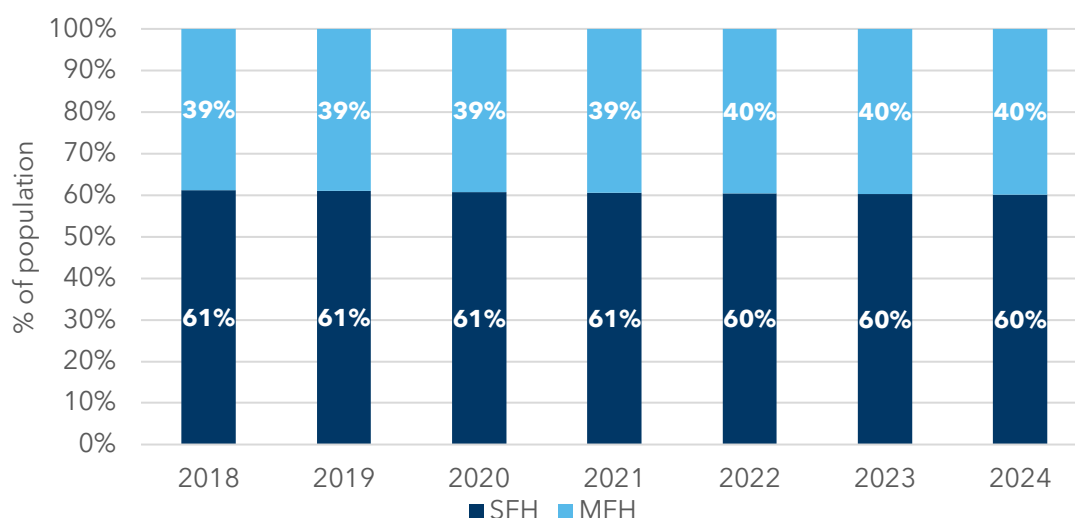
¹⁴ Natural Resources Canada. [Comprehensive Energy Use Database: Transportation Sector, Quebec](#). Accessed January 2025. Assume vehicle ownership remains constant and vehicles on the road align with population projections from Statistics Canada's M1 scenario. [Projected population, by projection scenario](#). Accessed June 2024.



Quebec's LDV segment mix has been relatively stable over the last seven years, with about half of new sales being SUVs and the majority of the remainder being made up of cars. Trucks make up a relatively small (16% in 2024) portion of annual vehicle sales compared to other parts of Canada. It is essential to understand the vehicle segment mix when these vehicles are transitioned to electric, as larger vehicles are heavier and tend to be less energy-efficient, thereby requiring more charging energy for the same amount of driving.

Figure 8. Historical percent of provincial population in single-family (SFH) versus multifamily homes (MFH), Quebec¹⁵

▶ Most Quebecers live in SFH, and the proportion has been relatively stable over time.



Nearly two-thirds of Quebecers (60% in 2024) live in single-family homes, and this proportion has been relatively stable over the last seven years from 61% in 2018¹⁶. This means that 40% of Quebecers live in multifamily homes, which has implications for their access to home charging and barriers to ZEV adoption.

This breakdown in housing types has an impact on ZEV adoption because the barriers to home charging for those in single-family homes tend to be much lower than in multifamily homes. Single-family home residents typically have more control over installing a charger where they park, and the costs of doing so are also typically lower. Provinces and municipalities committed to supporting ZEV adoption must either enable home charging in multifamily buildings through supportive policies, such as ZEV-ready requirements, or provide equivalent charging access in public places, which is significantly more expensive.

¹⁵ Based on population projections from Statistics Canada's M1 scenario (June 24, 2024. [Projected population, by projection scenario.](#)) and housing market data from the Canada Mortgage and Housing Corporation (June 25, 2023. [Housing market data.](#)).

¹⁶ We use Statistics Canada definitions of housing types as follows: Multifamily buildings include "Apartments five stories and more", "Apartments 5 stories and less" and "Row houses", while single family homes include "Semi-detached", "Single detached", "Apartment or flat in a duplex" and "Other".



2. Methodology

To create a forecast of ZEV charging load in Quebec, we first leveraged results from our in-house **ZEV Adoption (EVA™) model** to produce a light-duty ZEV adoption forecast based on a market characterization that we produce for each jurisdiction.

Figure 9. Overview of the EVA™ Model

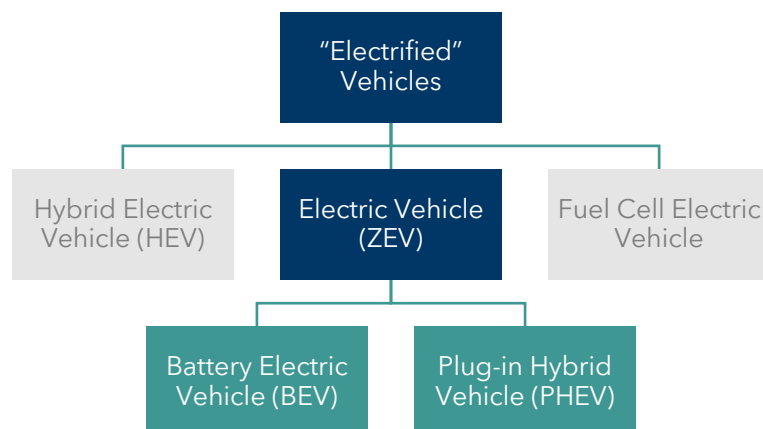
Technical	Economic	Constraints	Market
Assess the maximum theoretical potential for deployment <ul style="list-style-type: none"> Market size and composition by vehicle class (e.g. cars, SUVs, pickups, MHDVs) Forecasted availability of BEV and PHEV models in each vehicle class 	Calculate unconstrained economic potential uptake <ul style="list-style-type: none"> Forecasted incremental purchase cost of PHEV/BEV over ICE vehicles Total Cost of Ownership (TCO) based on operational and fuel costs 	Account for jurisdiction-specific barriers and constraints, which vary by vehicle class, including: <ul style="list-style-type: none"> Range anxiety or range requirements Public charging coverage, capacity, and charging time Home charging access 	Incorporate market dynamics and non-quantifiable market constraints <ul style="list-style-type: none"> Use of technology diffusion theory to determine rate of adoption Market competition between vehicle types (PHEV vs. BEV)

Our ZEV analysis includes the following vehicle types:

- **Battery electric vehicles (BEV)** – “pure” electric vehicles that only have an electric powertrain and that must be plugged into an electric source to charge (e.g. Tesla Model 3, Volkswagen ID.4, Hyundai Kona Electric)
- **Plug-in hybrid electric vehicles (PHEV)** – vehicles that can plug in to charge and operate in electric mode for short distances (e.g. 30 to 80 km), but that also include a combustion powertrain for longer trips. (e.g. Mitsubishi Outlander PHEV, Toyota Prius Prime, Ford Escape PHEV)



Figure 10. Vehicle types in scope



The following vehicle types are **excluded** from the analysis:

- Hybrid electric vehicles that do not plug in are considered ICEVs.
- Fuel cell electric vehicles such as hydrogen vehicles where the market is assumed to be minimal in the timeframe of the study.

2.1 Scenario Analysis

The adoption rate of electric vehicles was assessed under three scenarios that vary policy and program interventions which can significantly impact ZEV adoption. These include the following key policy and program levers:

- 1. Public Charging Access:** Existing infrastructure deployed to date has jumped-started the ZEV market, however significant investments are required to alleviate range anxiety.
- 2. Home Charging Access:** With most ZEV charging expected to take place at home, lack of access to home charging for some segments of the population could limit their ability to adopt ZEVs.
- 3. Vehicle Incentives:** Government rebates can help to bridge the gap to cost-parity with ICEVs in the short-term as the up-front purchase costs of ZEVs decline over time.
- 4. Federal Zero Emission Vehicle (ZEV) Availability Standard:** Under the current ZEV Availability Standard, auto manufacturers and importers must meet a 100% ZEV sales target by 2035. Our scenario analysis varies whether the standard is present as well as its enforcement year to show its potential impact on ZEV adoption.
- 5. Provincial ZEV Mandate:** While some provinces have implemented their own ZEV sales requirements, those that have not may potentially experience lower availability in the next few years as manufacturers and importers focus supply on regions with the highest demand or requirements for ZEV sales, even if there are targets at the federal level.

In addition to the modelled policy and program interventions, the forecasted ZEV adoption is also sensitive to uncertainties around key market and technology factors such as electricity rates, fuel prices, battery costs, total vehicle sales and ZEV model availability.

Our Low Growth scenario represents minimal efforts to support ZEV adoption, and in some cases the removal of existing supportive policies. The Moderate Growth scenario represents



some support to enable ZEV adoption and generally aligns with current commitments and policies, while the High Growth scenario represents a strong policy pathway to reach the Federal ZEV sales target. The specific parameters for each scenario are outlined in Table 2.

Table 2. Scenario assumptions for ZEV adoption

Parameter	Low Growth	Medium Growth	High Growth
Public Charging Infrastructure¹⁷	Limited 26,000 ports by 2030 41,000 ports by 2040	Moderate 51,000 ports by 2030 103,000 ports by 2040	Significant 103,000 ports by 2030 130,000 ports by 2040
Home Charging Access¹⁸	Limited Single-family homes are 91% ZEV-ready, 30% of multifamily homes are ZEV-ready by 2040	Moderate Single-family homes are 91% ZEV-ready, 45% of multifamily homes are ZEV-ready by 2040	Significant Single-family homes are 91% ZEV-ready, 60% of multifamily homes are ZEV-ready by 2040
Vehicle Incentives	Current incentives Federal: up to \$5,000 Provincial: up to \$5,000 (Both ramped down + phased-out by 2025)	Current incentives, extended Federal: up to \$5,000 (Ramped down + phased-out by 2030) Provincial: up to \$5,000 (Ramped down + phased-out by 2027)	Expanded incentives Federal: up to \$5,000 Provincial: up to \$5,000 (Both ramped down + phased-out by 2035)
Federal ZEV Availability Standard	None	100% by 2040 Federal interim targets extended	100% by 2035 Aligned with Federal interim targets
Provincial ZEV Mandate	None	100% by 2040 Existing provincial target extended	100% by 2035 Existing provincial target

We refer to specific vehicle purchase incentive levels for simplicity, but what matters for our modelling is the ZEV price relative to an ICEV. The same impact can come from a \$5,000 rebate, a \$5,000 penalty on ICEVs, or a combination that is revenue neutral, like a "feebate"

¹⁷ Charging infrastructure inputs in the High Growth scenario are aligned with the estimated charging needs developed in the 2024 Dunskey report [Electric Vehicle Charging Infrastructure for Canada](#). In the Medium and Low growth scenarios, charging inputs are lower to align with lower levels of adoption and to reflect reduced charging availability, which contributes to constrained ZEV adoption in these scenarios. Note that these inputs are not the result of a detailed charging needs assessment, but rather high-level estimates based on Dunskey's 2024 analysis, which reflects alternative adoption scenarios.

¹⁸ Assumptions for Home Charging Access were based on the methodology used in the 2024 Dunskey report, [Electric Vehicle Charging Infrastructure for Canada](#).



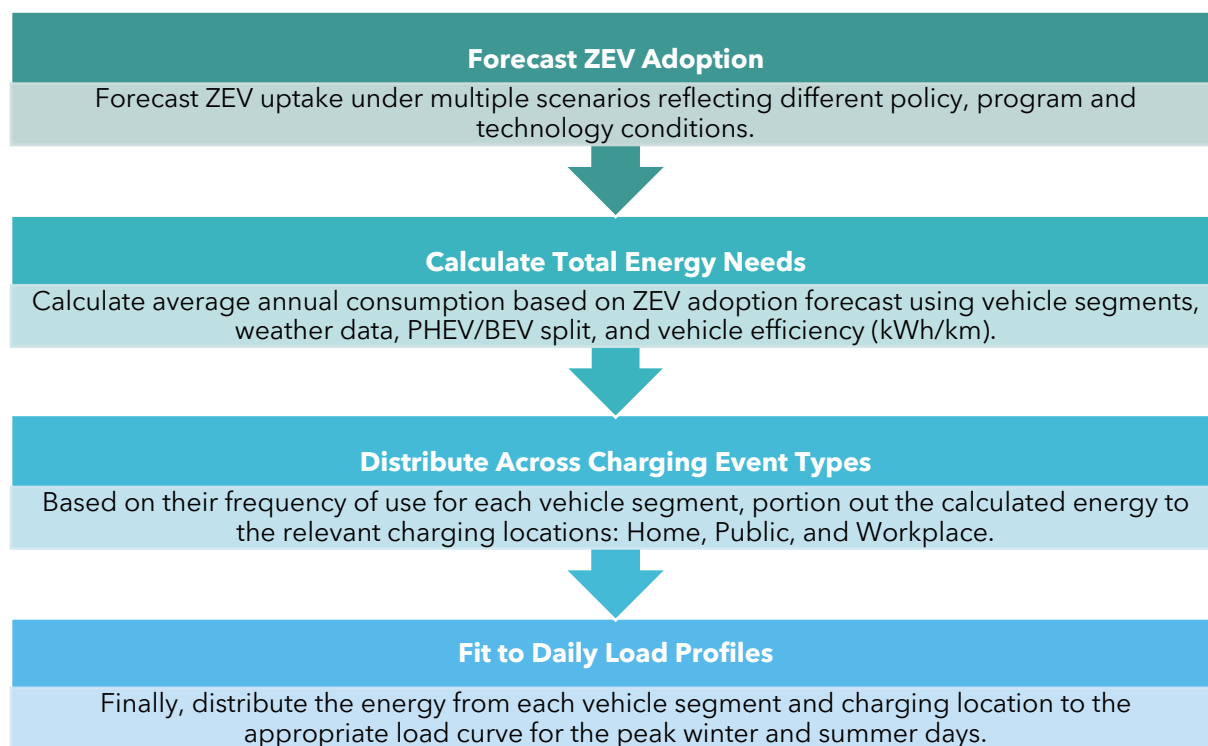
system. This approach would become important for the High Growth scenario to sustain ZEV incentives into the 2030s without high costs.

2.2 Electric Grid Load Impacts

This study follows a four-step process to assess the potential for and impacts of ZEVs on Quebec's electric grid from increased demand for electricity for ZEV charging. The ZEV adoption forecast from EVA™ is used to calculate the potential grid load (demand for electricity) impacts from realistic charging behaviours. To create a forecast of ZEV charging load in Quebec, we first leveraged results from our in-house **ZEV Adoption (EVA™) model** to produce a light-duty ZEV adoption forecast based on a market characterization that we produce for each jurisdiction.

Figure 9 outlines each of these four steps for determining peak demand from ZEVs.

Figure 11. Process for modelling ZEV adoption and load impacts



To determine the impacts of ZEV adoption on the electrical grid, we used typical 24-hour diversified charging distribution profiles established from the literature¹⁹ for each vehicle segment and charging location, and the Dunskey EVA™ model results, with regional adjustments for vehicle consumption in Quebec (i.e. temperature and proportions of vehicle

¹⁹ The charging distribution profiles were developed by leveraging data sets from a range of government and utility-led pilot programs including the California Energy Commission (April 29, 2019. [California Investor-Owned Utility Electricity Load Shapes.](#)); ISO New England ([2020 Transportation Electrification Forecast.](#)); and Rocky Mountain Institute. (2019. [DCFC Rate Design Study.](#))



types). The resulting load curves represent the average charging behaviour of different ZEV segments on the road during summer and winter peak days.²⁰

Next, these curves are multiplied by the forecasted number of ZEVs on the road in each study year. The results of this load impact analysis produce the hypothetical daily load impact for peak days. The curves consider the use of all charging event types - home, workplace, and public charging.

Charging event types refer to the location where charging is taking place, which will change the power level, time of day, and flexibility of the charging load. Each ZEV will receive a proportion of its total charging energy from different event types. For example, a personal vehicle is likely to charge at home most of the time, but it will occasionally charge at a public charger while the driver is shopping or at their workplace. This breakdown of charging event types will vary based on the vehicle’s purpose. Our assumptions for charging event type proportions by vehicle segment and origin can be found in Table 3.

Table 3. Proportion of daily charging energy for each event type and vehicle segment

Charging Event Type	Personal	Commercial
Home/Depot ²¹	80%	100%
Workplace	10%	N/A
Public	10%	N/A

²⁰ Refers to the day with the highest electricity demand in a single hour, for a given year and season.

²¹ Refers to where most vehicles are parked overnight, “Home” for personal vehicles and “Depot” for commercial vehicles.





3. Results

Key results highlights that we cover in this section include:

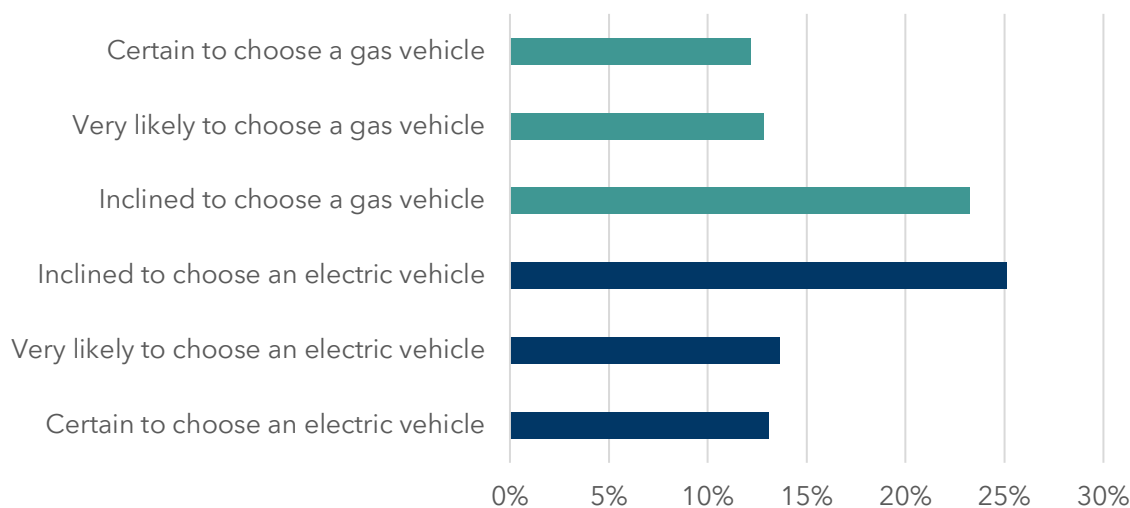
1. Over the long term, ZEV adoption in Quebec is forecasted to approach 100% of new sales, which would accumulate to 61% of total vehicles on the road by 2040, even in a low-growth scenario.
2. If effectively managed charging programs and technologies are employed, winter peak load from ZEV charging has the potential to be reduced by 1,200 MW (16%) in a medium growth scenario.
3. Without effective programs and policies in place over the next few years, Quebec will be on a slower path to electrification, resulting in lost benefits for Quebecers in both improved air quality and financial savings from reduced fuel and maintenance costs.

3.1 Results from Survey of Canadians

As part of the *Powering Up* project, Electric Mobility Canada conducted a survey of over 6,000 Canadians, with 901 respondents from Quebec. A portion of this survey aimed to confirm, update, or determine new assumptions that should be used in the EVA™ model to forecast ZEV adoption in Canada as accurately as possible. This section summarizes some of those key results.

Figure 12. When thinking about your next vehicle purchase, which will you choose? Quebec only

 **Nearly half of Quebecers (51%) plan to buy a ZEV as their next vehicle.** This preference is similar to Canadian urban residents (49%) and individuals aged 30-44 (51%).





Although Quebecers are willing to pay a premium for a ZEV over an ICEV (see Figure 13), the EVA™ model assumes that the comparatively higher upfront costs will pose a barrier to the majority of potential ZEV buyers until ZEV prices reach parity with ICEVs across most segments.

Figure 13. When considering the upfront cost of an electric vehicle vs a traditional gas vehicle, how much more do you consider acceptable today? Quebec only

▶ 87% of Quebecers would be willing to pay a premium for a ZEV versus an ICEV.

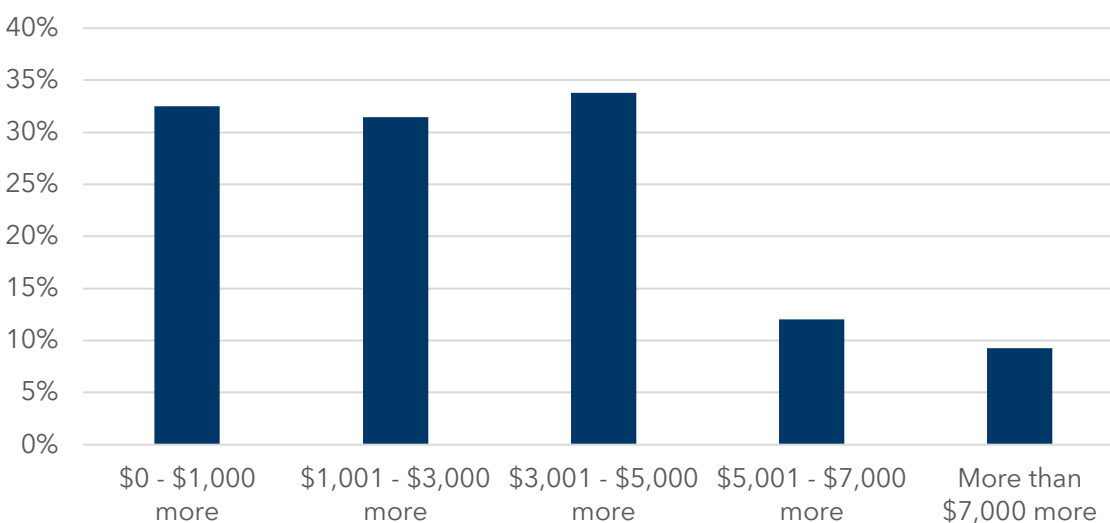


Figure 14. How many long distance (500 km or more) trips do you make in one year? Quebec only

▶ Nearly half of Quebecers take 1-2 long distance trips annually.

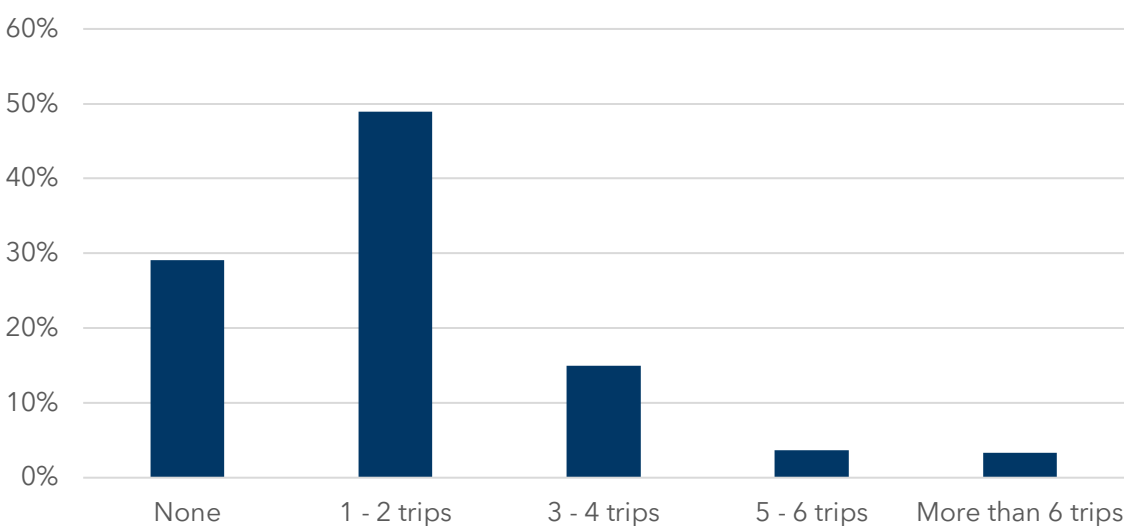
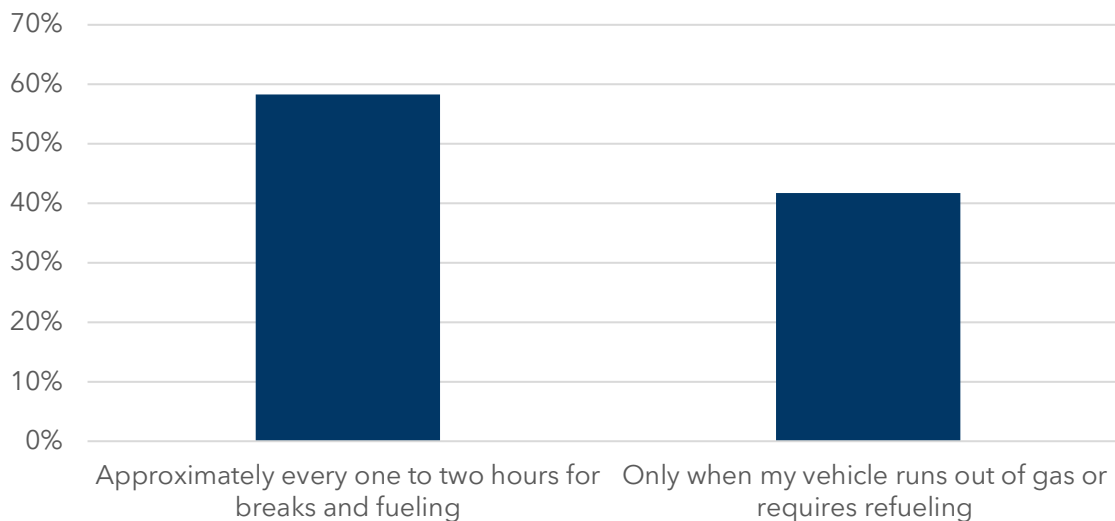




Figure 15. How frequently do you typically make stops during long-distance trips (500 km or more)? Quebec only

▶ 58% of Quebecers stop more frequently on long trips than they would need to refuel, indicating that ZEV range is not a major constraint or inconvenience on their ability to make long-distance trips so long as sufficient public charging is available.



Nearly half of Quebecers (47%) drive less than 30km to get to work (60km round trip), which means that not many people need to rely on top-up charging, or do not travel far enough daily for range to be a concern in daily driving.

Despite improvements in battery size and access to public charging, there may still be perceived range barriers, also known as “range anxiety”, which makes potential ZEV buyers hesitant to switch to electric, but could be improved either through education or exposure to ZEVs and charging as adoption increases.

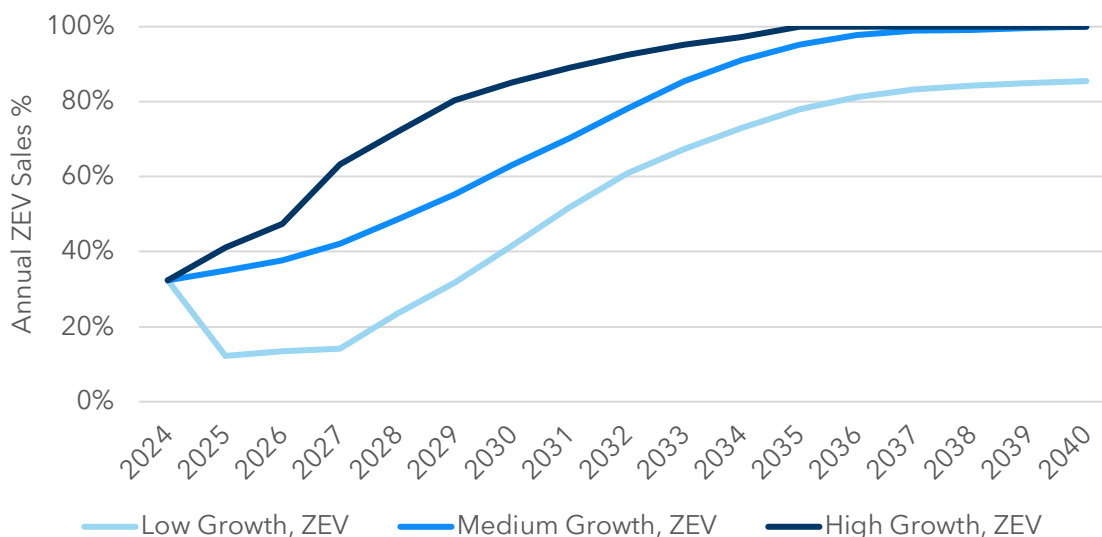
This survey also included questions pertaining to Canadians’ knowledge about ZEVs, which can be indicative of some common misconceptions that result in perceived barriers to adoption. For instance, the majority of Quebecers are unaware of the average range of new ZEVs, with only 26% knowing that it falls between 400 and 500 kilometres. Additionally, only 65% of Quebecers are aware of the federal government rebates for ZEVs. A sample of additional questions that were asked in this knowledge section is included in the Appendix, Additional Results from Survey of Canadians.



3.2 ZEV Adoption Results

Policies and programs that support ZEV adoption in Quebec will be significant drivers of growth over the next 10 years.

Figure 16. Annual ZEV sales % by scenario, Quebec



Changes in charging availability, purchase incentives, and a ZEV standard in the near term will determine how quickly Quebec arrives at a complete transition to electric vehicles. If these factors are in place, they will reduce key barriers to adoption, including having enough charge when needed, bringing ZEVs to price parity with ICEVs, and ensuring adequate local supply.

Policy makers have a critical opportunity in the next few years to put Canada on a strong path to vehicle electrification, enabling Canadians to reap the cost and environmental benefits over the following decades.

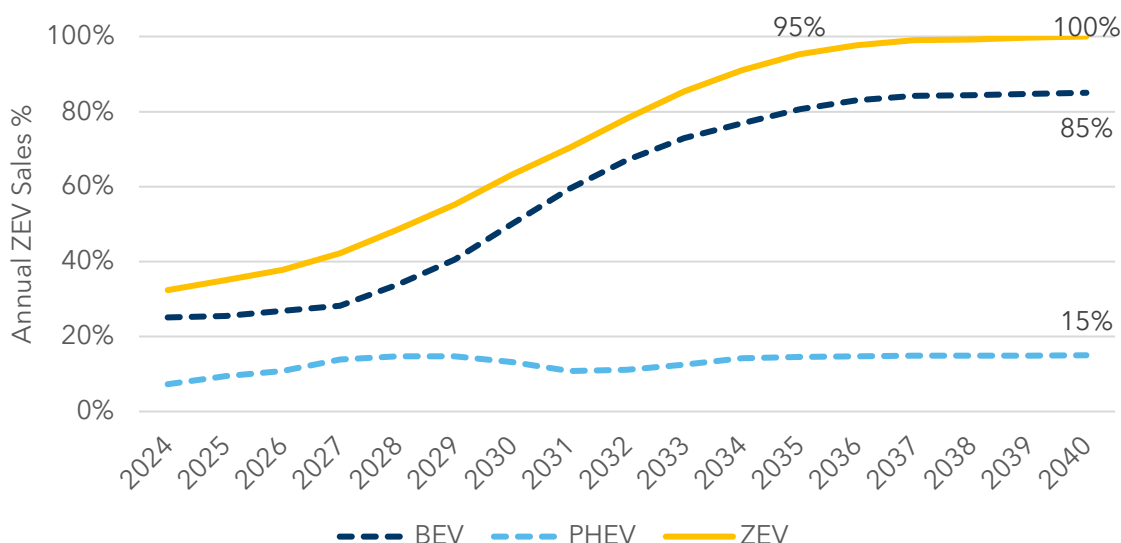


3.2.1 Medium Growth Scenario

Although the Medium scenario models a delayed federal ZEV standard enforcement date, ZEV adoption is still expected to reach 95% of new sales by the current target date of 2035.

Figure 17. Annual ZEV sales % by powertrain, medium growth, Quebec

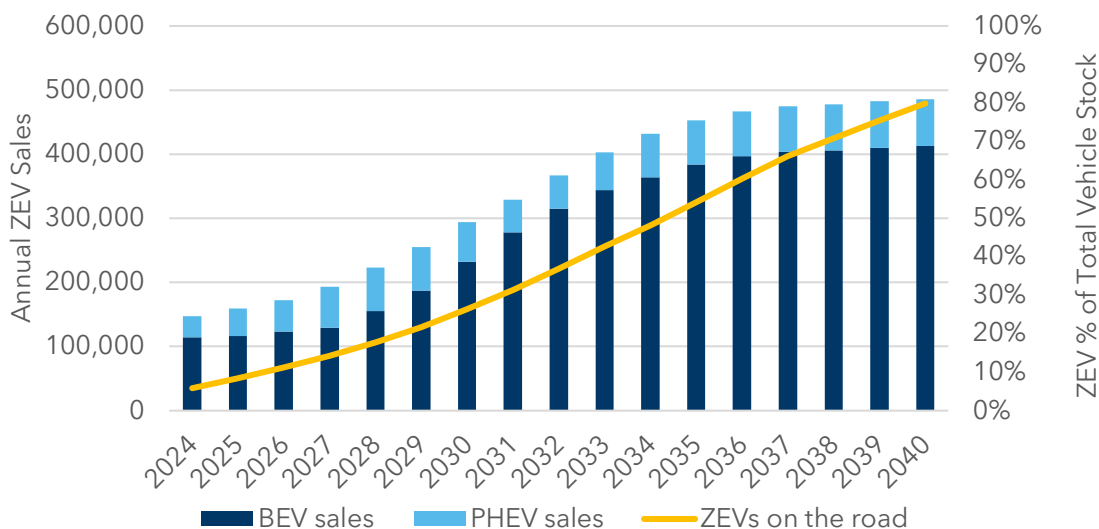
▶ Quebec will experience significant growth in ZEV uptake, reaching 100% by 2040.



With the additional public and home charging access assumed in this scenario, reducing barriers to BEV adoption, BEVs out-compete PHEVs due to lower total cost of ownership.

Figure 18. Annual ZEV sales by powertrain and total ZEV stock, medium growth, Quebec

▶ By 2040, over 5.2 million of the 6.6 million (80%) LDVs on the road are forecasted to be ZEVs.





3.2.2 High Growth Scenario

Under the High scenario, additional policy supports remove the primary barriers to ZEV adoption, including public charging, home charging access, and upfront cost reductions.

Figure 19. Annual ZEV sales % by powertrain, high growth, Quebec

▶ The ZEV proportion of annual sales increases rapidly towards the 100% ZEV standard in 2035, reaching 85% by 2030.

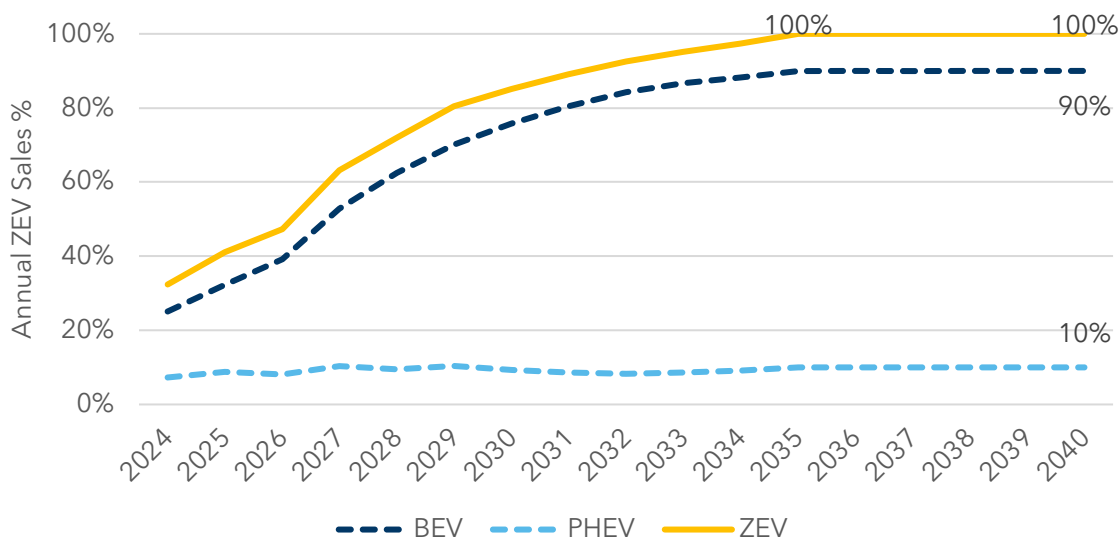
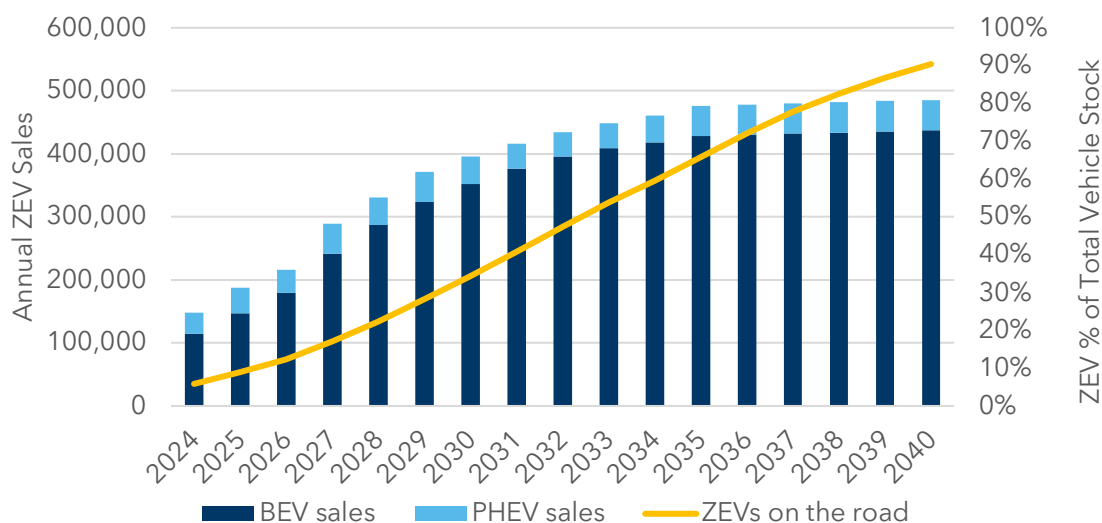


Figure 20. Annual ZEV sales by powertrain and total ZEV stock, high growth, Quebec

▶ By 2040, nearly 6.0 million of the 6.6 million (90%) LDVs on the road are forecasted to be ZEVs.



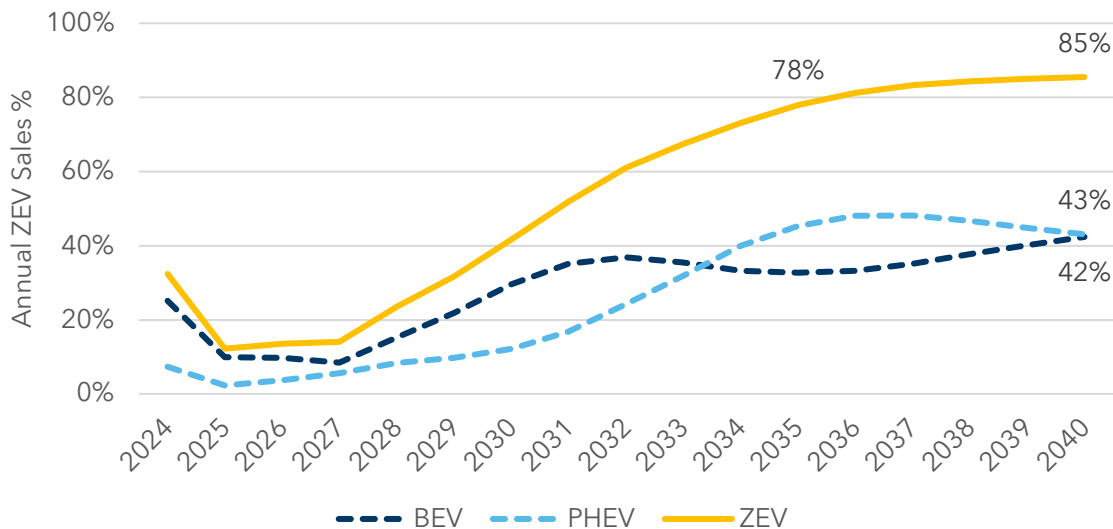


3.2.3 Low Growth Scenario

With few supportive policies in the Low scenario, ZEV adoption potential will be constrained.

Figure 21. Annual ZEV sales % by powertrain, low growth, Quebec

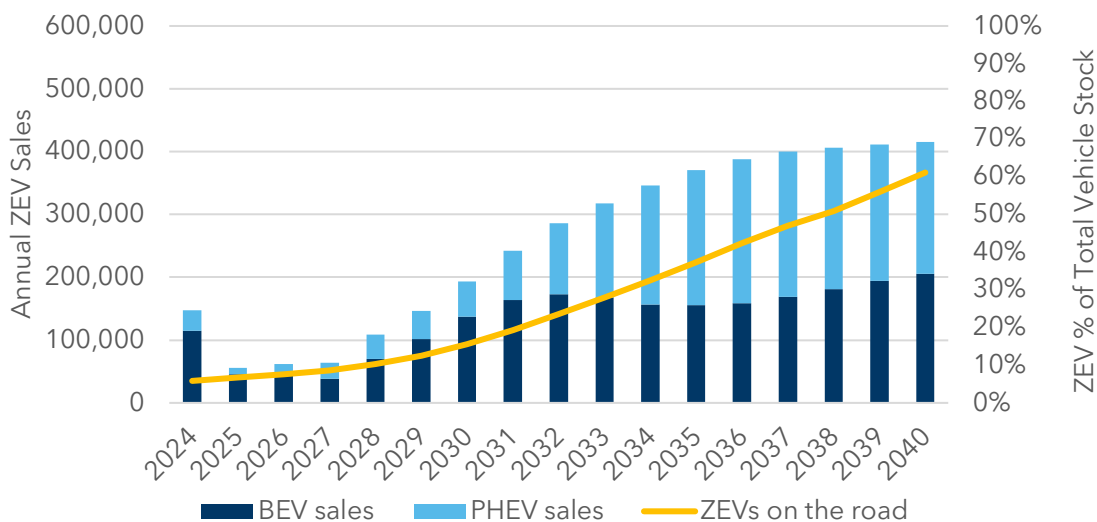
▶ ZEV adoption is expected to fall short of the current federal 2035 ZEV target (100%), reaching only 78% of new sales by 2035 and 85% by 2040.



The market share shifts towards PHEVs in 2033 as public infrastructure deployment in this scenario is insufficient to meet the needs of BEV drivers. However, over the long term, the economics of BEVs are likely to continue improving and result in an increasing market share.

Figure 22. Annual ZEV sales by powertrain and total ZEV stock, low growth, Quebec

▶ By 2040, over 4.0 million of the 6.6 million (61%) LDVs on the road are forecasted to be ZEVs.



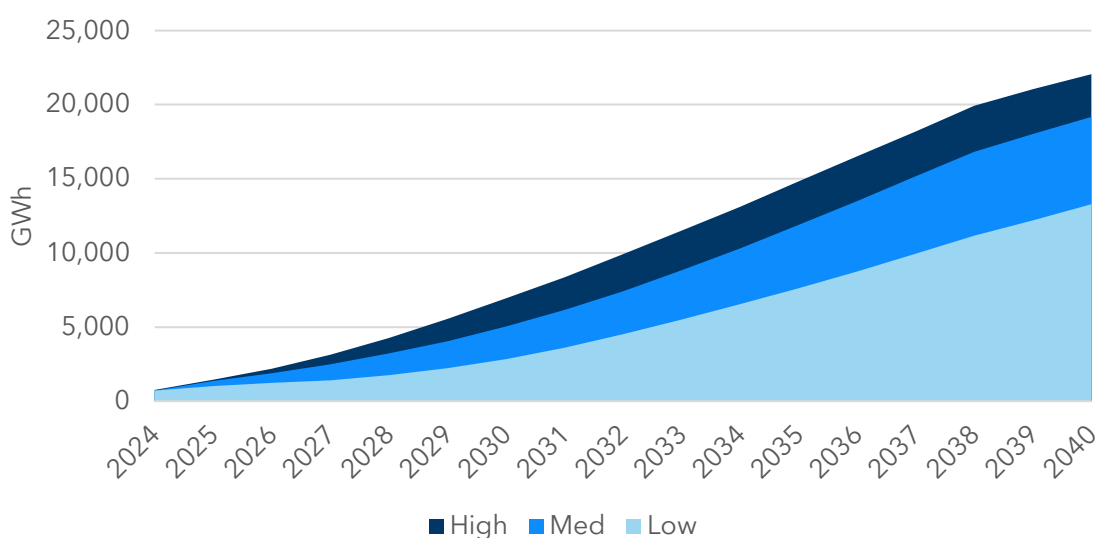


3.3 Electric Grid Load Impact Results

Total annual energy consumption from ZEVs will be higher in the Medium and High scenarios compared to the Low scenario, not only because there are more ZEVs overall, but also because there are more BEVs than PHEVs. Since PHEVs drive a proportion of their time on gasoline, whereas BEVs must always use electricity, a higher proportion of BEVs will result in higher overall energy consumption.

Figure 23. Annual energy impacts from ZEV charging, scenario comparison, Quebec

▶ Total annual load impacts in Quebec could range from 13,200 to 22,000 GWh by 2040 under the Low and High Growth scenarios, respectively, mirroring the growth of cumulative ZEVs on the road.



Light-duty ZEVs will increase annual electricity consumption in Quebec by between 10% and 17% by 2040.²²

²² Based on our ZEV forecast (Figure 16) and Hydro Quebec's History of electricity demand in Quebec for 2024. See source: Hydro Quebec. [History of electricity demand in Quebec](#). Accessed February 2025.



3.3.1 ZEV Charging Load Growth Over Time

Outdoor air temperatures on the coldest day can increase vehicle energy needs, thereby doubling peak grid impacts²³ compared to summer requirements, mainly due to cabin heating needs.²⁴

Figure 24. Peak ZEV Charging Load, summer, Quebec

▶ ZEVs will contribute between **2,400 and 4,000 MW** of peak load by 2040 in **summer**.

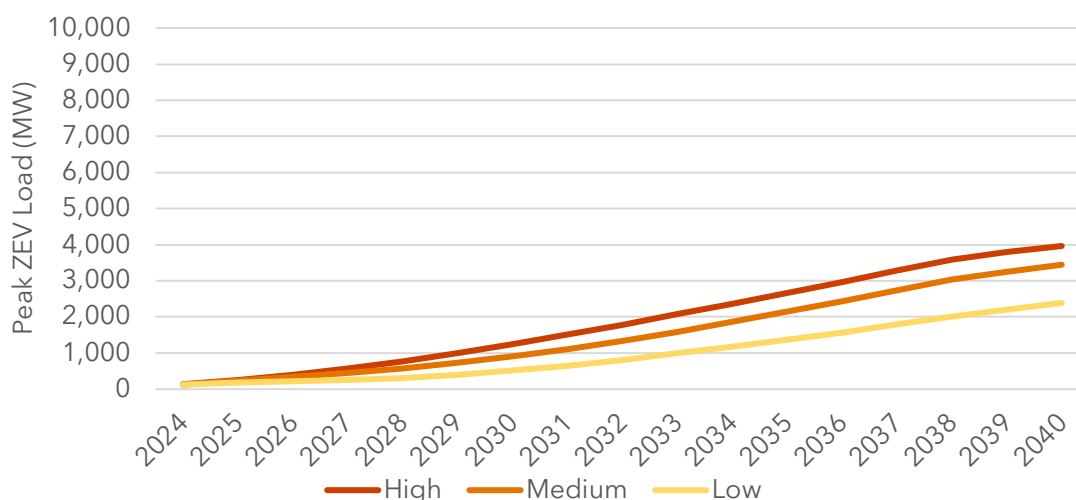
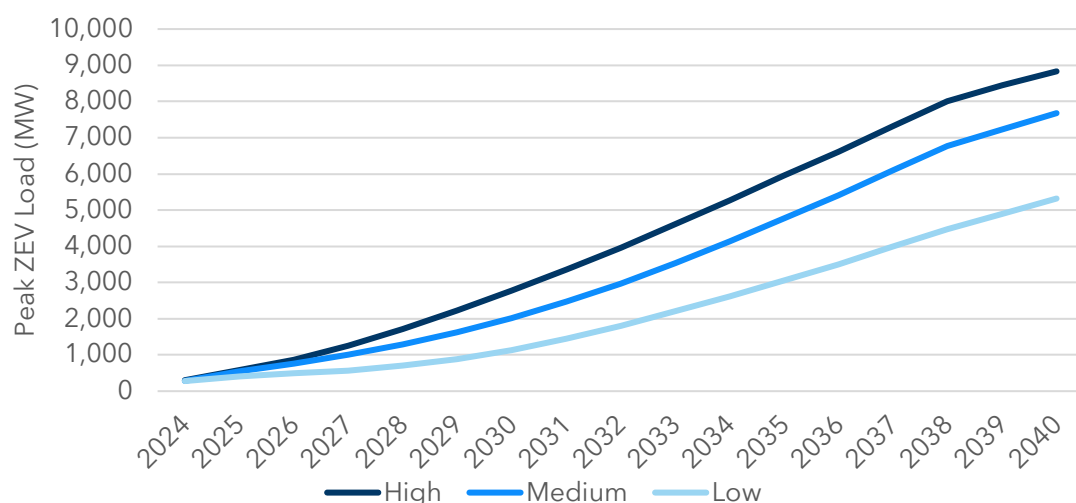


Figure 25. Peak ZEV Charging Load, winter, Quebec

▶ ZEVs will contribute between **5,300 and 8,800 MW** of peak load by 2040 in **winter**.



²³ Peak load refers to the hour with the highest electricity demand for a given year and season.

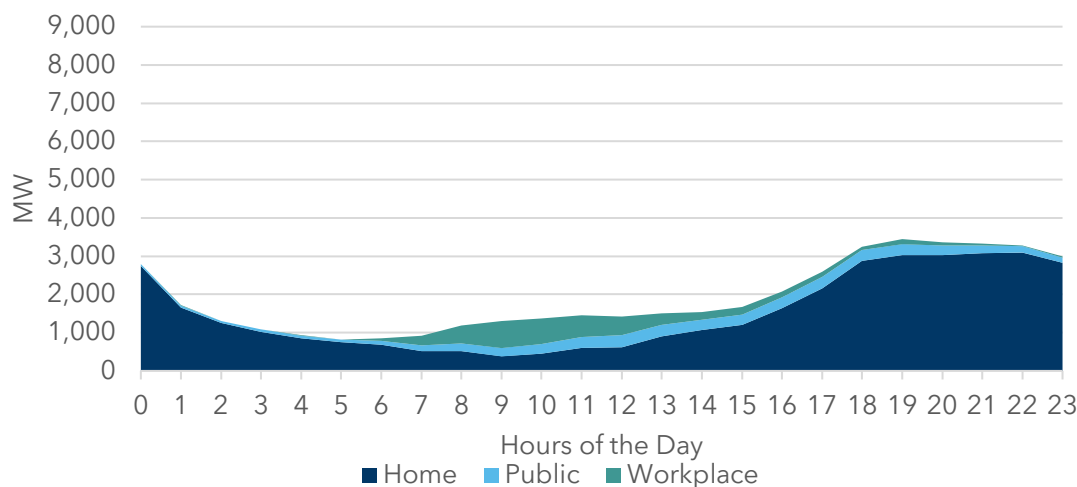
²⁴ Geotab. November 30, 2023. [To what degree does temperature impact EV range?](#)



3.3.2 Peak Day ZEV Load in 2040

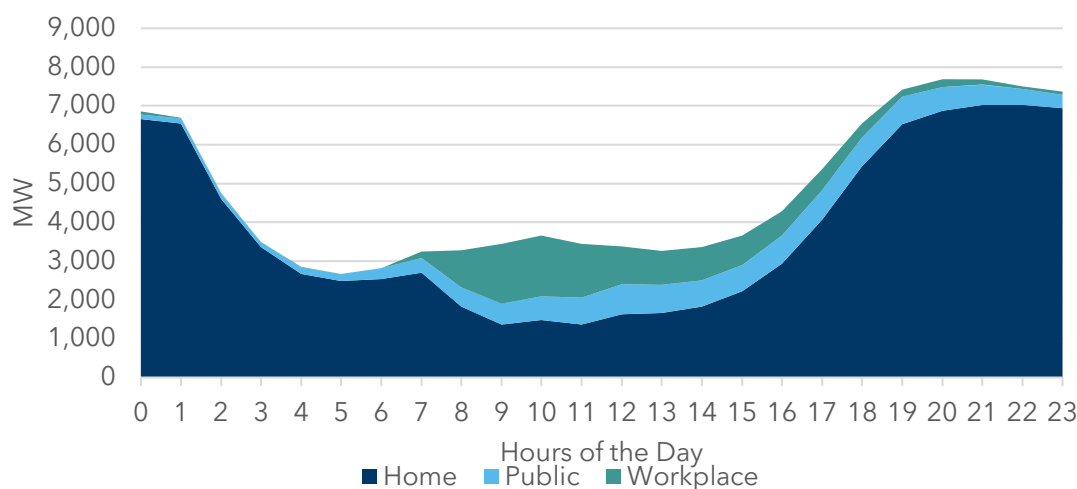
Most of the peak day²⁵ impact from ZEV charging will come from home charging, with the majority of this charging occurring in the evening and overnight.

Figure 26. Summer peak day ZEV load in 2040, medium growth, QC



Although the ZEV-peak typically occurs overnight, as a result, load impacts from ZEV charging are significant enough during Quebec's peak periods (typically 6 am – 9 am and 4 pm – 8 pm in winter)²⁶ to be impactful on the electrical system if the charging load is unmanaged.

Figure 27. Winter peak day ZEV load in 2040, medium growth, QC



²⁵ Refers to the day with the highest electricity demand in a single hour, for a given year and season.

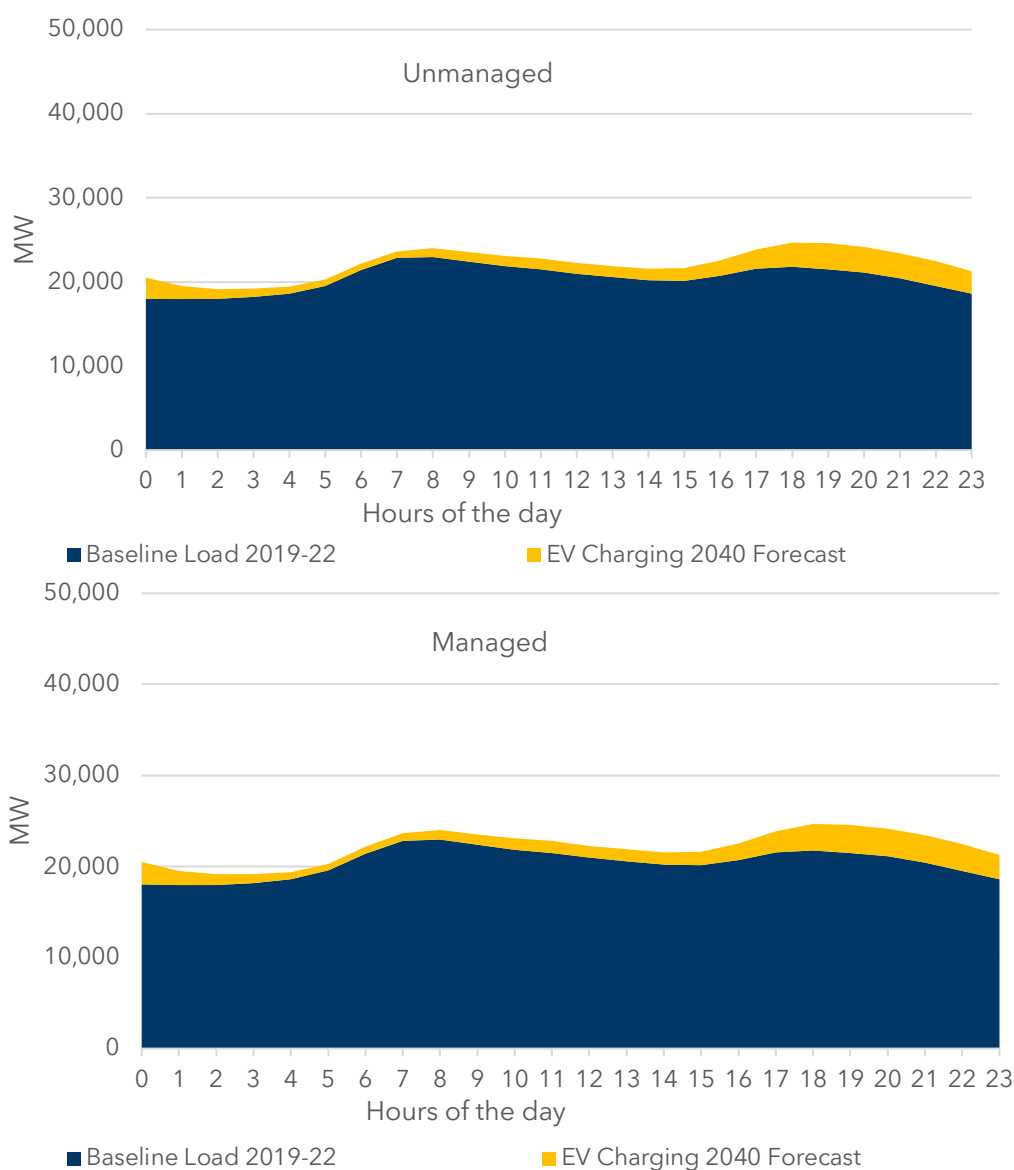
²⁶ Hydro Quebec has a voluntary critical peak pricing program that issues peak events during peak periods in the winter months. Hydro Quebec. [Flex D Rate](#). Accessed February 2025.



3.3.3 Managed ZEV Charging Load

To understand the impact of ZEV charging on the total system peak, we layer the ZEV load on top of the existing grid demand.²⁷ This also allows us to see opportunities to shift ZEV load to periods when other loads are low. When applied to a typical peak day, light-duty ZEVs typically increase peak demand and push the peak hour to later in the evening.

Figure 28. Managed charging potential, summer peak day, medium growth, QC



However, if this charging is effectively managed through active load management, winter peak impacts could be reduced by 1,200 MW (16%).²⁸ Note that this analysis uses sample

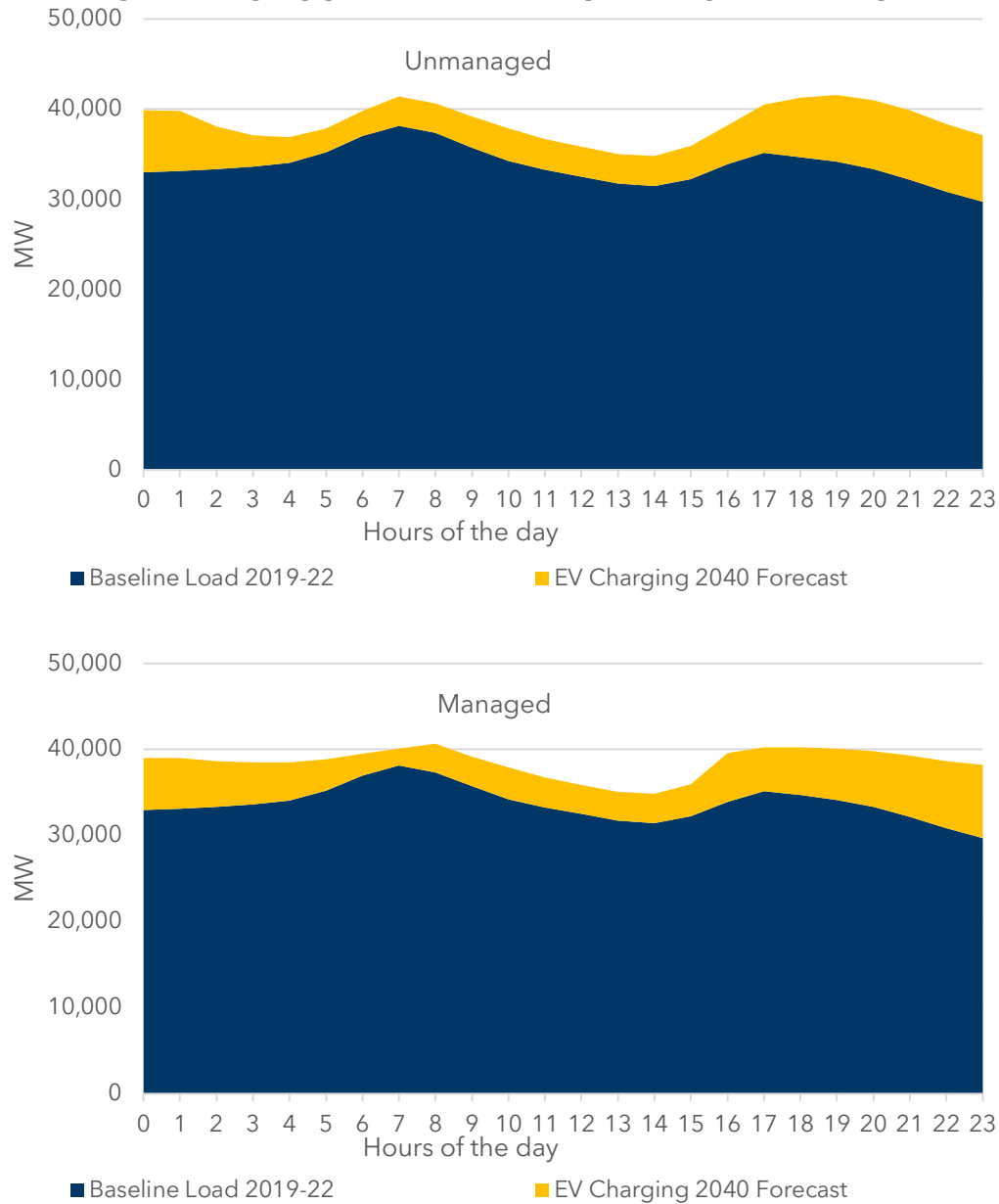
²⁷ Hydro Quebec. [History of electricity demand in Quebec](#). Accessed February 2025.

²⁸ We assume managed charging applies only to EVs charging at home on Level 2 chargers, and that 20% of those EVs are unmanaged with 80% participating in a utility program. Medium growth scenario.



peak days from Quebec in 2019-2022, but peak day baseline load profiles can vary from year to year, and grow over time from electrification of other loads like buildings. Quebec typically has its peak in winter mornings and evenings.

Figure 29. Managed charging potential, winter peak day, medium growth, QC





4. Key Takeaways

1

Over the long term, ZEV adoption in Quebec is forecasted to approach 100% of new sales, which would accumulate to 61% of total vehicles on the road by 2040, even in a low-growth scenario. The impact of policies and programs, as well as the deployment of charging infrastructure, has the potential to increase the rate of adoption significantly in earlier years.

2

If effectively managed charging programs and technologies are employed, winter peak load from ZEV charging has the potential to be reduced by 1,200 MW (16%) in a medium growth scenario.

- While the actual load shift will depend on the techniques and technologies employed, as well as the incentives provided for ZEV drivers to participate, these results highlight the opportunity to avoid costly grid upgrades by leveraging the inherent flexibility of ZEV charging loads.
- By 2040, transportation electrification could be such an important driver of load that utilities may need to employ additional strategies in addition to shifting charging to overnight. These may include encouraging daytime charging at workplaces alongside increases in generation capacity.

3

Without effective programs and policies in place over the next few years, Quebec will be on a slower path to electrification, resulting in lost benefits for Quebecers in both improved air quality and financial savings from reduced fuel and maintenance costs.

The **most impactful tools** that local actors have to support the adoption of electric vehicles are **increasing charging access, increasing the local supply of ZEVs, and reducing vehicle purchase costs**. Critical actions to address these barriers include:

- Supportive ZEV-ready policies, standards, and programs to increase home charging availability, and deployment of sufficient public charging to supplement home charging
- Requiring and encouraging a sufficient supply of ZEVs at local dealerships
- Financial support for ZEV purchases as prices approach parity with ICEVs



Appendix

Key Inputs & Assumptions

Table 4. Federal and Provincial ZEV Incentives, Quebec²⁹

Scenario	Powertrain	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036+
Lo	PHEV	\$8,750	\$5,750	-	-	-	-	-	-	-	-	-	-	-
Lo	BEV	\$12,000	\$9,000	-	-	-	-	-	-	-	-	-	-	-
Med	PHEV	\$8,750	\$5,750	\$4,750	\$3,750	\$1,875	\$1,875	\$938	-	-	-	-	-	-
Med	BEV	\$12,000	\$9,000	\$7,000	\$5,000	\$2,500	\$2,500	\$1,250	-	-	-	-	-	-
Hi	PHEV	\$8,750	\$8,750	\$8,750	\$8,750	\$8,750	\$5,750	\$4,750	\$3,750	\$3,000	\$1,800	\$900	\$450	-
Hi	BEV	\$12,000	\$12,000	\$12,000	\$12,000	\$12,000	\$9,000	\$7,000	\$5,000	\$4,000	\$2,400	\$1,200	\$600	-

²⁹ Based on a combination of professional judgement and currently available incentives and target phase-out dates from the Government of Canada: [Incentives for Zero-Emission Vehicles \(iZEV\)](#). Accessed December 2024, and the Government of Quebec: [Financial assistance for electric vehicles](#). Accessed December 2024.

**Table 5. Fuel Costs, Quebec³⁰**

Variable	Units	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Electricity rate ³¹	\$/kWh	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.12	0.12	0.12	0.12	0.12	0.12	0.13	0.13
Gas rate ³²	\$/L	1.80	1.82	1.84	1.86	1.87	1.89	1.91	1.93	1.95	1.97	1.99	2.01	2.03	2.05	2.07	2.09	2.11

³⁰ We assume an annual growth rate of 1% and no carbon tax.

³¹ Dunskey's projected electricity rates by province in real dollars. These are blended \$/kWh rates including energy, transmission, distribution and associated fees, but excluding taxes. Includes both residential and smaller commercial electricity rates.

³² Statistics Canada. December 17, 2024. [*Monthly average retail prices for gasoline and fuel oil, by geography.*](#)

**Table 6. Light-duty vehicle stock and sales, thousands of vehicles, Quebec³³**

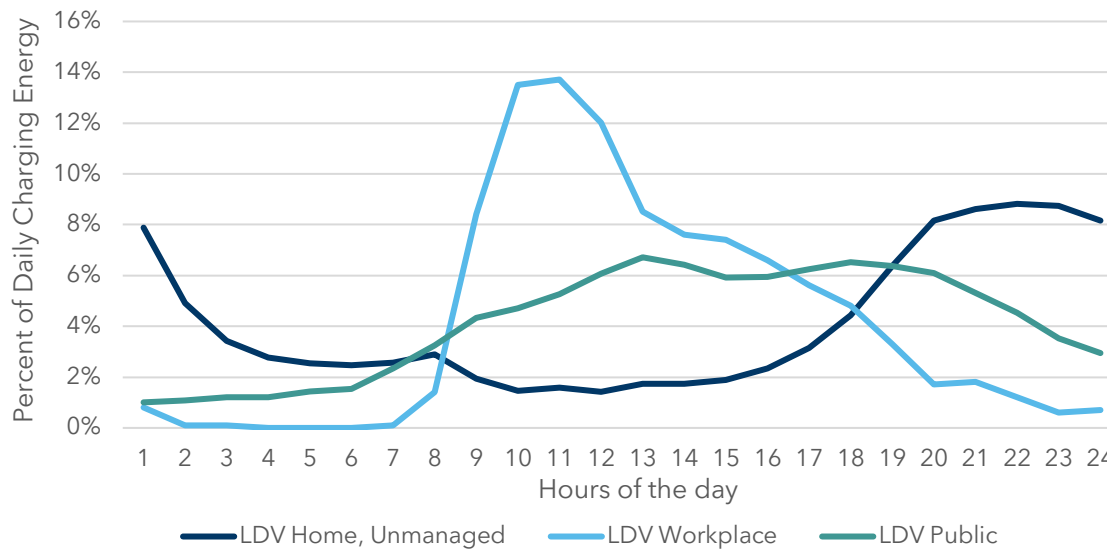
Variable	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
LDV sales	456	456	457	457	460	462	465	467	469	472	474	476	478	480	482	484	486
LDV Stock	4,871	4,941	5,104	5,319	5,502	5,701	5,858	6,001	6,002	5,947	5,734	5,816	5,880	5,933	5,990	6,044	6,090

³³ Natural Resources Canada. [Comprehensive Energy Use Database: Transportation Sector, Quebec](#). Accessed January 2025. Assume vehicle ownership remains constant and vehicles on the road align with population projections from Statistics Canada's M1 scenario. [Projected population, by projection scenario](#). Accessed June 2024.



The unmanaged diversified charging distribution profiles were developed by leveraging data sets from a range of government and utility-led pilot programs including: California Energy Commission 2019 [California Investor-Owned Utility Electricity Load Shapes](#); ISO New England [2020 Transportation Electrification Forecast](#); Rocky Mountain Institute 2019 [Direct Current Fast Chargers \(DCFC\) Rate Design Study](#).

Figure 30. Diversified charging distribution profiles

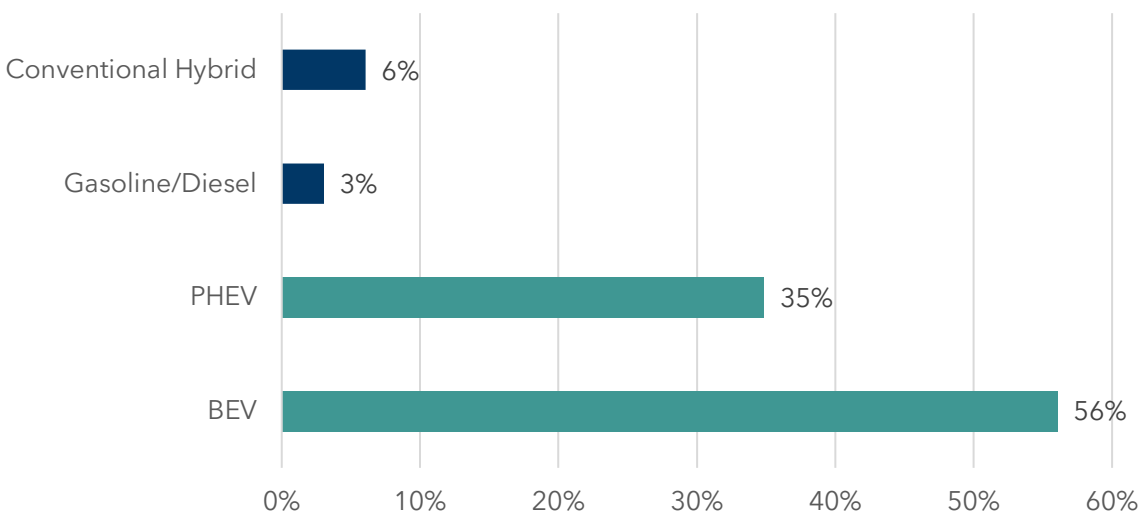


The curves in the figure above represent the proportion of daily charging energy that the average vehicle would charge in each hour of the day. We calculate average daily energy needs per ZEV based on the average driving distance for vehicles in Quebec and use this in combination with the charging distribution profiles to determine how much charging energy is used every hour for our load impacts analysis.



Additional Results from Survey of Canadians

Figure 31. What type of vehicle do you intend to purchase or lease next? Quebec only (Posed only to current ZEV owners)



After being presented with a series of knowledge testing questions about electric vehicles and their correct answers, survey respondents were asked again to select the type of vehicle they would buy next. The responses to Figure 32 should be compared to Figure 12 to assess the potential impact of increased awareness of ZEV benefits on purchasing decisions.

Figure 32. Taking into consideration the information provided to you, when thinking about your next vehicle purchase, which will you choose? Quebec only

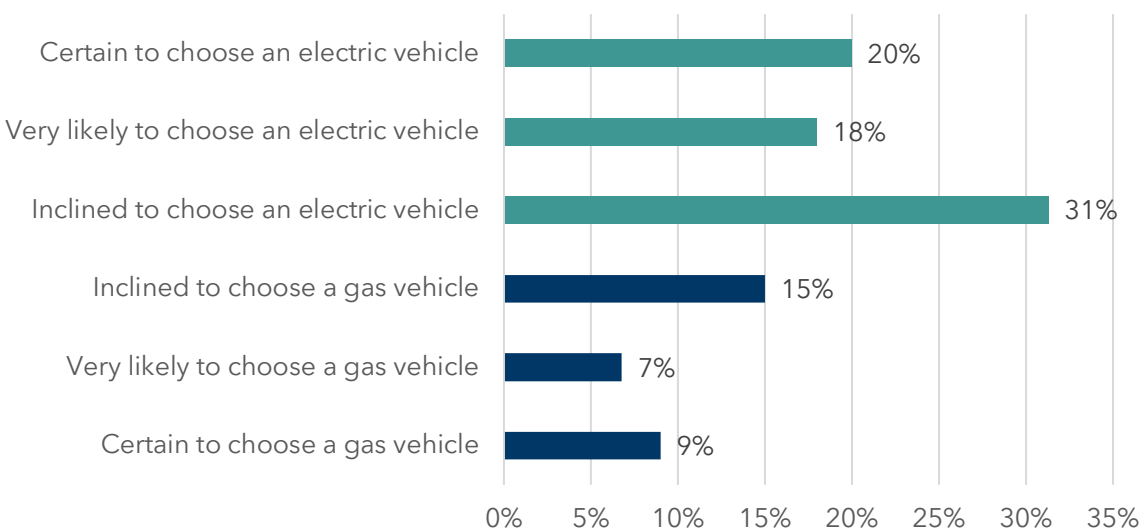




Figure 33. How influential were government incentives in your decision to purchase/lease a ZEV/PHEV? Quebec only

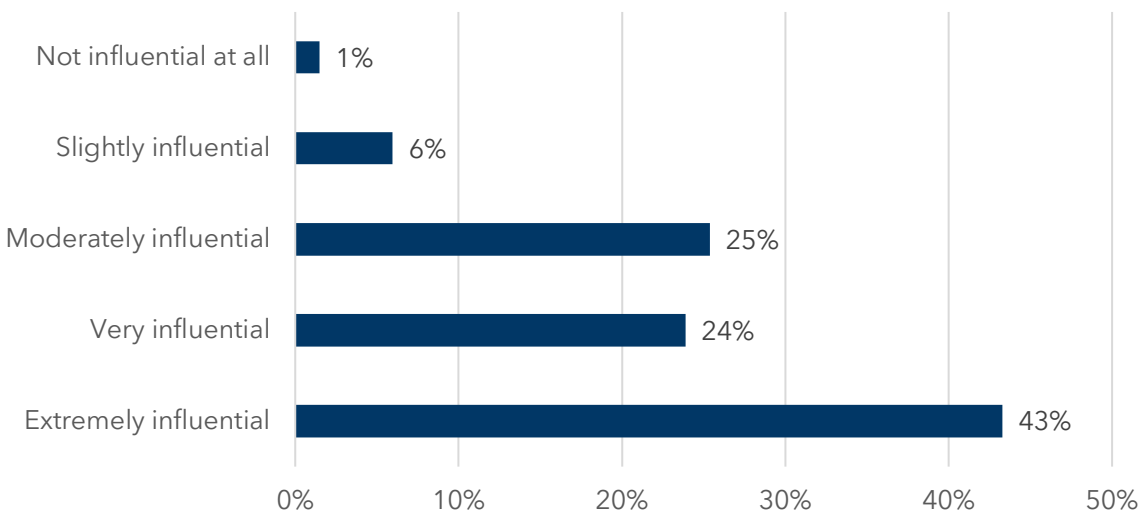


Figure 34. When you are selecting your next vehicle, do you expect you will buy/lease a fully electric vehicle (BEV) or a plug-in hybrid electric vehicle (PHEV)? Quebec only

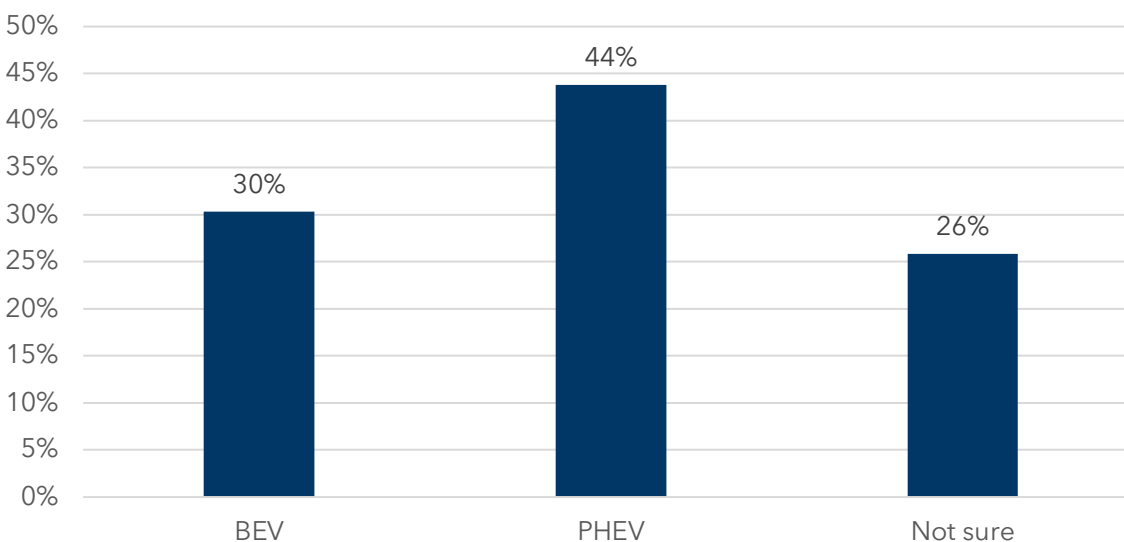




Figure 35. Are you aware of the federal government rebate of up to \$5,000 for purchasing an electric vehicle? Quebec only

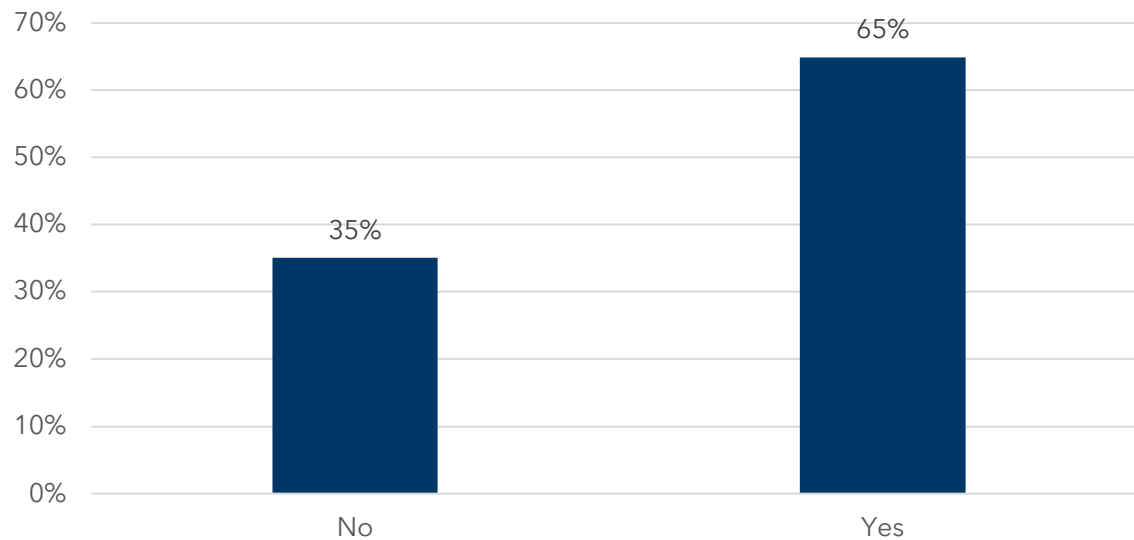


Figure 36. Are you aware that the government of Quebec offers a rebate of up to \$4,000 for purchasing an electric vehicle? Quebec only

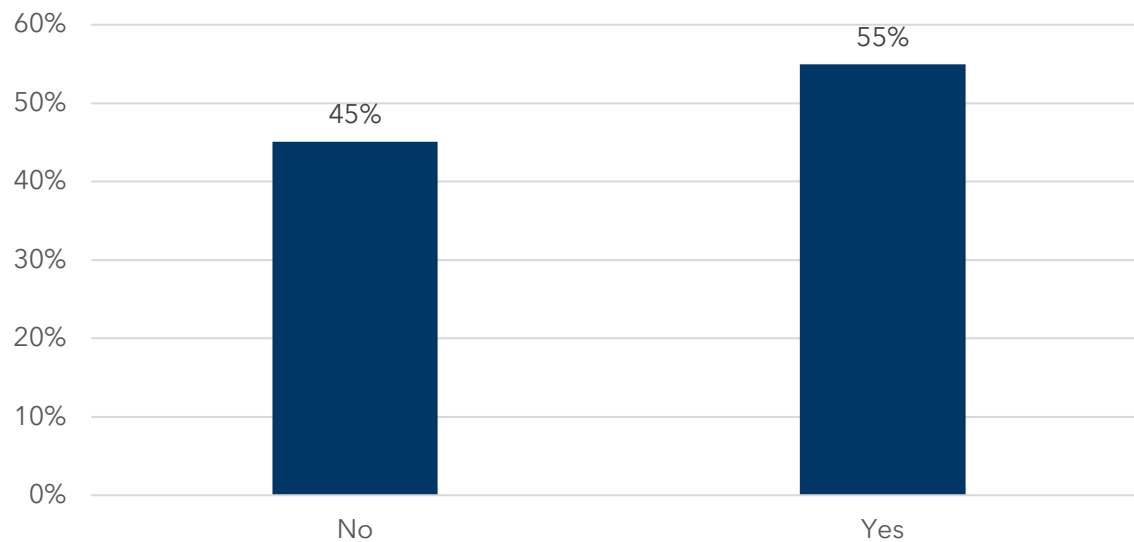




Figure 37. Are you aware that you may be eligible for a federal tax deduction specifically for the purchase of an electric vehicle if you are self-employed or own a company? Quebec only

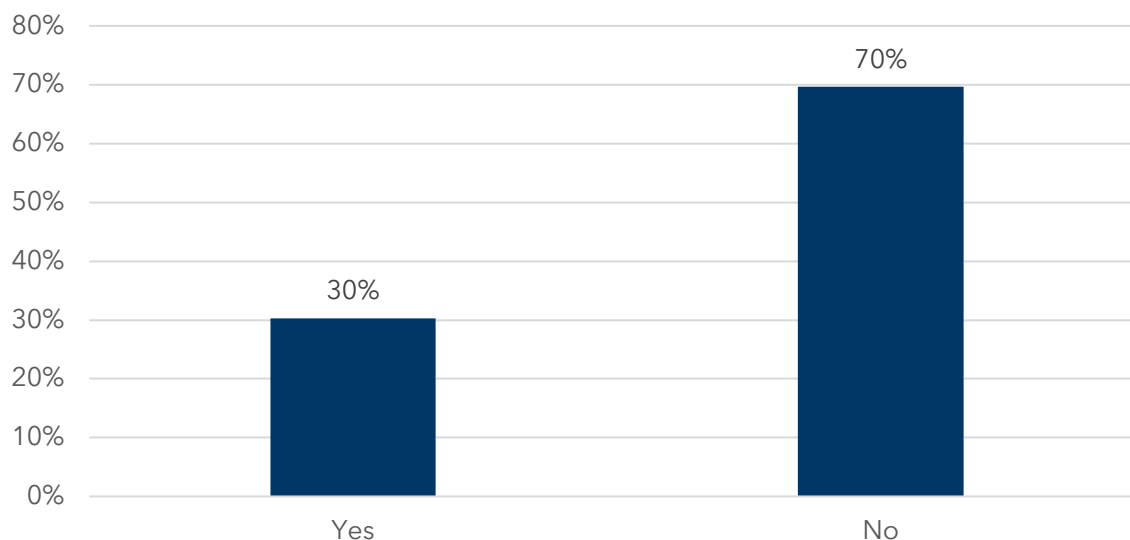


Figure 38. Are you familiar with other incentives available to ZEVs (e.g., ferries, dedicated lanes on highways, dedicated parking spots closer to the entrance, etc.)? Quebec only

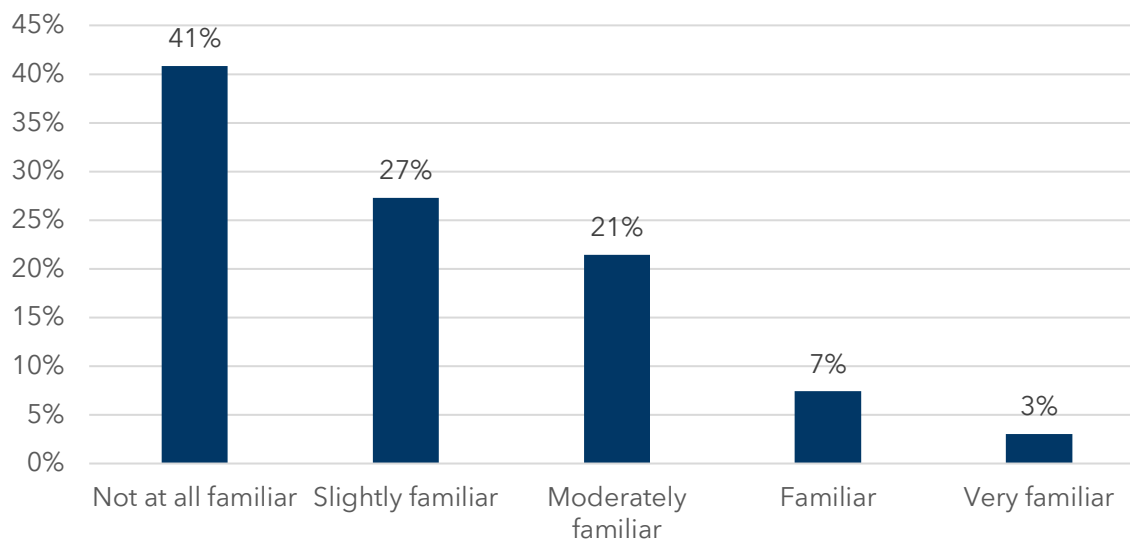




Figure 39. What is the average price of a new light-duty vehicle (car, SUV, pickup truck) in Canada? Quebec only

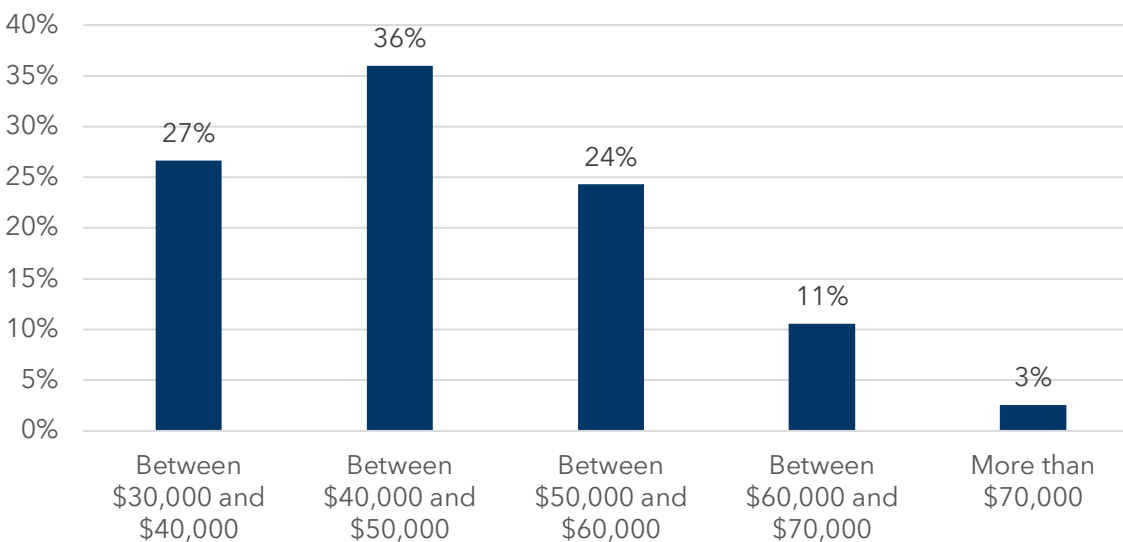
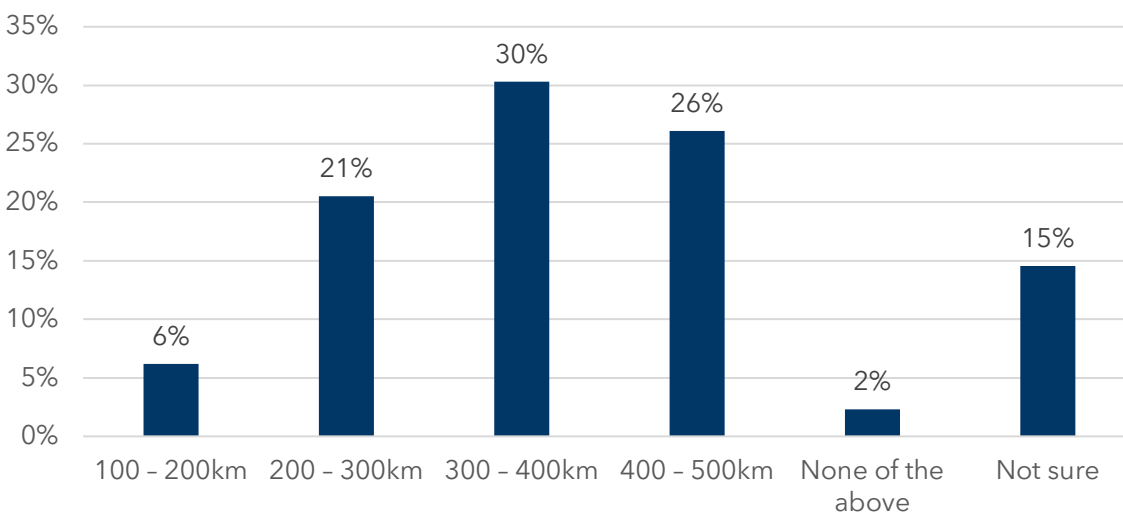


Figure 40. What is the average range of most new electric vehicles? Quebec only



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