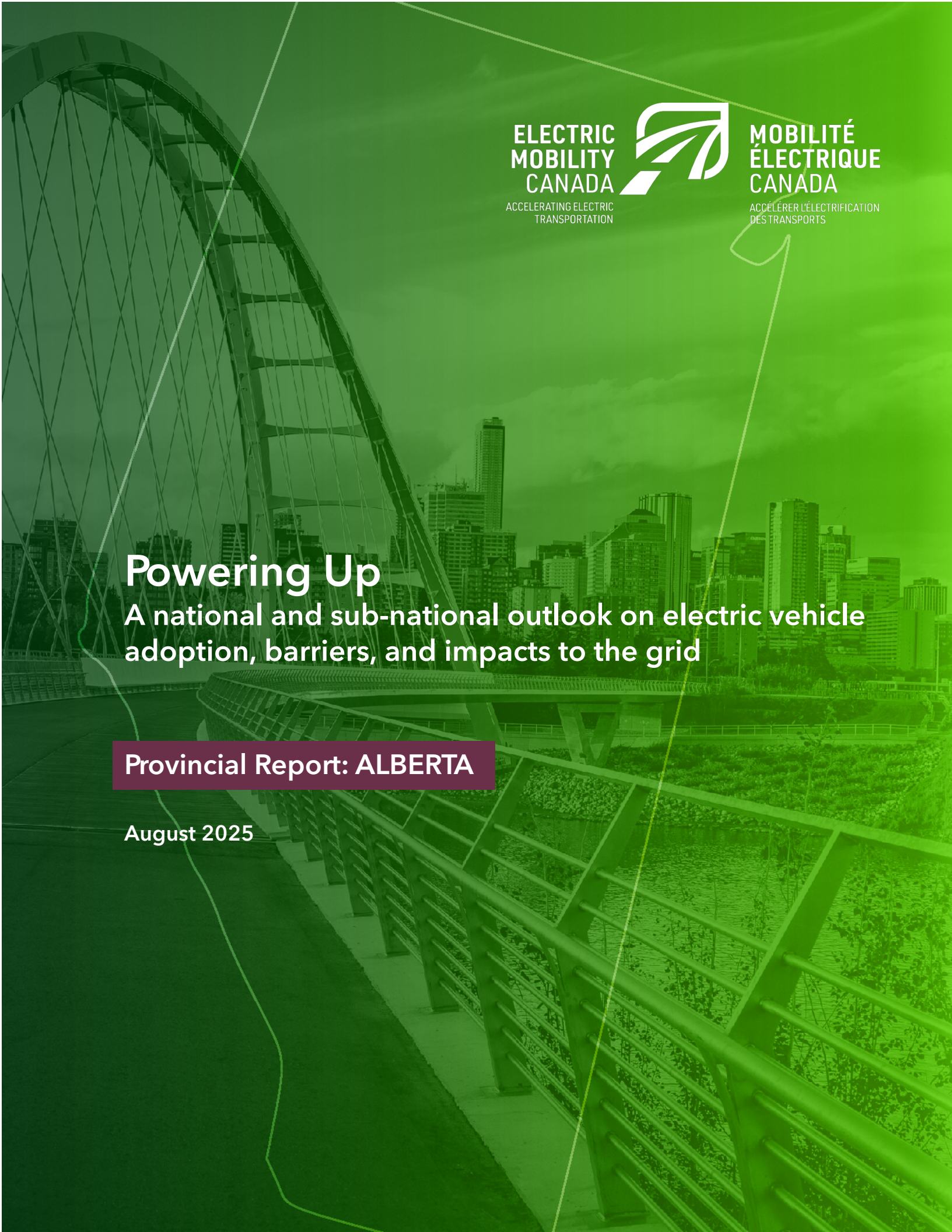

ELECTRIC MOBILITY CANADA
ACCELERATING ELECTRIC TRANSPORTATION

MOBILITÉ ÉLECTRIQUE CANADA
ACCÉLÉRER L'ÉLECTRIFICATION DES TRANSPORTS

Powering Up

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

Provincial Report: ALBERTA

August 2025

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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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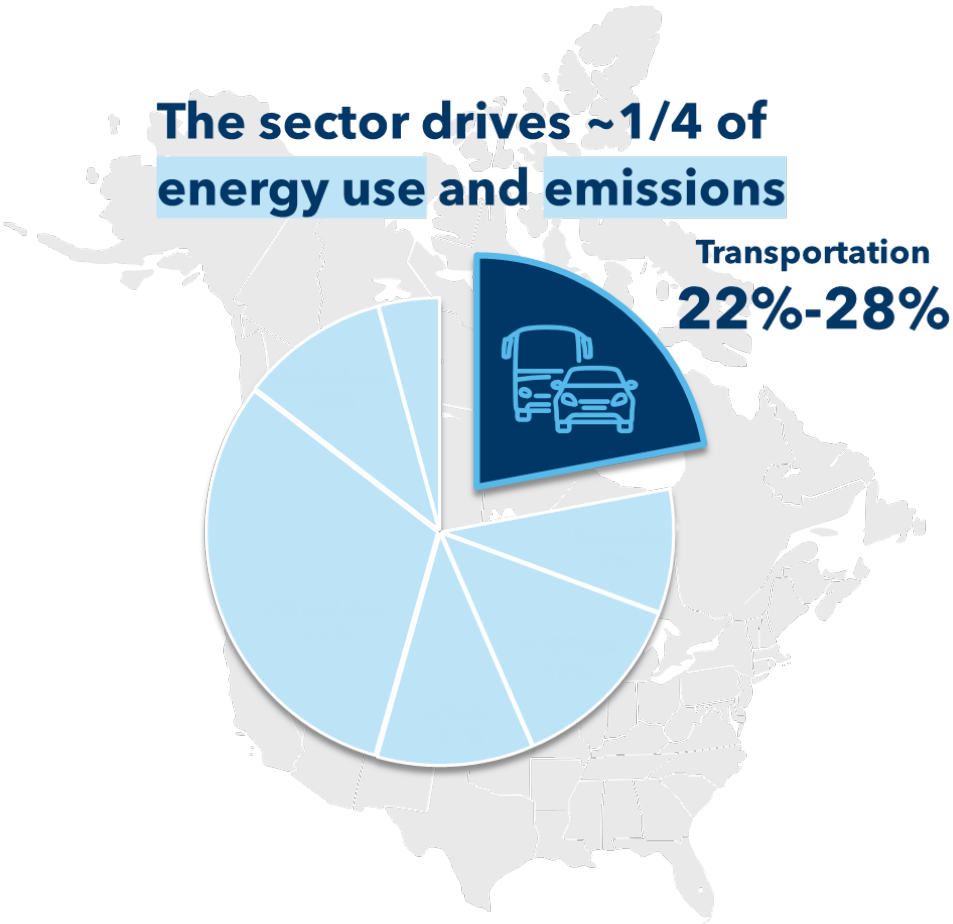
1. Background

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 Dunsky 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 Vehicle (ZEV[1]) 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 ZEV 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.

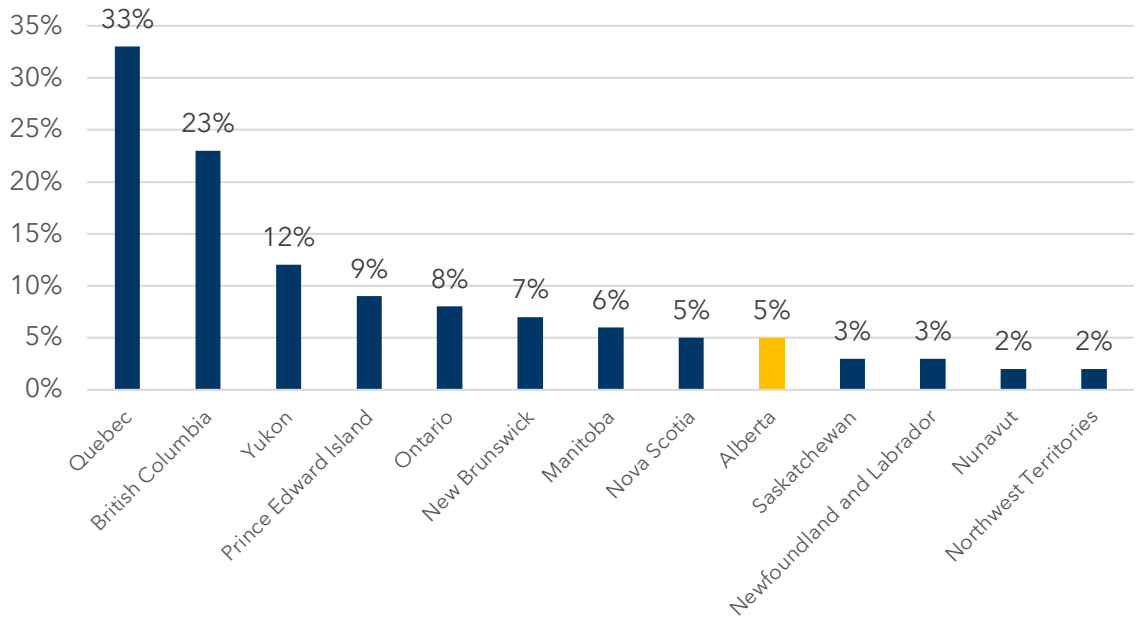
[1] Includes fully-electric or battery-electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs).

1.2 Historical ZEV Adoption

ZEV adoption in Alberta lands in the bottom five compared to other provinces, at about the same sales rate as Nova Scotia. According to S&P Global, while ZEV adoption represented 15.4% of new vehicle sales in 2024 across Canada, ZEV sales were at 5% in Alberta, behind Manitoba and Nova Scotia.

Figure 2. 2024 ZEV share of new vehicle sales by province and territory[2]

ZEVs represented 5% of new vehicle sales in 2024.

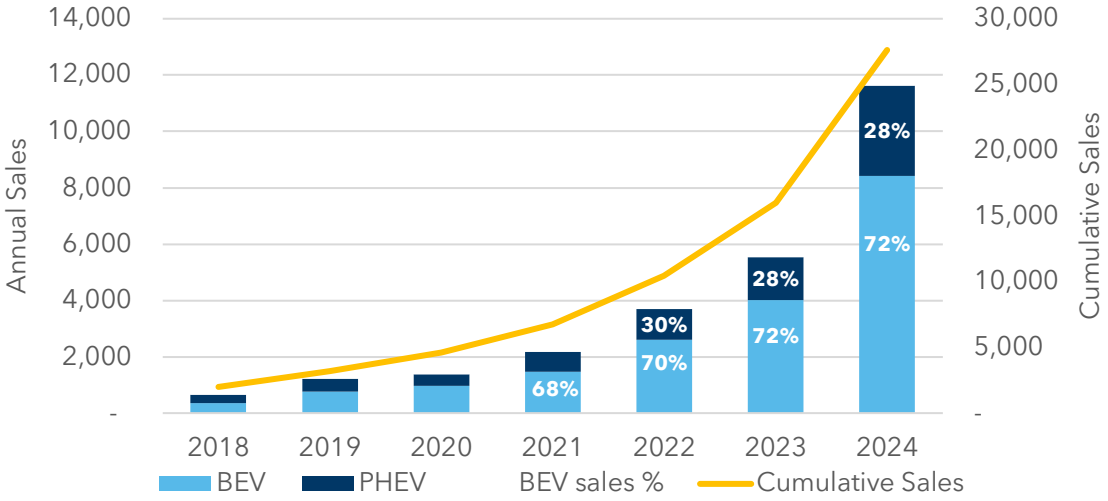


ZEV adoption in Alberta falls in the bottom five, similar to Nova Scotia.

[2] S&P Global. Q4 2024. *Automotive Insights: Q4 2024 Canadian EV Information and Analysis.*

Figure 3. Historical ZEV sales, Alberta

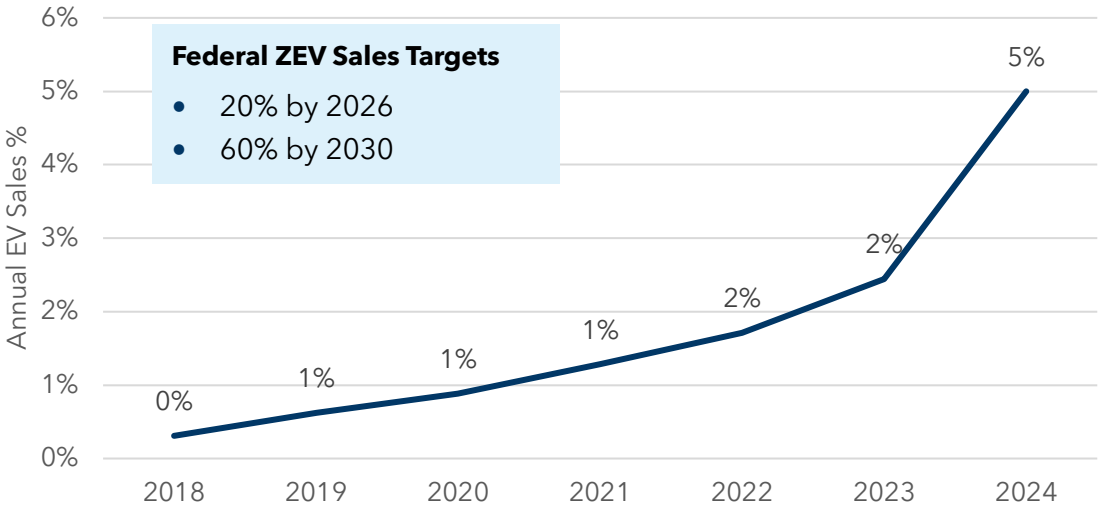
Nearly 28,000 ZEVs have been sold in the province as of 2024.[3]



In Alberta, ZEV adoption has grown significantly in the last few years, particularly since 2022. BEV sales as a share of overall ZEV sales have increased from 56% to 72% of all ZEV sales between 2018 and 2024.

Figure 4. Historical ZEV sales %, Alberta[4]

Since 2018, ZEV market share has grown year-over-year by an average of 65% each year.

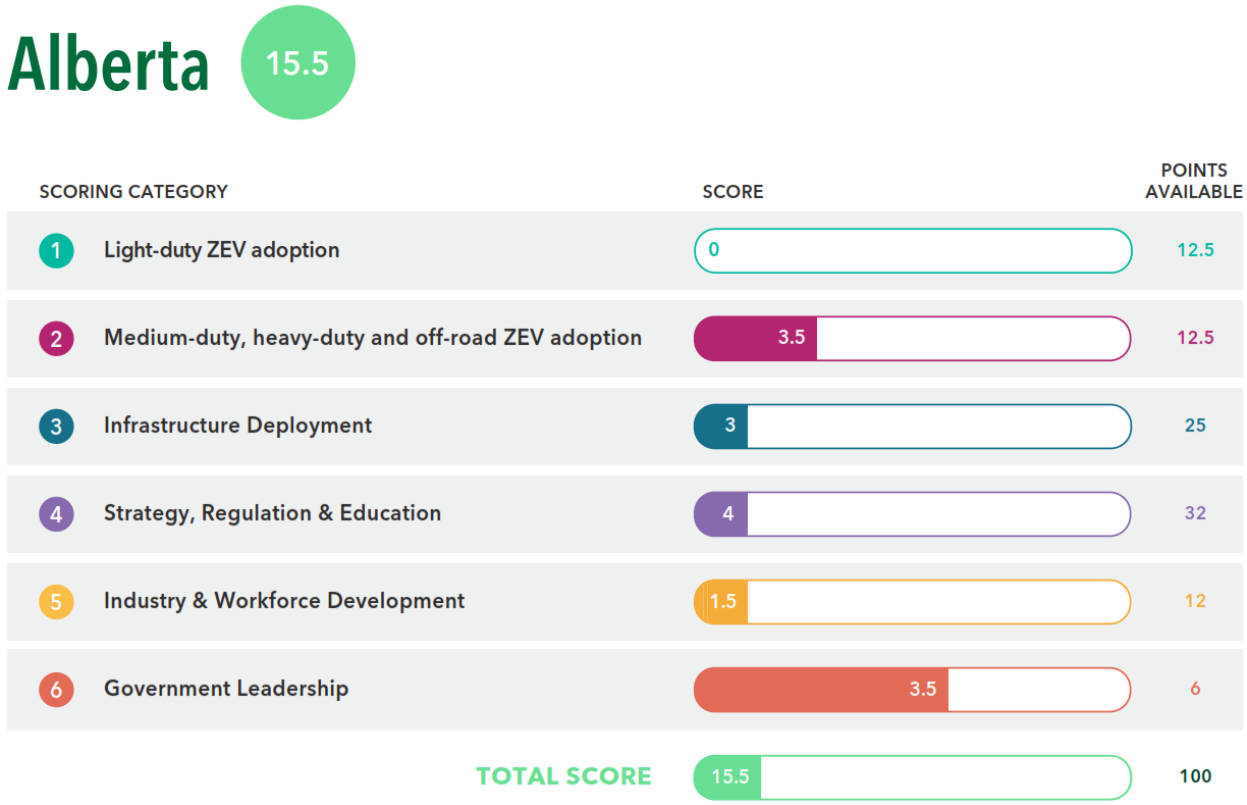


[3] Sources include Statistics Canada. *New motor vehicle registrations, quarterly, by geographic level*. Accessed January 2025 and Statistics Canada. *Vehicle registrations, by vehicle type and fuel type*. Accessed January 2025.
[4] Annual EV Sales percentage are calculated leveraging car and light 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 EV Sales percentages for those years.

1.3 Policy Landscape

In 2022, Dunsky created a Provincial and Territorial Zero-Emission Vehicle Scorecard for Electric Mobility Canada. At that time, Alberta provided financial support for municipalities to undertake ZEV projects, including ZEV purchases and public charging infrastructure, through the Municipal Climate Change Action Centre. The utility ATCO also led the deployment of a 20-charger network called Peaks to Prairies. Alberta ranked eighth among all provinces and territories, with a score of 15.5 points in the "Getting Started" category.

Figure 5. Alberta ZEV Scorecard, 2021-22



In that scorecard, we also outlined several key opportunities for Alberta to improve its score and thereby encourage higher rates of ZEV adoption in the coming years, as shown in the table below. There were no significant updates against the specific opportunities outlined, but since 2022, Fortis Alberta has launched a smart charging pilot, and the City of Calgary has launched a funding program for ZEV-ready retrofits in multifamily buildings.

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

Opportunities highlighted in ZEV Scorecard (2022)[5]	Major progress or updates in 2023-2024
The Province of Alberta currently offers no ZEV purchase subsidies to consumers or businesses. Financial support of this kind can help to accelerate uptake in the province.	N/A
Set provincial ZEV sales targets and work to incorporate these targets with the forthcoming federal ZEV Availability Standard. A provincial mandate would ensure supply and choice of ZEV models for consumers.	N/A
The province has an opportunity to convene utilities, municipalities, and other actors to strategically plan ZEV infrastructure investment.	N/A
There are currently no ZEV-related workforce development and training programs in the province. Alberta can seize this economic opportunity by investing in technical training in colleges and other institutions.	N/A
Set government ZEV fleet procurement targets.	N/A

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

- Fortis Alberta launched a managed charging program in 2023 to understand ZEV charging patterns and behaviours. 85% of enrolled ZEV owners opted to participate in a utility-controlled charging event accompanied by an incentive, and 75% of participants indicated having a positive experience.[6]
- In September 2024, The City of Calgary announced ChargeYYC, a pilot program to increase ZEV charging access in multi-family buildings. In Phase 1 of the pilot, up to 60 residents could apply for up to $4,000 to develop an ZEV charger installation plan (called the ZEV Charging Roadmap) for the building, prepared by a qualified professional. The first phase reached capacity, with a second intake in early 2025. The second phase, planned for 2025, will provide funding to install ZEV chargers for selected projects based on approved ZEV Charging Roadmaps.[7]

[5] Electric Mobility Canada. 2021-22. *Provincial and Territorial Zero-Emission Vehicle Scorecard.*
[6] Alberta Utilities Commission. *Proceeding 29297*. Accessed October 2024.
[7] The City of Calgary. *ChargeYYC*. Accessed February 2025.

1.4 Vehicle and Housing Market Overview

LDV sales in Alberta declined significantly in 2020 and 2021 but have since been increasing. This market growth has implications not only for the potential total ZEV sales but also for the grid impact of an increasing number of electric vehicles.

Figure 6. Historical light-duty vehicle stock on the road, Alberta[8]

The vehicle market in Alberta has been increasing, reaching a stock of 3.22 million in 2024.

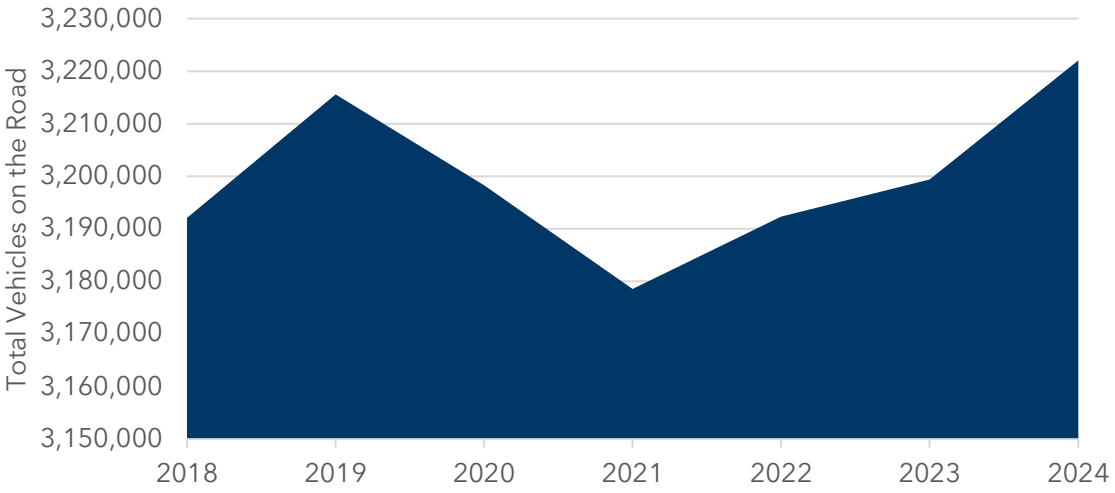
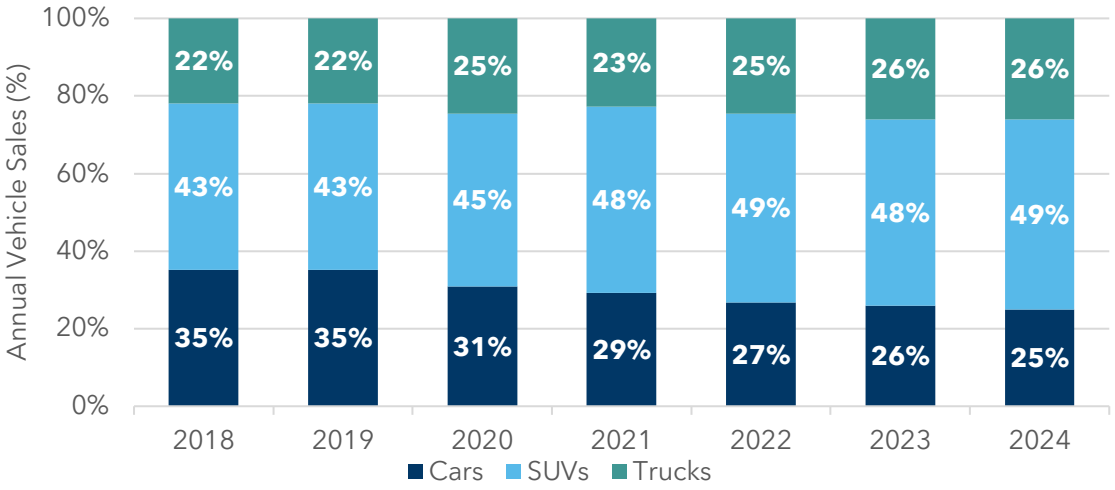


Figure 7. Historical light-duty vehicle segment mix, Alberta[9]

The current segment mix is 49% SUVs and 25% cars, the remaining 26% being light trucks.

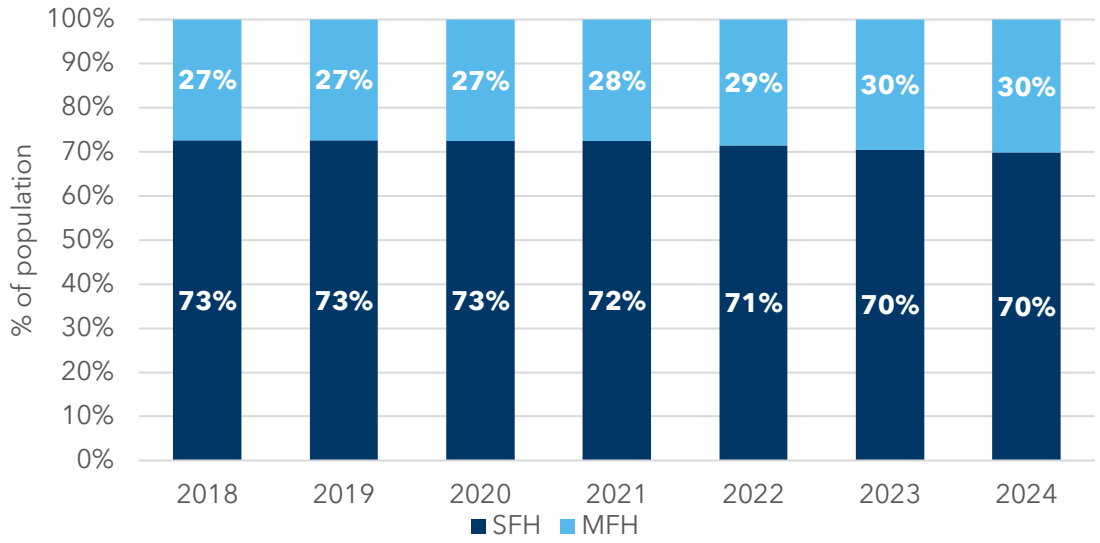


[8] Natural Resources Canada. *Comprehensive Energy Use Database: Transportation Sector, Alberta.* Accessed December 2024. Assume vehicle ownership remains constant and vehicles on the road align with population projections from Statistics Canada's M1 scenario. *Projected population, by projection scenario.* Accessed June 2024.
[9] Ibid.

Alberta's LDV segment mix has been trending towards larger vehicles (SUVs, Trucks) between 2018 and 2024 with cars representing 35% of annual vehicle sales in 2018 and declining to 25% in 2024 It is essential to consider the vehicle segment mix when transitioning these vehicles to electric, as larger vehicles are heavier and tend to be less energy-efficient, 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), Alberta[10]

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



About 70% of Albertans live in single-family homes, and this proportion has been relatively stable over the last seven years, from 73% in 2018 to 70% in 2024[11]. This means that about 30% of Albertans 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.

[10] 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.*).
[11] 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 Alberta, 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.

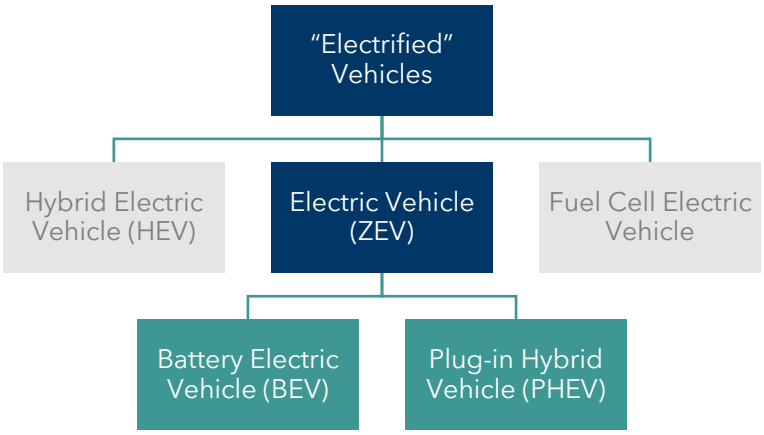
Figure 9. Overview of the EVA™ Model

Technical	Economic	Constraints	Market
Assess the maximum theoretical potential for deployment	**Calculate unconstrained economic potential uptake**	**Account for jurisdiction-specific barriers and constraints, which vary by vehicle class, including:**	**Incorporate market dynamics and non-quantifiable market constraints**
• Market size and composition by vehicle class (e.g. cars, SUVs, pickups) • Forecasted availability of vehicle models in each class	• Forecasted incremental purchase cost of ZEVs over ICEVs • Total Cost of Ownership (TCO) based on operational and fuel costs	• Range anxiety or range requirements • Public charging coverage, capacity, and charging time • Home charging access	• Use of technology diffusion theory to determine rate of adoption • Market competition between vehicle powertrain types

Our ZEV analysis includes the following vehicle powertrain 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 EVs.
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 Infrastructure[12]	Limited 3,400 ports by 2030 23,000 ports by 2040	Moderate 6,700 ports by 2030 58,000 ports by 2040	Significant 14,000 ports by 2030 73,000 ports by 2040
Home Charging Access[13]	Limited Single-family homes are 91% ZEV-ready, 15% of multifamily homes are ZEV-ready by 2040	Moderate Single-family homes are 91% ZEV-ready, 37% of multifamily homes are ZEV-ready by 2040	Significant Single-family homes are 91% ZEV-ready, 59% of multifamily homes are ZEV-ready by 2040
Vehicle Incentives	Current incentives **Federal:** up to $5,000 (Ramped down + phased-out by 2025)	Current incentives, extended **Federal:** up to $5,000 (Ramped down + phased-out by 2030)	Expanded incentives **Federal:** up to $5,000 **Provincial:** up to $2,500 (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	None	100% by 2035

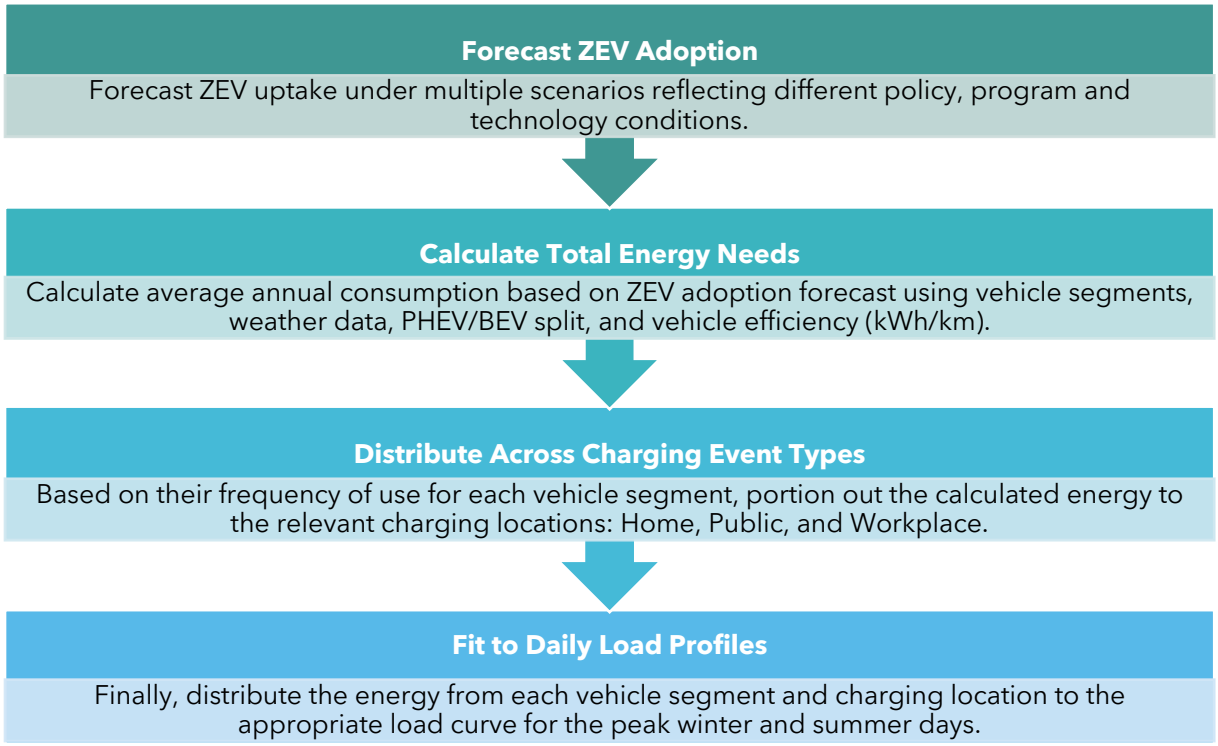
We refer to specific vehicle purchase incentive levels for simplicity, but what matters for our modelling is the ZEV price relative to an ICEV. The same impact can be achieved through a $5,000 rebate, a $5,000 penalty on ICEVs, or a combination that is revenue-neutral, such as a "feebate" system. This approach would become important for the High Growth scenario to sustain ZEV incentives into the 2030s without high costs.

[12] Charging infrastructure inputs in the High Growth scenario are aligned with the estimated charging needs developed in the 2024 Dunsky 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 Dunsky's 2024 analysis, which reflects alternative adoption scenarios.
[13] Assumptions for Home Charging Access were based on the methodology used in the 2024 Dunsky report, *Electric Vehicle Charging Infrastructure for Canada*.

2.2 Electric Grid Load Impacts

This study follows a four-step process to assess the potential for and impacts of ZEVs on Alberta'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. **Figure 11** 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 literature[14] for each vehicle segment and charging location, and the Dunsky EVA™ model results, with regional adjustments for vehicle consumption in Alberta (i.e. temperature and proportions of vehicle types). The resulting load curves represent the average charging behaviour of different ZEV segments on the road during summer and winter peak days.[15]

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

[14] 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.*)
[15] Refers to the day with the highest electricity demand in a single hour, for a given year and season.

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[16]	80%	100%
Workplace	10%	N/A
Public	10%	N/A

[16] 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:

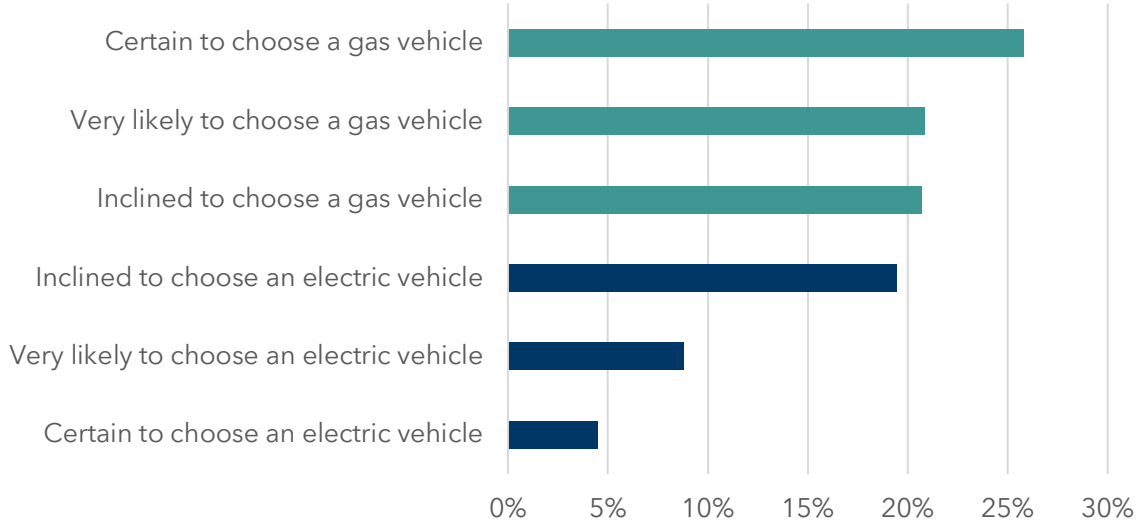
1. Over the long term, ZEV adoption in Alberta is forecasted to approach 100% of new sales, which would accumulate to 40% of total vehicles on the road by 2040, even in a low-growth scenario.
2. If effectively managed charging programs and technologies are employed, winter peak load from ZEV charging has the potential to be reduced by 1,200 MW (41%) in a medium growth scenario.
3. Without effective programs and policies in place over the next few years, Alberta will be on a slower path to electrification, resulting in lost benefits for Albertans in both improved air quality and financial savings from reduced fuel and maintenance costs.

3.1 Results from the Survey of Canadians

As part of the *Powering Up* project, Electric Mobility Canada conducted a survey of over 6,000 Canadians, with 704 respondents from Alberta. 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? Alberta only

One third of Albertans (33%) plan to buy a ZEV as their next vehicle. This preference is less than that of Canadian urban residents (49%) and individuals aged 30-44 (51%).



Although Albertans 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? Alberta only

68% of Albertans would be willing to pay a premium for a ZEV versus an ICEV.

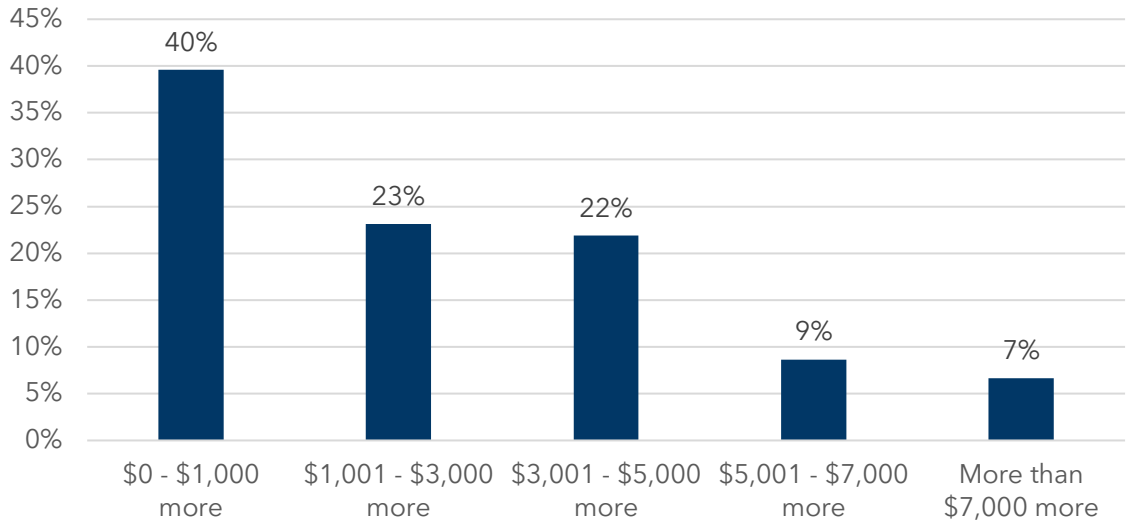


Figure 14. How many long distance (500 km or more) trips do you make in one year? Alberta only

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

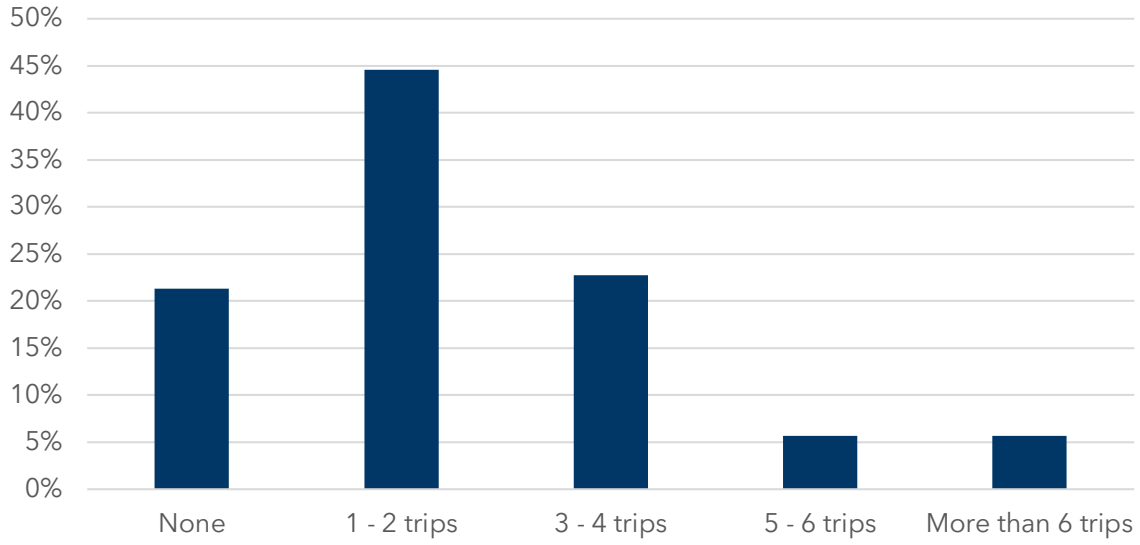
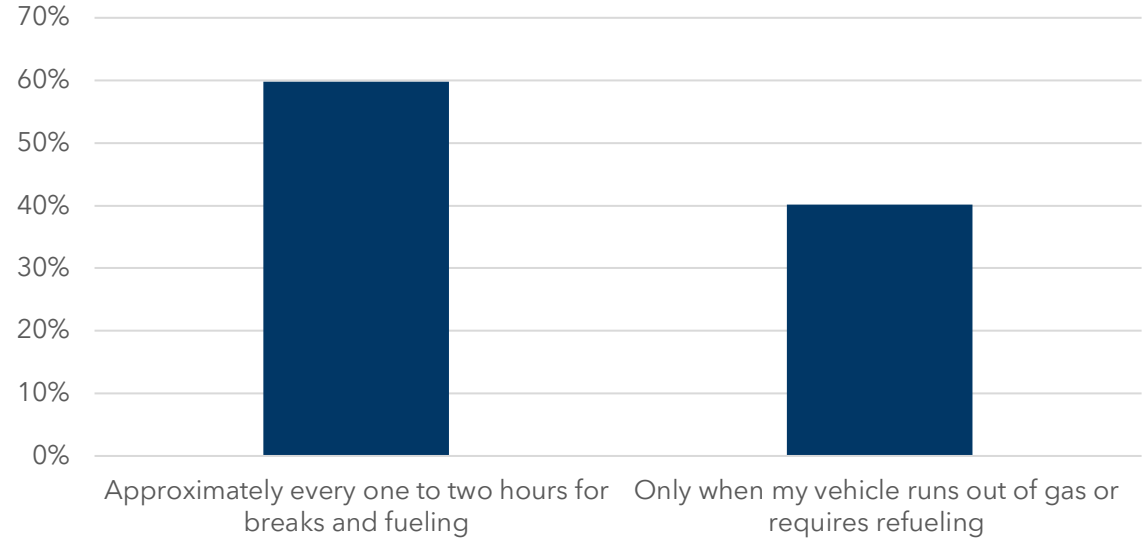


Figure 15. How frequently do you typically make stops during long-distance trips (500 km or more)? Alberta only

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

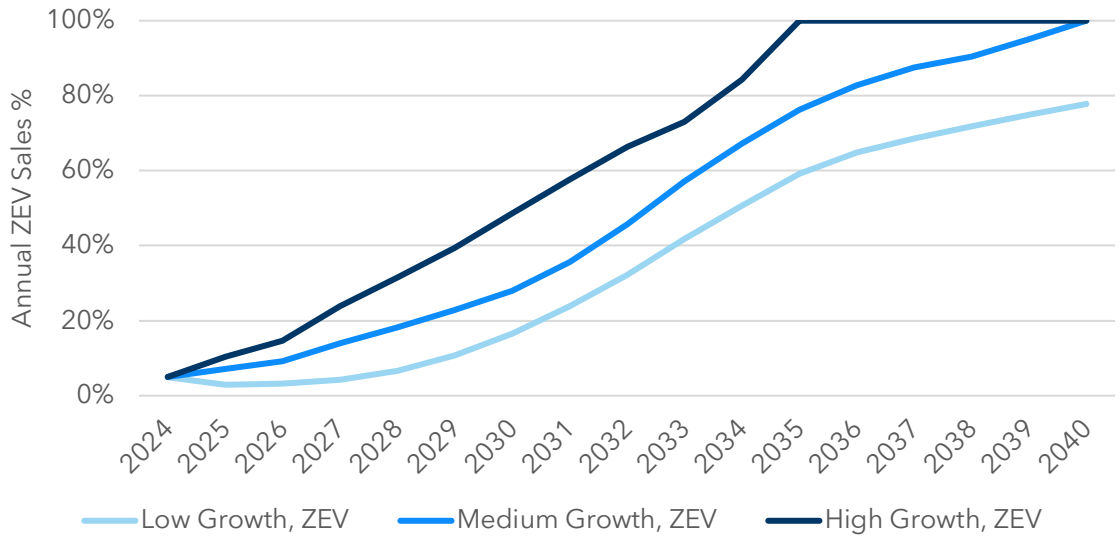
Despite improvements in battery size and access to public charging, there may still be perceived range barriers, also known as "range anxiety", which makes potential ZEV buyers hesitant to switch to electric, but could be improved either through education or exposure to EVs and charging as adoption increases.

This survey also included questions pertaining to Canadians' knowledge about EVs, which can be indicative of some common misconceptions that result in perceived barriers to adoption. For instance, the majority of Albertans are unaware of the average range of new EVs, with only 28% knowing that it falls between 400 and 500 kilometres. Additionally, only 37% of Albertans are aware of the federal government rebates for EVs. A sample of additional questions that were asked in this knowledge section is included in the Appendix, Additional Results from the Survey of Canadians.

3.2 ZEV Adoption Results

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

Figure 16. Annual ZEV sales % by scenario, Alberta



Changes in charging availability, purchase incentives, and a ZEV mandate in the near term will determine how quickly Alberta 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 EVs to price parity with ICEVs, and ensuring adequate local supply.

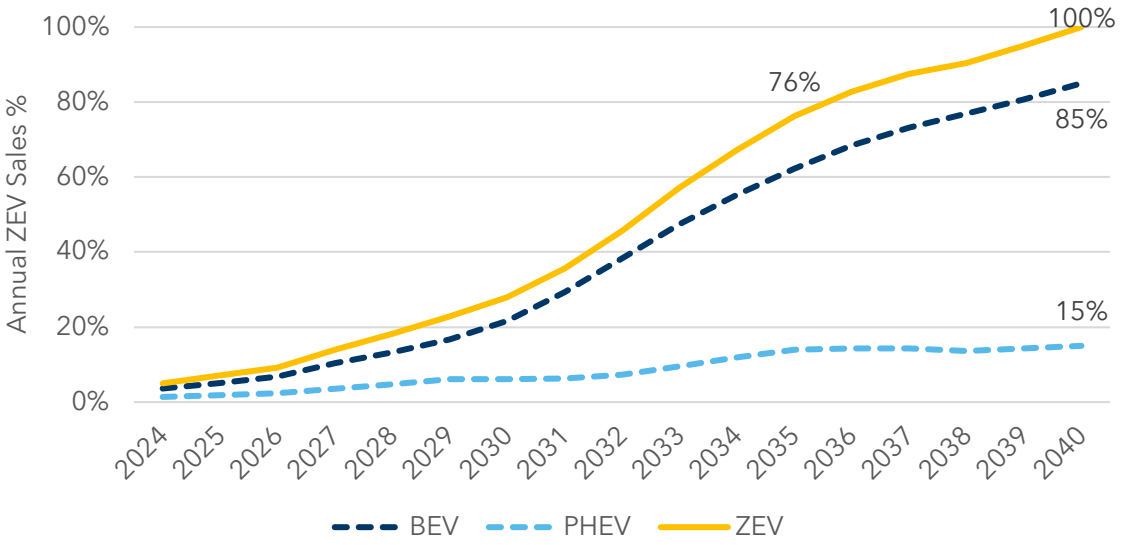
Policy makers have a critical opportunity in the next few years to put Canada on a strong path to vehicle electrification, enabling Canadians to reap the cost and environmental benefits over the following decades.

3.2.1 Medium Growth Scenario

Although the Medium scenario models a delayed federal ZEV Availability Standard enforcement date, ZEV adoption is still expected to reach 76% of new sales by the current target date of 2035.

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

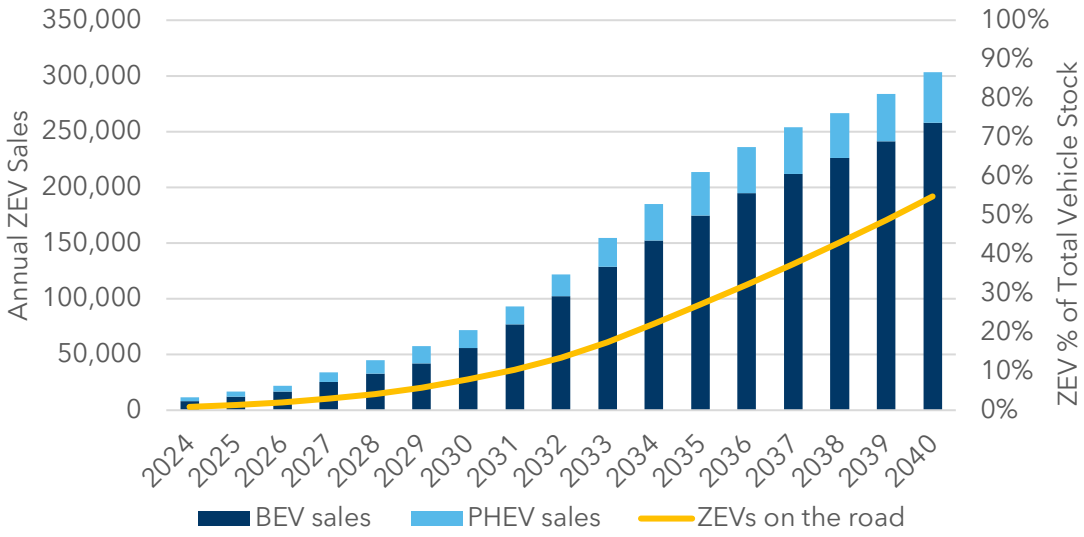
Alberta will experience significant growth in ZEV uptake, reaching 100% by 2040.



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, Alberta

By 2040, over 2.3 million of the 4.3 million (55%) 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, Alberta

The ZEV proportion of annual sales increases rapidly towards the 100% ZEV Availability Standard in 2035, reaching 49% by 2030.

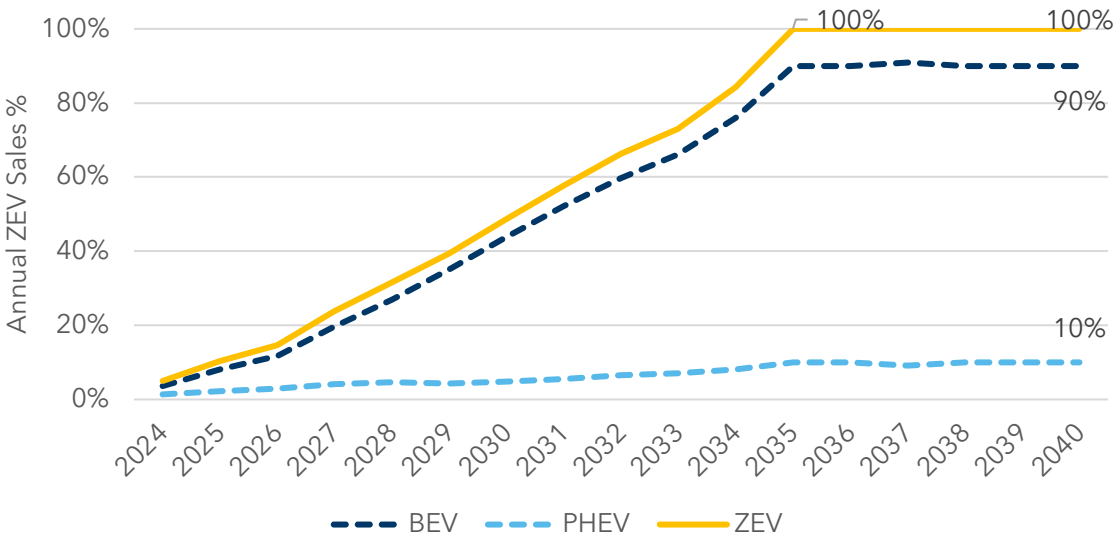
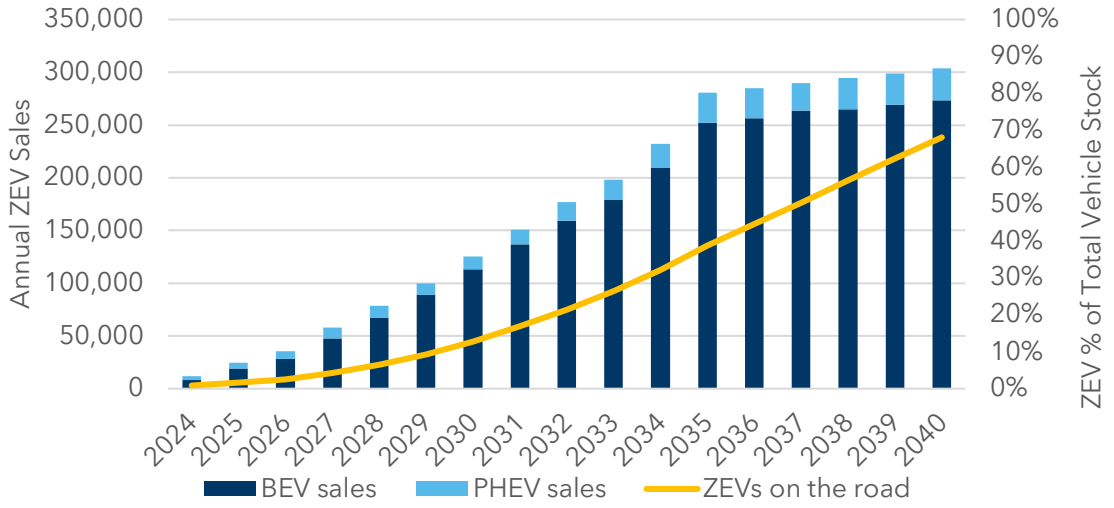


Figure 20. Annual ZEV sales by powertrain and total ZEV stock, high growth, Alberta

By 2040, over 2.9 million of the 4.3 million (68%) LDVs on the road are forecasted to be ZEVs.

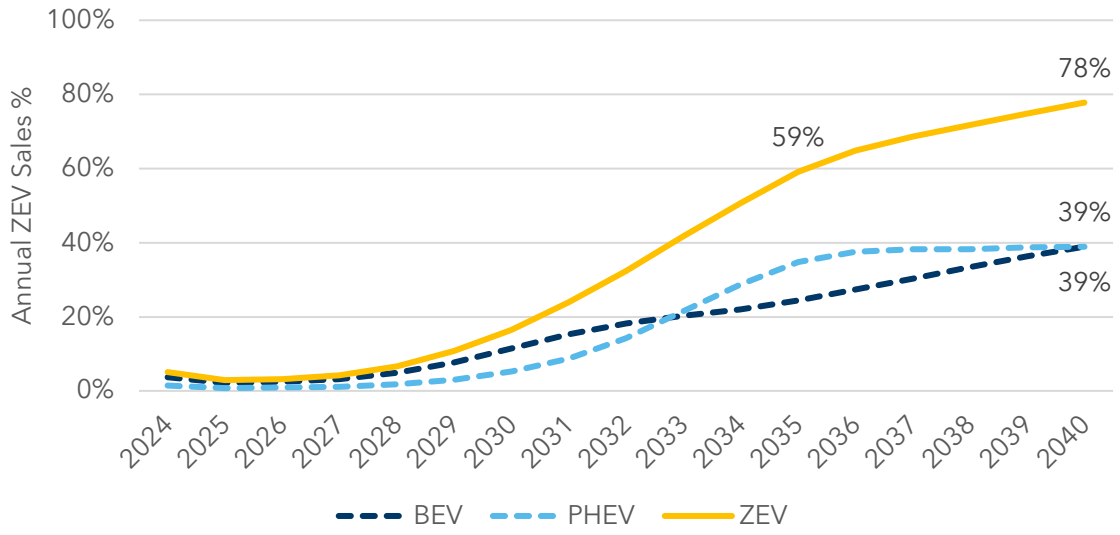


3.2.3 Low Growth Scenario

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

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

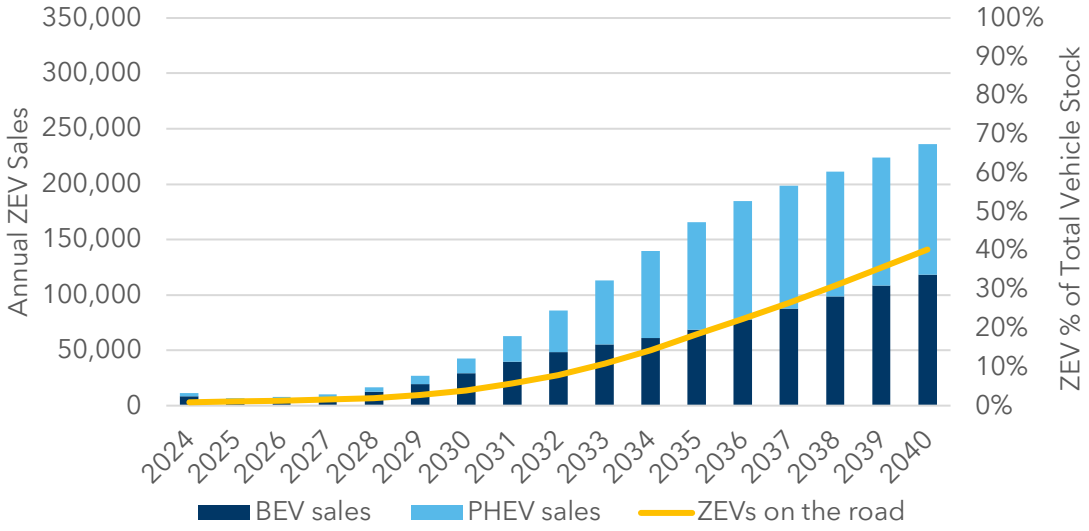
ZEV adoption is expected to fall short of the current federal 2035 ZEV target (100%), reaching only 59% of new sales by 2035 and 78% by 2040.



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 to improve and result in increasing market share.

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

By 2040, over 1.7 million of the 4.3 million (40%) LDVs on the road are forecasted to be ZEVs.

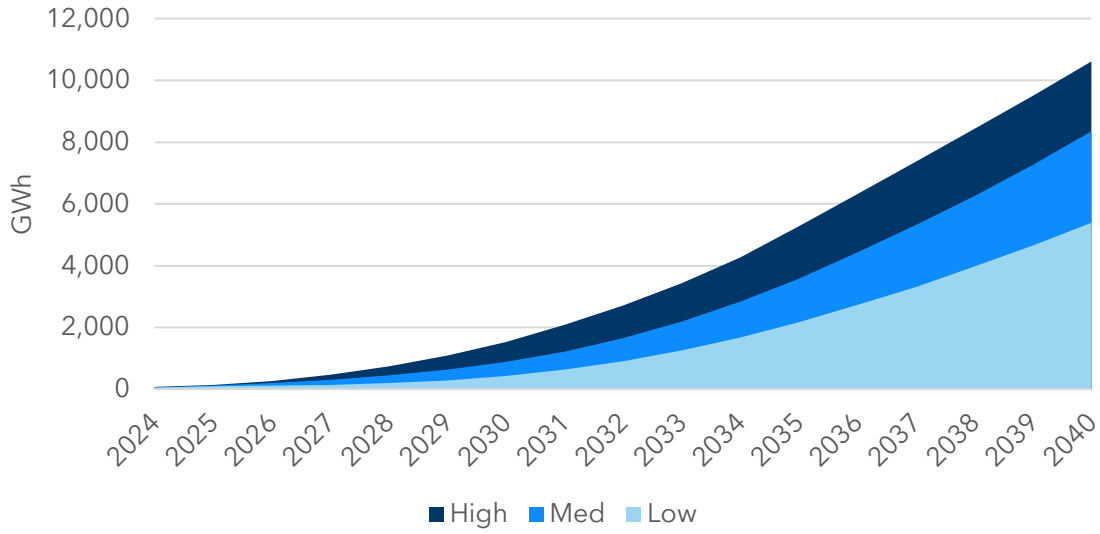


3.3 Electric Grid Load Impact Results

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 gas, whereas a BEV must always use electricity, a higher proportion of BEVs will result in higher energy consumption overall.

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

Total annual load impacts in Alberta could range from 5,300 to 10,600 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 Alberta by between 6% and 12% by 2040.[17]

[17] Based on our ZEV forecast (Figure 23) and the Alberta Energy System Operator's (AESO) Annual Market Statistics Reports for 2023. See source: AESO. Annual Market Statistics Reports. 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 impacts[18] compared to summer requirements, mainly due to cabin heating needs.[19]

Figure 24. Peak ZEV Charging Load, summer, Alberta

ZEVs will contribute between **900 and 1,800 MW** of peak load by 2040 in **summer**.

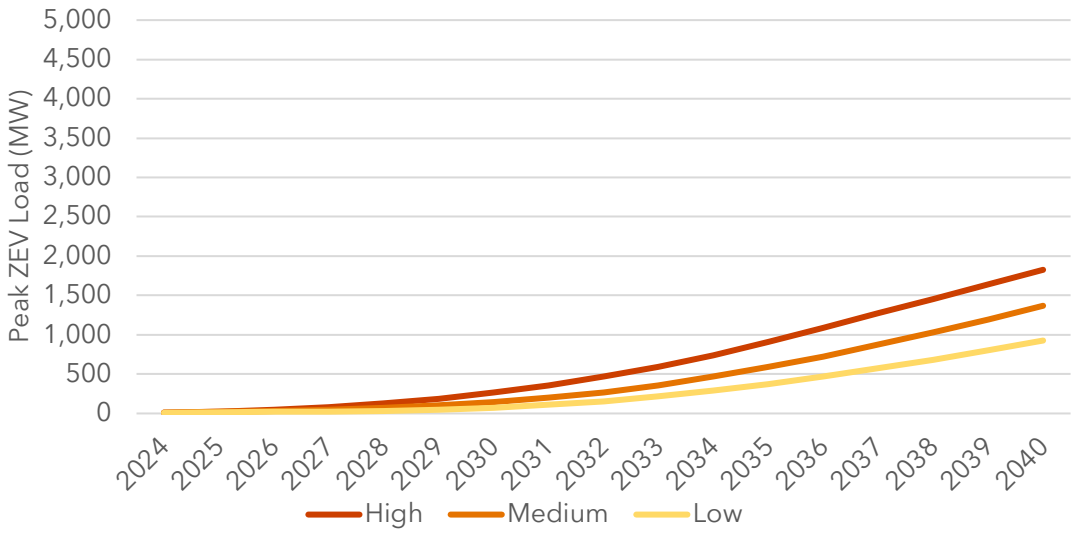
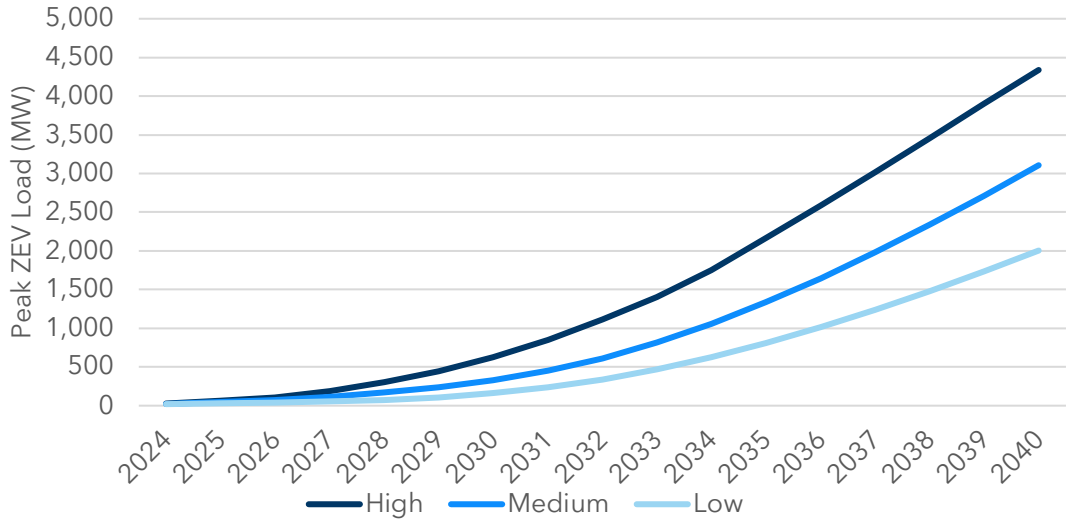


Figure 25. Peak ZEV Charging Load, winter, Alberta

ZEVs will contribute between **2,000 and 4,300 MW** of peak load by 2040 in **winter**.

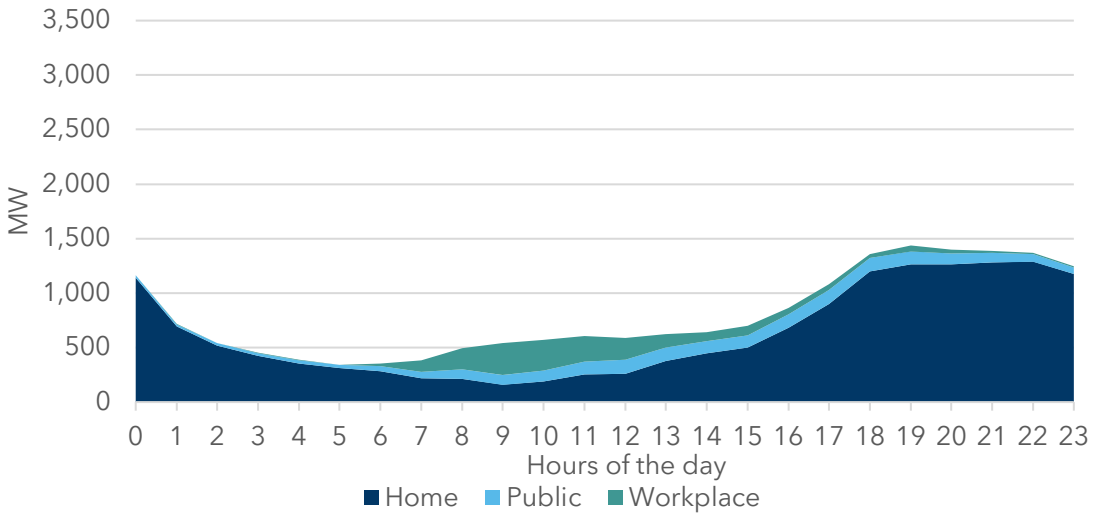


[18] Peak load refers to the hour with the highest electricity demand for a given year and season.
[19] Geotab. November 30, 2023. *To what degree does temperature impact EV range?*

3.3.2 Peak Day ZEV Load in 2040

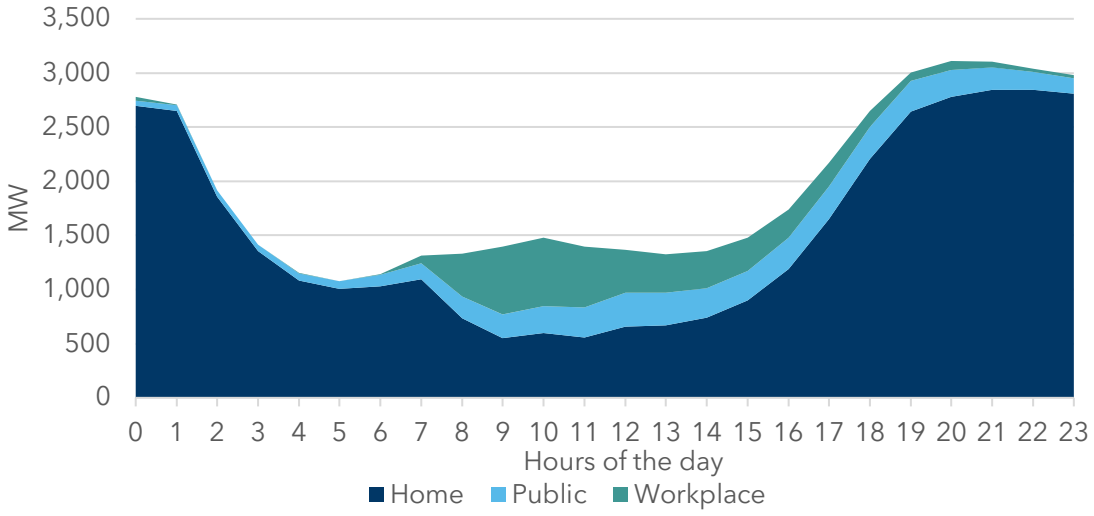
Most of the peak day[20] impact from ZEV charging will come from home charging, with the majority of this type of charging occurring in the evening and overnight.

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



Although the ZEV-peak typically occurs overnight, as a result, load impacts from ZEV charging are significant enough during Alberta's peak periods (typically 5 pm - 9:30 pm in summer and 4 pm - 7 pm in winter)[21] to be impactful on the electrical system if the charging load is unmanaged.

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

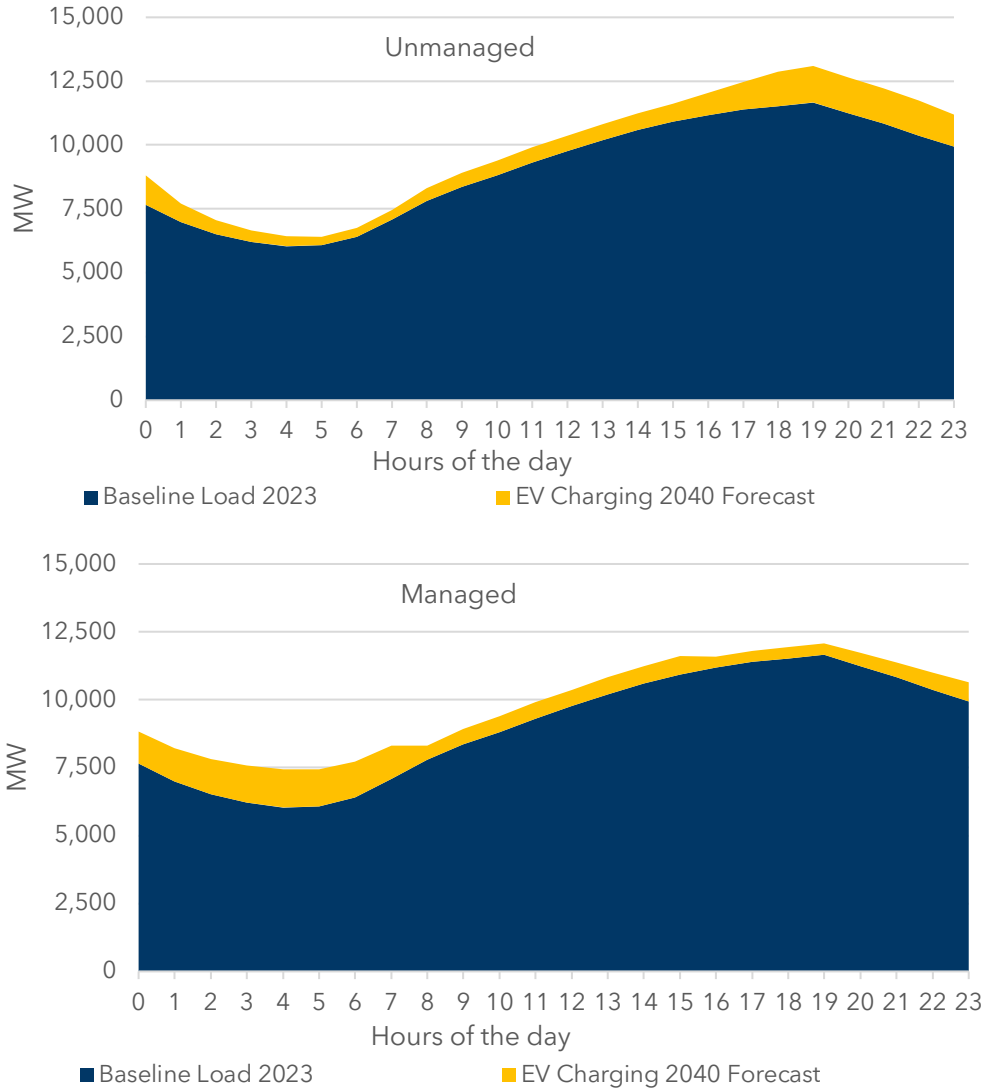


[20] Refers to the day with the highest electricity demand in a single hour, for a given year and season.
[21] AESO. *Electricity Conservation & Grid Alerts.* Accessed February 2025.

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. [22] 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 EVs typically increase peak demand and push the peak hour to later in the evening.

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

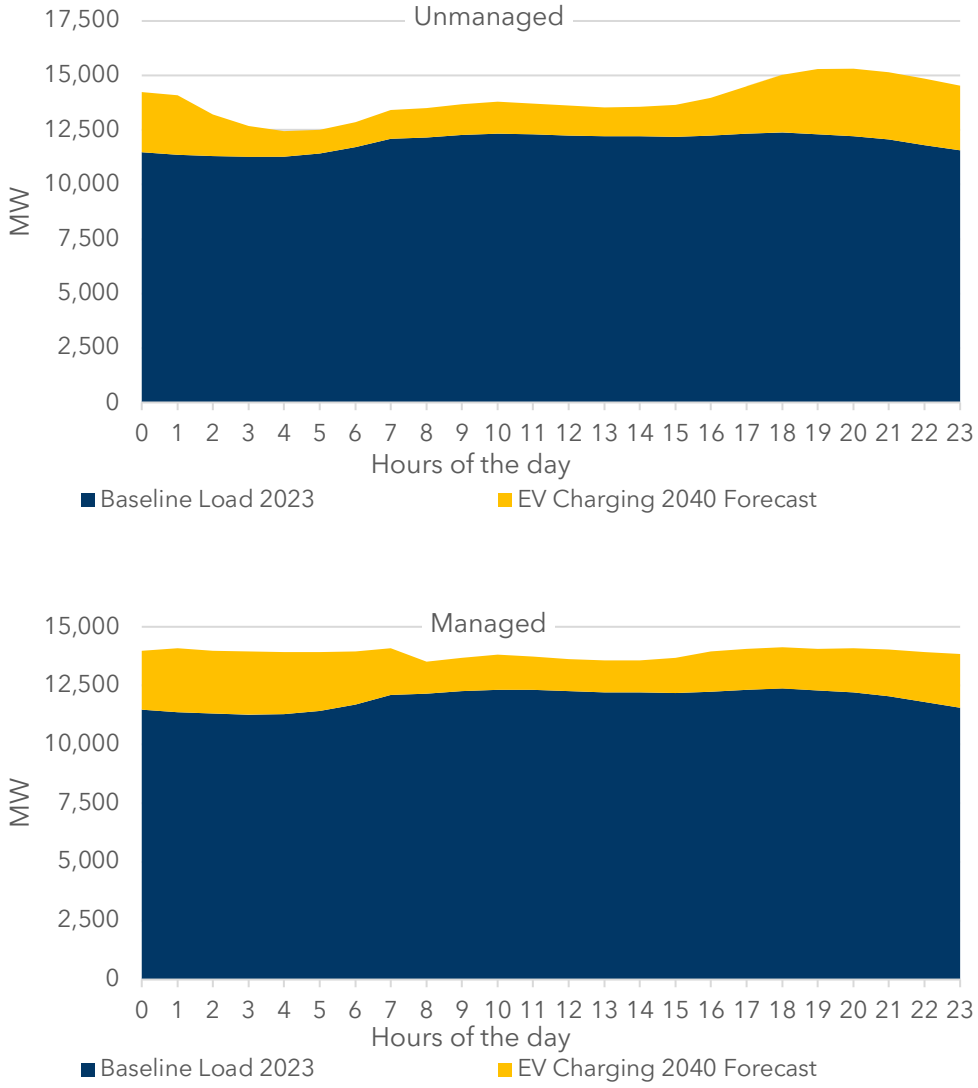


However, if this charging is effectively managed through active load management, winter peak impacts could be reduced by 1,200 MW (41%). [23] Note that this analysis uses sample peak days from Alberta in 2023, but peak day baseline load profiles can vary from year to

[22] AESO. Annual Market Statistics Reports. Accessed February 2025.
[23] 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.

year and grow over time from electrification of other loads like buildings. Alberta typically has its peak in winter mornings and evenings.

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



4. Key Takeaways

1

Over the long term, ZEV adoption in Alberta is forecasted to approach 100% of new sales, which would accumulate to 40% 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 (41%) 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, Alberta will be on a slower path to electrification, resulting in lost benefits for Albertans 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, Alberta[24]

Scenario	Powertrain	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036+
Lo	**PHEV**	$3,750	$2,475	-	-	-	-	-	-	-	-	-	-	-
Lo	**BEV**	$5,000	$3,300	-	-	-	-	-	-	-	-	-	-	-
Med	**PHEV**	$3,750	$3,750	$3,750	$3,000	$2,625	$2,000	$1,313	$656	-	-	-	-	-
Med	**BEV**	$5,000	$5,000	$5,000	$4,000	$3,500	$3,000	$1,750	$875	-	-	-	-	-
Hi	**PHEV**	$3,750	$5,625	$5,625	$5,625	$5,625	$5,625	$5,625	$5,625	$4,500	$2,700	$1,350	$675	-
Hi	**BEV**	$5,000	$7,500	$7,500	$7,500	$7,500	$7,500	$7,500	$6,000	$4,800	$2,880	$1,440	$720	-

[24] 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.

Table 5. Fuel Costs, Alberta[25]

Variable	Units	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
Electricity rate[26]	$/kWh	0.15	0.15	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17
Gas rate[27]	$/L	1.48	1.50	1.51	1.53	1.54	1.56	1.57	1.59	1.60	1.62	1.64	1.65	1.67	1.69	1.70	1.72	1.74

[25] We assume an annual growth rate of 1% and no carbon tax.
[26] Dunsky'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.
[27] Statistics Canada. December 17, 2024. *Monthly average retail prices for gasoline and fuel oil, by geography.*

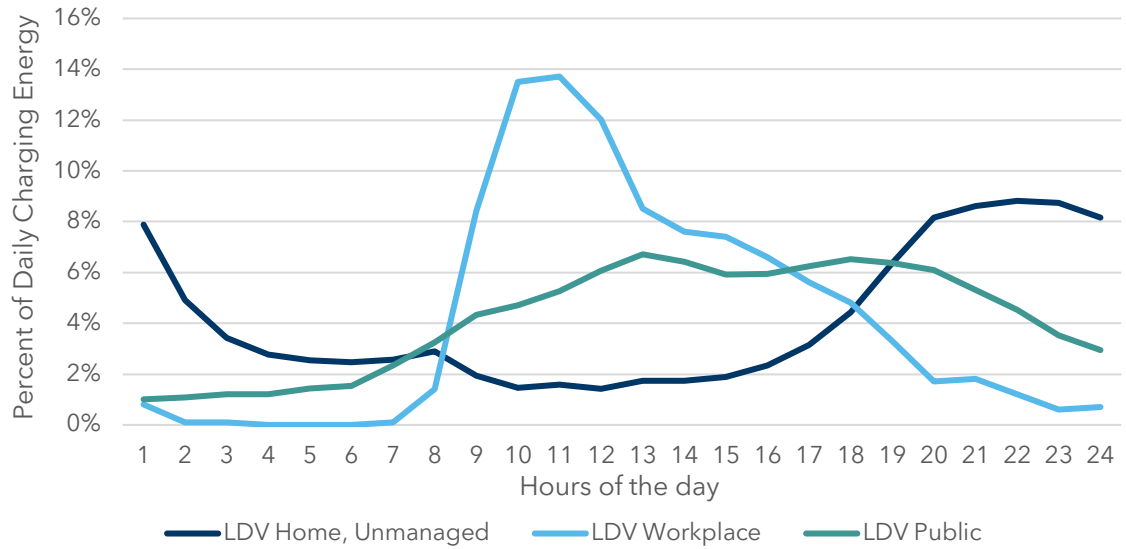
Table 6. Light-duty vehicle stock and sales, thousands of vehicles, Alberta[28]

Variable	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
LDV sales	232	236	240	244	248	253	257	262	267	271	276	280	285	290	294	299	304
LDV Stock	3,222	3,297	3,362	3,418	3,459	3,489	3,508	3,557	3,626	3,682	3,749	3,833	3,963	4,084	4,163	4,235	4,306

[28] Natural Resources Canada. *Comprehensive Energy Use Database: Transportation Sector, Alberta.* Accessed December 2024. 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.

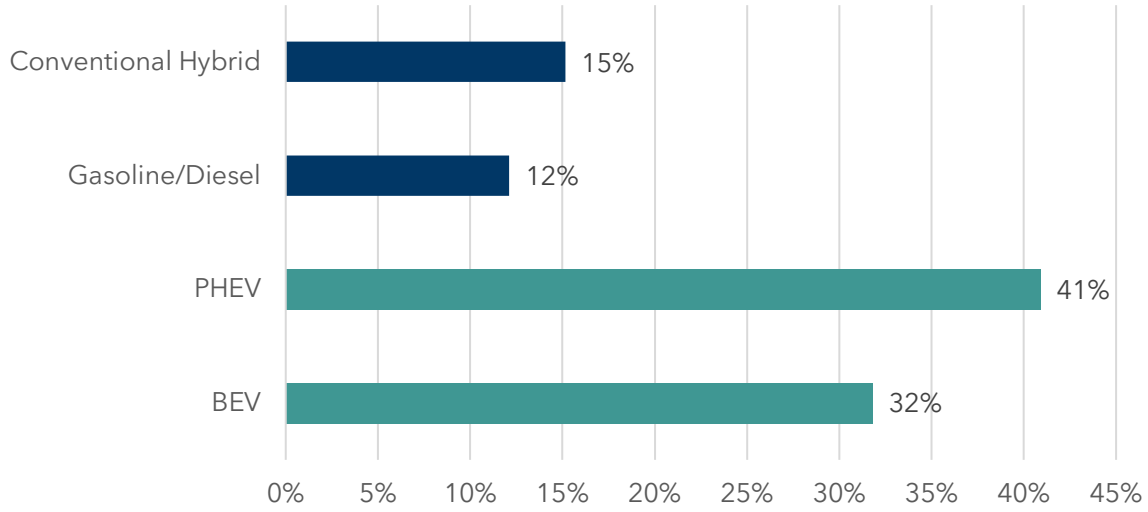
Figure 30. Diversified charging distribution profiles



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 British Columbia 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 the Survey of Canadians

Figure 31. What type of vehicle do you intend to purchase or lease next? Alberta 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? Alberta only

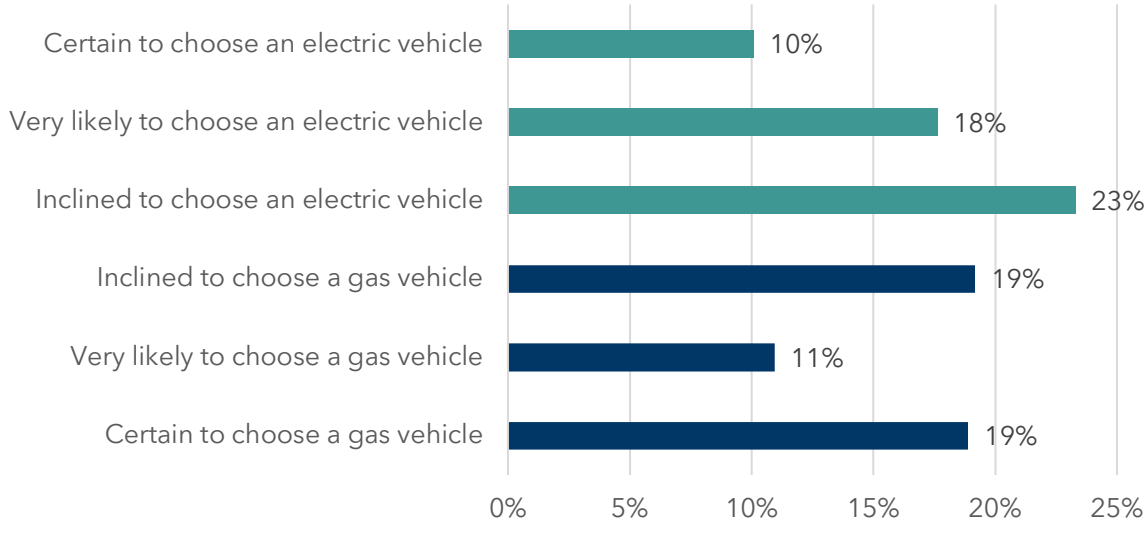


Figure 33. How influential were government incentives in your decision to purchase/lease a ZEV/PHEV? Alberta only

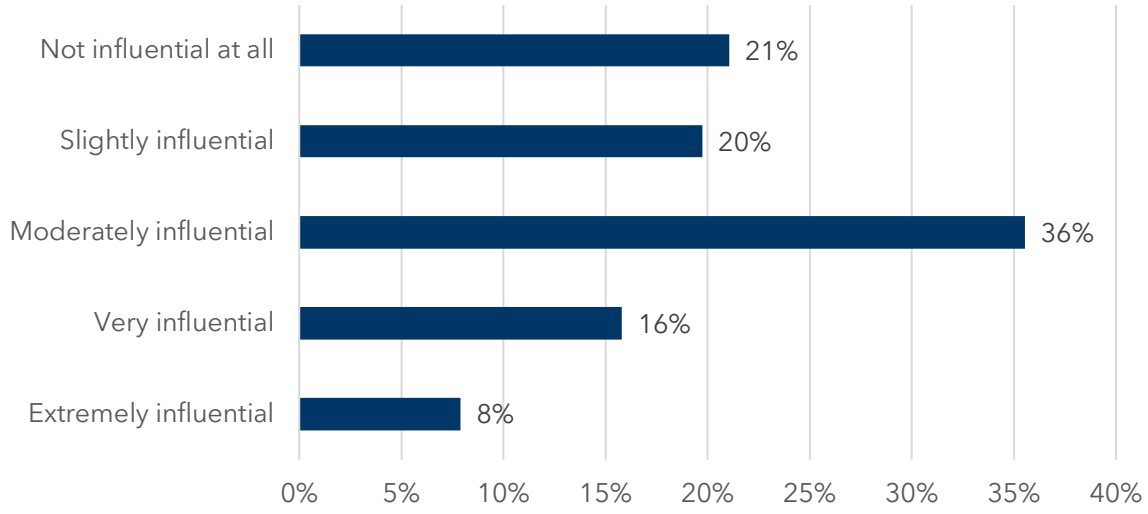


Figure 34. When you are selecting your next vehicle, do you expect you will buy/lease a fully electric vehicle (BEV) or a plug-in hybrid electric vehicle (PHEV)? Alberta only

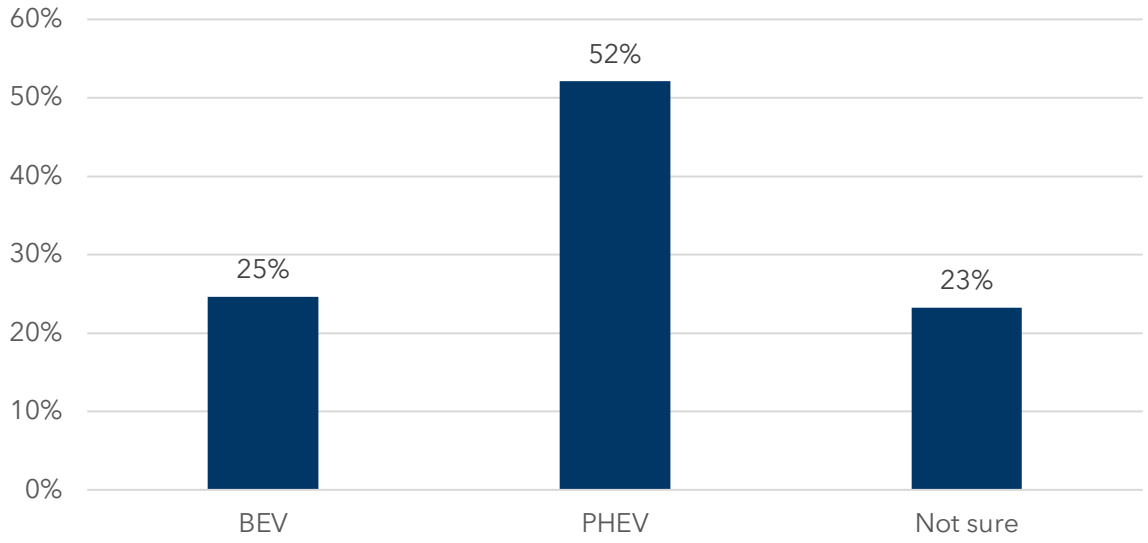


Figure 35. Are you aware of the federal government rebate of up to $5,000 for purchasing an electric vehicle? Alberta only

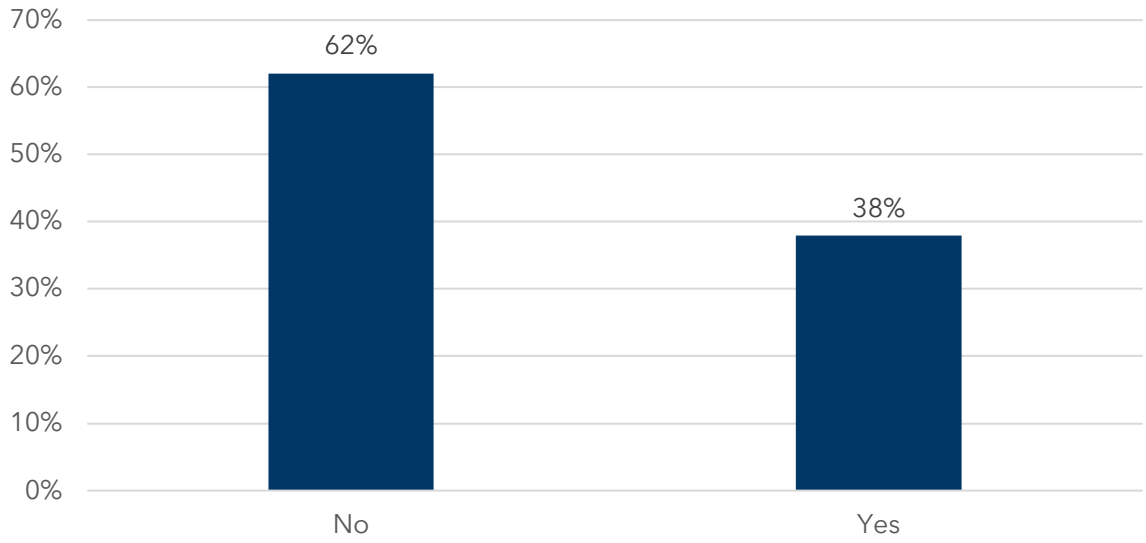


Figure 36. Are you aware that you may be eligible for a federal tax deduction specifically for the purchase of an electric vehicle if you are self-employed or own a company? Alberta only

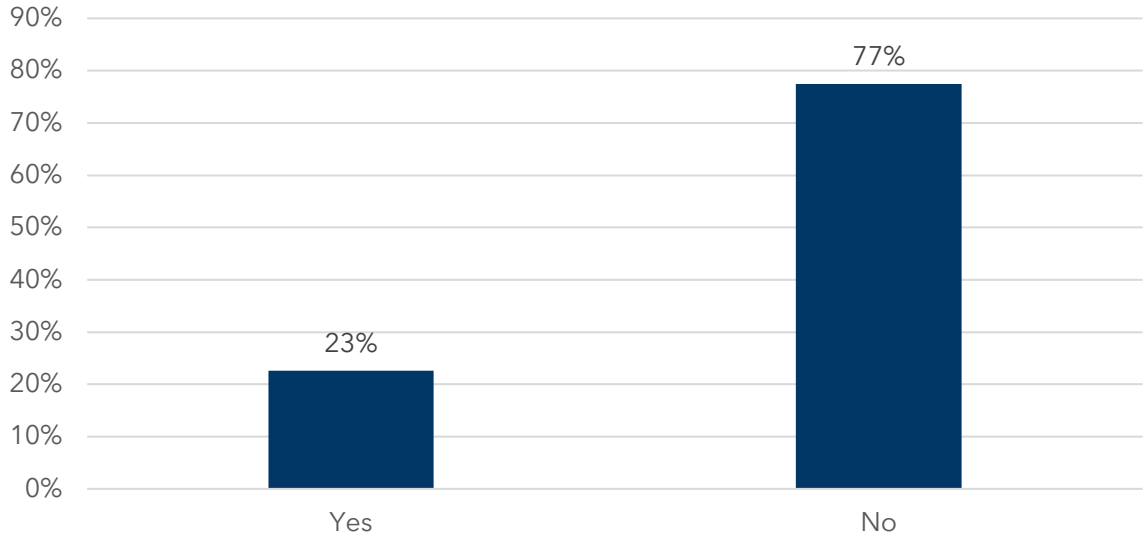


Figure 37. Are you familiar with other incentives available to EVs (e g , ferries, dedicated lanes on highways, dedicated parking spots closer to the entrance, etc)? Alberta only

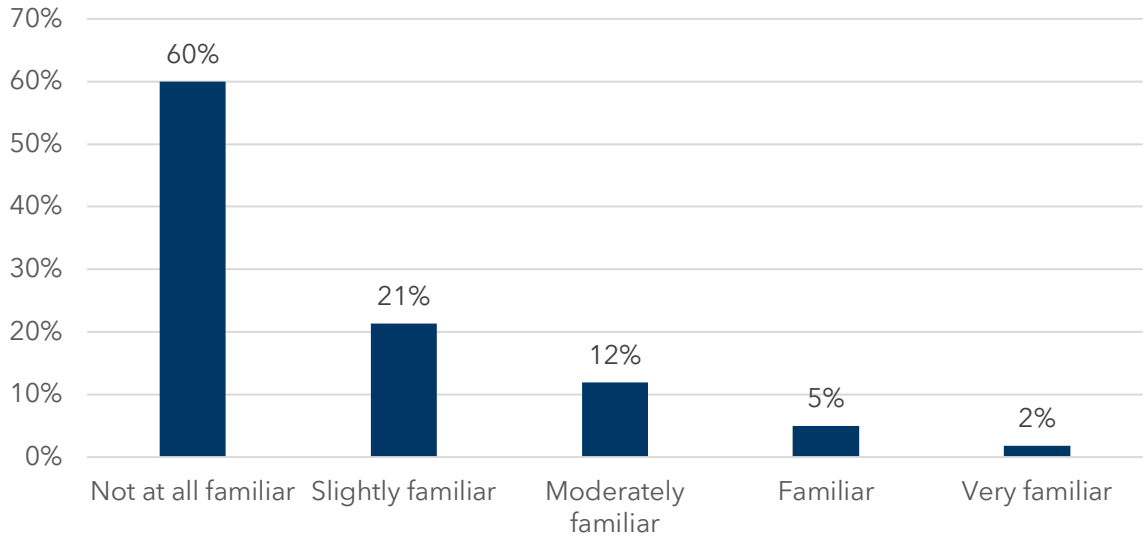


Figure 38. What is the average price of a new light duty vehicle (car, SUV, pickup truck) in Canada? Alberta only

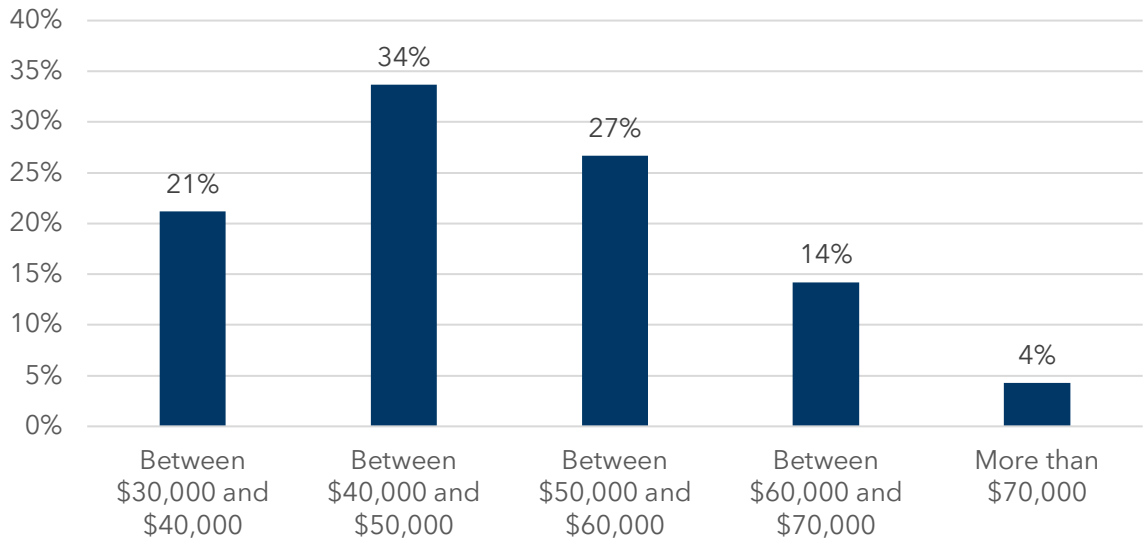
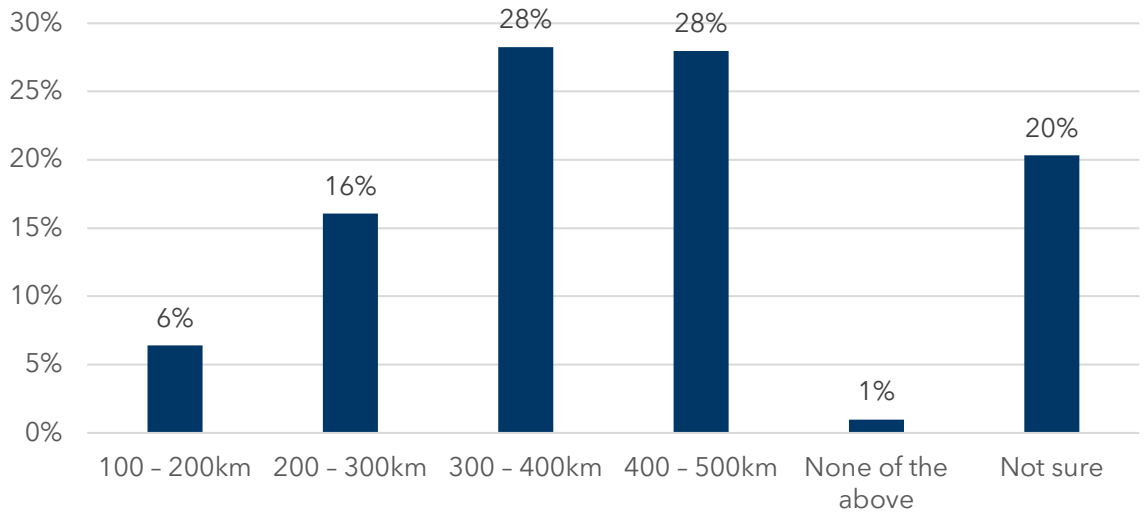


Figure 39. What is the average range of most new electric vehicles? Alberta only



About Dunsky

Dunsky supports leading governments, utilities, corporations and others across North America in their efforts to accelerate the clean energy transition, effectively and responsibly.

With deep expertise across the Buildings, Mobility, Industry and Energy sectors, we support our clients in two ways: through rigorous Analysis (of technical, economic and market opportunities) and by designing or assessing Strategies (plans, programs and policies) to achieve success.

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