CVP 2: PUROLATOR

COMMERCIAL VEHICLE PILOTS PROGRAM

CLASS 4 DELIVERY VAN PROJECT

FINAL REPORT

British Columbia | cleanBC GO ELECTRIC

Transport Canada Transports Canada

Executive Summary

Project Overview

The Purolator project received funding from the CleanBC Go Electric Commercial Vehicle Pilots (CVP) Program. It is the second initiative to complete a full year of telematics data collection, surveys, and interviews.

The project deployed 13 Motiv Epic-4s Class 4 battery-electric vans (BEVs) for last-mile package delivery in British Columbia's Lower Mainland and Southwest region. The data collection period was April 2024 to April 2025. Each BEV had a 158-kilowatt hour (kWh) battery, a manufacturer-rated range of 240 kilometres (km), and a 22,000-pounds (lbs) weight rating.

Two Ford E-450 internal combustion engine (ICE) vehicles operating under comparable duty-cycles were also included. This enabled direct comparisons of energy use, operating costs, and greenhouse gas (GHG) emissions. CVP Program funding of C$410,370.81 supported vehicle procurement and the installation of 13 Level 2 depot chargers.

Key Findings

RANGE

Implied range often fell between 70-100 percent of the manufacturer-stated 240 km range. It is significantly impacted by the duty-cycle[1] of the vehicles.

Outside air temperature impacts range and energy consumption. On average, driving energy consumption increased by roughly 1.37 kWh/100 km per °C drop. The implied range[2] is highest in summer months and lowest in the winter.

Higher energy/fuel consumption is associated with increased payloads for both BEVs and ICE vehicles. Payload impacts were more pronounced for BEVs in the winter compared to the summer. This indicates that temperature and payload effects can compound one another.

CHARGING

Overnight charging at Purolator's base using Level 2 chargers was sufficient. Public charging was not used during the project and midday charging was rarely required.

Vehicles ended the service day below 10 percent state-of-charge (SoC) on only 2 days or 0.1 percent of the time. Vehicles began service days at an average SoC of approximately 94 percent. They ended at approximately 71 percent.

On average the batteries received approximately 31 kWh of energy from charging a day. This represents only 20 percent of the total 158-kWh battery capacity indicating that overnight depot charging was sufficient for daily operations.

Regenerative braking provided, on average, 1/6th of the BEVs energy needs. Purolator's policy was to keep the BEVs charged between 10 percent and 95 percent to preserve capacity for regenerative braking and to ensure BEVs were never stranded.

The charger connector port often wore out and will likely need ongoing replacement.

[1] A duty-cycle in this context refers to the typical use-case pattern of the vehicles. This includes the different operating conditions, how long it is in use for, and how often it is used. Please see page 6 for more information.

[2] The implied range is an estimate of the maximum potential distance the vehicle could have traveled on a full charge; this was calculated by taking the actual kilometres traveled on a given day and then dividing it by the percentage of actual charge used. Please see page 6 for more information.

OPERATING PATTERNS AND FLEET INTEGRATION

- **Operating patterns were consistent with stop-and-go parcel delivery,** with frequent short driving sessions and extended periods of idling throughout the service day.

- **Idling accounted for only 9 percent of energy use despite the BEVs spending 30 percent of the day idling.**

- **Drivers reported positive impressions of the BEVs.** They cited quieter operation, improved air quality at depots, and improved comfort. Initial range anxiety decreased as familiarity with the vehicles increased.

- **Electricity costs for the BEVs were six times lower than fuel costs for comparable ICE vehicles.** This resulted in $59,539 in reduced fuel costs for the year across the fleet.

- **The calculated operational GHG emissions for the BEVs were almost 70 times lower than for the ICE vehicles:** 10g/km compared to 697g/km.[3]

- **Vehicle uptime emerged as a key integration challenge for the BEV fleet.** Challenges faced included a fleet-wide software recall, electronic component issues, and extended downtime from high voltage systems[4] repairs requiring the BEVs be sent to the dealer.

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[3] See Appendix B for more information on CO_2 intensity calculations.

[4] High voltage systems include everywhere electrical power flows from the charger to the battery to the motor. Please see page 6 for more information.

Part A: Introduction

Transportation sector emissions in 2022 were up 18 percent from 2007 and continued to account for the largest share (42 percent of British Columbia's (BC) greenhouse gas (GHG) emissions. Commercial on-road transport (primarily heavy-duty vehicles) made the largest contribution with a 21 percent increase while emissions from personal on-road transport stayed essentially flat.

– 2024 Climate Change Accountability Report, Page 11.

About this Report

Through public consultations with industry organizations, businesses, and local and regional governments, the Province has consistently heard that there is not enough reliable real-world data relevant to BC about commercial zero-emission vehicle (ZEVs) use. We, the Province's clean transportation team, aim to fill this gap with a series of outcome packages produced from data collected on vehicles funded by the CleanBC Go Electric Commercial Vehicle Pilots (CVP) Program.

All CVP Program funded projects must collect one year of telematics data. They also complete a quarterly and final survey, and an exit interview. More information on the CVP Program can be found in **Appendix A**.

The approach of this report is non-evaluative and data-driven. It's designed to acknowledge the diversity of fleet operations and the need for context-specific interpretation. Objectivity and fact-based information are essential for decision-making. This report provides tools for insight rather than prescribing outcomes. This is to support fleet managers in making decisions that are best suited to their unique circumstances. This report is not a scorecard or a verdict. It will not tell you whether this project was a 'success' or a 'failure'. Every fleet is different. We want to encourage readers to ask questions about their own fleet to help determine if and how ZEVs may or may not fit into those operations.

Information presented in this report has been prioritized based on industry feedback. We have been told the most important things to consider when buying a ZEV is:

- **Range**
- **Reliability**
- **Payload**
- **Costs/savings**

In this report we gave significant attention to range, reliability, and payload. Fuel costs savings, have been clearly identified but estimates related to total cost of ownership (TCO) are not included. While this was a frequently requested metric, we felt that an accurate indicator of TCO could not be calculated from only one-year of data and that this information, if provided, would be misleading.

This report begins with an introduction to the project, followed by a discussion of quantitative and qualitative findings. Please refer to the project's interactive dashboard to explore the collected data yourself.

Purolator project

The **Purolator project** is the second project in the CVP Program to complete its data collection requirements. Data is from April 2024 to April 2025 and includes one year of vehicle telematics data collection and qualitative data in the form of quarterly surveys, a final survey, and an exit interview.

The Purolator fleet consists of **13 "Motiv Epic-4s" Class 4 battery-electric vehicles (BEV).**

Also included were two Ford E-450 internal combustion engine (ICE) step vans. These were included in the data collection for comparisons of greenhouse gas (GHG) emissions and energy costs. All trucks were delivering packages in the Lower Mainland/Southwest of BC. The trucks have a battery capacity of 158 kWh, and their factory rated range is 240 km with a weight rating of 22,000 lbs. The project and vehicle specifications are presented in **Table 1.**

Fleet Name (and size)	Purolator (13 BEVs + 2 ICE Vehicles)
CVP Program Funding Call	3
Project Type (Procurement, Retrofit, New Design)	Procurement
Make/Model	Motiv Epic-4s (BEV) Ford E-450 step van (ICE Vehicle)
Vehicle Class	4
Use Case	Package delivery
Powertrain	13 battery-electric vans 2 internal combustion engine vans
Vehicle Range	240 km
Battery Capacity	158 kWh
Weight Rating	22000 lbs
Chargers / Hydrogen Filling Stations (if funded)	13 chargers (Level 2)
Project Start	April 2024
Project End	April 2025
Location	BC Mainland/Southwest
CVP Program Approved Funding	C$410,370.81

Table 1 *– Project and Vehicle Specifications*

This project includes telematics data from two ICE equivalent vehicles in Purolator's fleet. The analysis completed for this project was done by evaluating the performance of the BEVs within their duty-cycles compared to ICE vehicles operating under the same conditions. The comparison of fuel savings and avoided GHG emissions were done using real Class 4 ICE vehicles.

Disclaimer

This report is provided for informational purposes only. The analysis and findings presented herein are based on data consolidated and interpreted by the Province. They do not constitute an endorsement or recommendation of any specific technology, company, or service provider. The content has been prepared using neutral language and does not offer legal, financial, or professional advice. The Province accepts no liability for any direct or indirect consequences arising from the use or reliance on the information contained in this report.

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PART B: RESULTS

Below is a summary of high-level metrics collected during the project. **Table 2** shows several key metrics such as the average daily distance driven, the end of day battery state-of-charge (SoC), and others.

	Metric	Value
Emissions and Cost Savings	Avoided CO_2 (operational)	86,095 kg
	Average CO_2 emissions per km	10 g/km
	Fuel Cost Savings	C$ 59,539
Operation and Performance	Average Daily Distance	53.1 km
	Distance Driven	125,363 km
	Days Driven	2,353 days
	Max. Daily Distance	163.6 km
	Average Calculated Range	170.2 km
	Average Speed	16.6 km/h
	Average Daily Drive Time	2.4 h
	% Full Charge Days ending with SoC < 10%	0.1 %
Charging and Energy	Average End of Day SoC	71.0 %
	Average Start of Day SoC	94.0 %
	Average Daily Charge Time	4.3 h
	Average Daily Charged Energy	31 kWh
	Energy Consumption While Driving	57.5 kWh/100 km
	Energy Consumption While Driving + Idling	66.7 kWh/100 km
	Overall Energy Consumption	68.1 kWh/100 km
	Energy Regeneration While Driving	11.7 kWh/100 km

***Table 2** – Purolator Project Data – Key Metrics*

KEY TERMS

Implied range is an estimate of the maximum potential distance the vehicle could have traveled on a full charge. This is calculated by taking the actual kilometres traveled on a given day and then dividing it by the percentage of actual charge used. The equation for calculating implied range is:

$$\text{Implied Range} = \frac{\text{distance}}{\text{SOCdrop}} * 100$$

Duty-cycle in this context refers to the typical use-case pattern of the vehicles. This includes the different operating conditions, how long it is in use for, and how often it is used. The duty-cycle includes all periods when the vehicle can be considered active. For our purposes, this includes time where it is charging, idling, driving, or generally operating away from base.
A vehicle would be out of duty if it were not in use, not charging, and not being used. For example: a vehicle being turned off while an extra-long delivery was being complete would still be considered active, whereas sitting off at base or at a maintenance depot would be considered inactive.

High voltage systems encompass all parts of the vehicles where energy flows to or from the battery. This includes the:

- Battery pack
- Electric drive motor
- Onboard charger
- Cabling
- All onboard converters (AC/DC, DC/AC, DC/DC) connecting elements of vehicle electrical systems.

Range

Data shows the BEVs' ranges meet their duty-cycle needs.

The implied range of the BEVs most commonly fell between 70-100 percent of the manufacturer's stated range of 240 km, as seen in **Figure 1**. The average daily distance driven was 53.2 km with a maximum distance driven of 164 km **(Figure 2)**. Purolator reported BEVs met operational needs, but they continue to adjust routes over time to make the best use of the vehicles and to ensure that they stay within their capabilities.

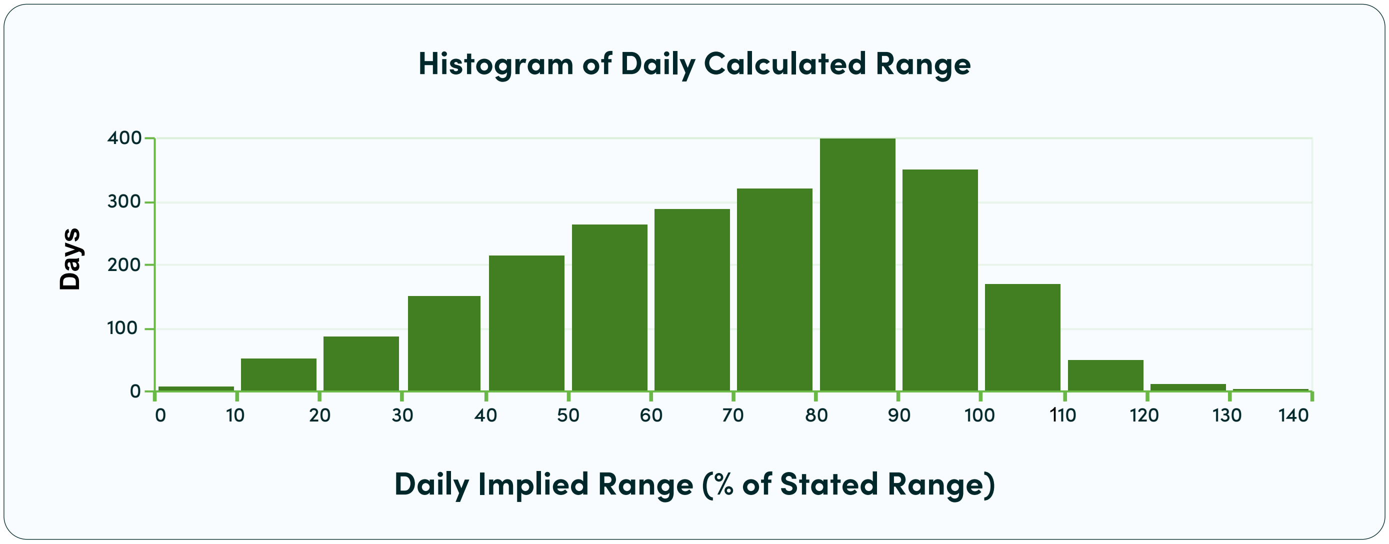


Figure 1 *– Purolator (CVP) – Daily Implied Range as percent of Stated Range*

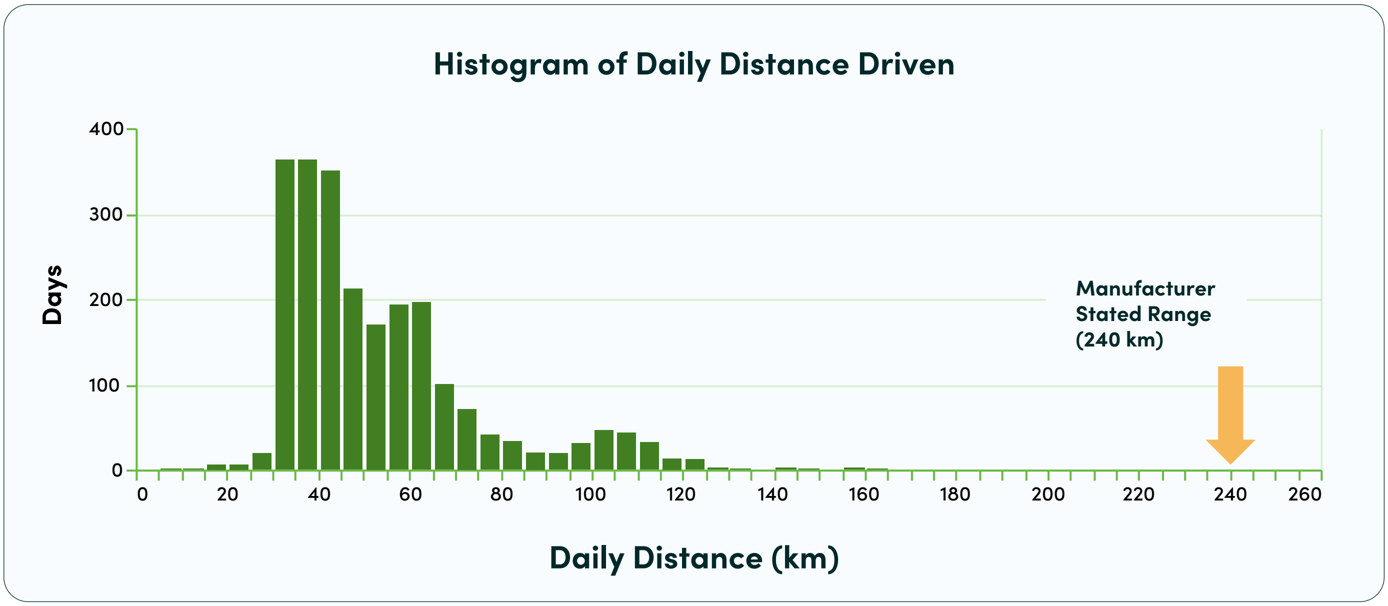


Figure 2 *– Purolator (CVP) – Daily Distance Driven*

Electric vehicle range depends on many operational and environmental factors, including:

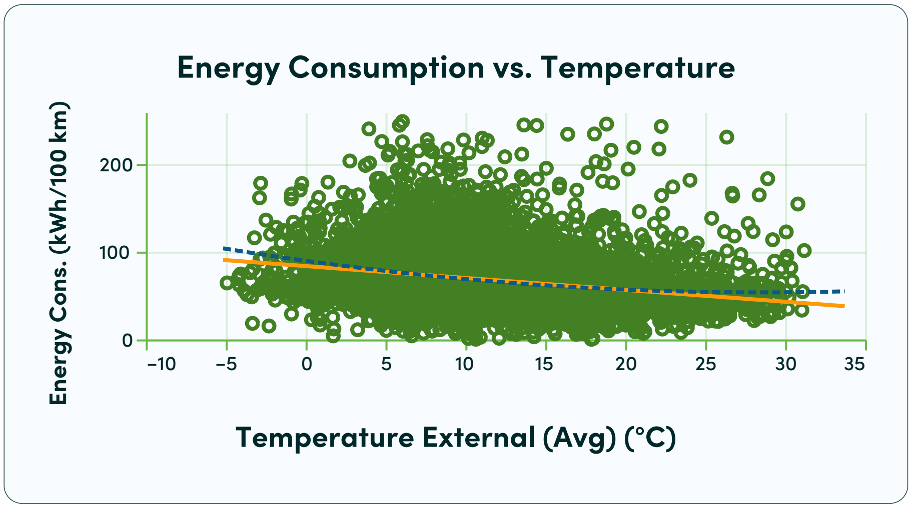
- Payload
- Driving style
- Traffic
- Hills
- Temperature
- Battery capacity

The data captured does not fully isolate all variables impacting range from one another. Conclusions drawn from this report should take this into account.

Temperature impacts

Outside air temperature had a noticeable impact on range.

The BEVs operated in temperatures between -5ºC and +32ºC over the course of the data collection period. On average, the energy consumption of the vehicle was 57.5 kWh/100 km while driving but increased by around 1.37 kWh/100 km for every drop of a degree (Cº) in outside air temperature. This means energy consumption increased by about 2.4 percent per degree as the temperature got colder. This is shown as the solid orange trend line in **Figure 3**. The dotted blue trend line shows that the BEVs were most efficient on average at +25ºC and used slightly more energy as temperatures rose above that.



Temperature Effect on Energy Consumption (linear fit)

-1.37

kWh/100 km°C

Figure 3 – Purolator (CVP) – Energy Consumption vs. Outside Temperature

Why report changes in energy consumption (use) instead of changes in range?

Through feedback, we heard that you are more interested in how temperature effects range rather than how it effects energy use. This is difficult because many factors affect range, including payload, hills, driving styles, traffic, and battery size. A BEV could easily travel further on a colder day due to other operational differences.

Across the 13 vehicles a general trend shows that for every drop in degree of temperature there is a decrease in range of about 3 km, though there is substantial variation in the observed day-to-day implied ranges. The trend varies between 2-6 km per degree for each vehicle, highlighting again the impacts from differences in use-case on range. Colder temperatures generally were associated with larger decreases in range, but an exact temperature where this effect starts could not be reliably calculated as it differed greatly between vehicles.

The intent of this metric is to add more context to the *Range* section so that the temperature's generalized effect on the range of the tracked vehicles can be more broadly understood. We caution against extrapolating this information precisely to other fleets or to future day-to-day operations without an in-depth understanding of all other operational factors.

We can also observe temperature impacts by comparing seasonal differences in energy consumption. Higher energy use in the colder months was very commonly observed. **Figure 4** presents seasonal averages of energy consumption showing a 30 percent increase in the winter compared to the summer.

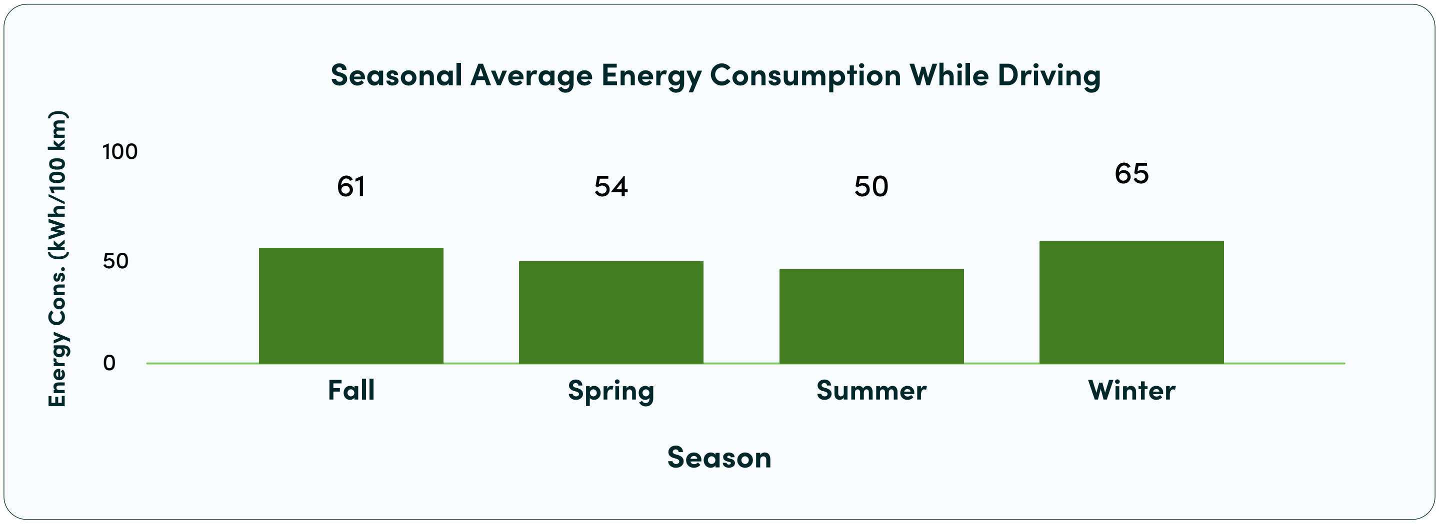


Figure 4 – CVP Program Data Analysis Dashboard – Seasonal Average Energy Consumption While Driving

Reduced range is the most impactful outcome of increased energy consumption. We show month-by-month differences for each vehicle's implied range in **Figure 5**. We show this as the thick blue line aggregating data from all 13 BEVs. Implied range was on average the highest in June at 86 percent of the manufactured stated range and lowest in January at 51 percent. All the BEVs saw their highest implied range between May and September, with the lowest between December and March.

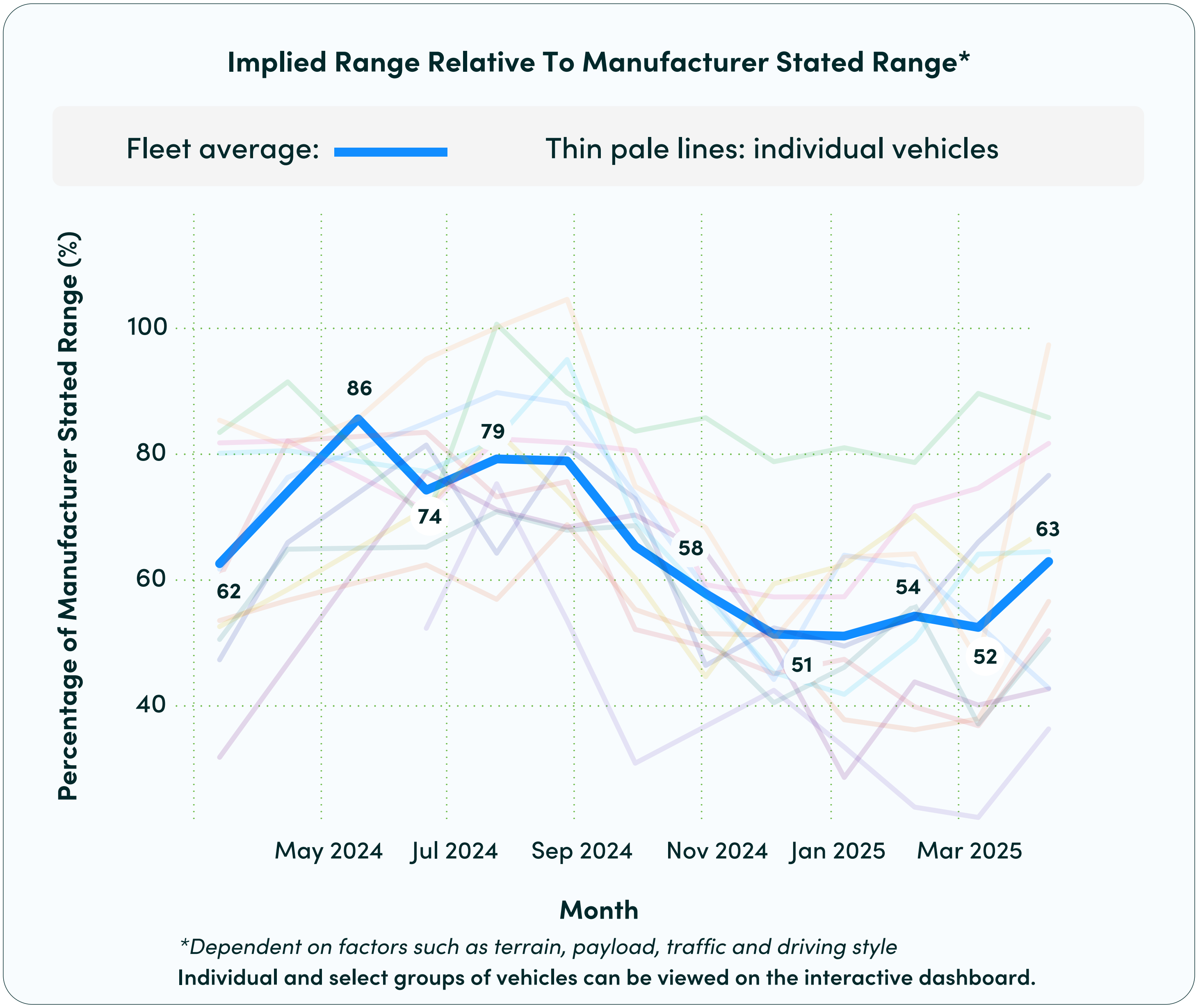


Figure 5 - CVP Program Data Analysis Dashboard - Average Monthly Implied Range

Payload impacts

Payload impacts energy consumption but is compounded by temperature.

Payload data is for the start-of-day only. To provide insight into how payload may impact range, we completed the following analysis by comparing average energy consumption for the service day to the payload value. With the available data, it was not possible to track payload decreases throughout the day as packages are unloaded. Payloads varied greatly between 270 lbs and 2,936 lbs. The most common amounts recorded are between 800 lbs and 2,000 lbs, as seen in **Figure 6**.

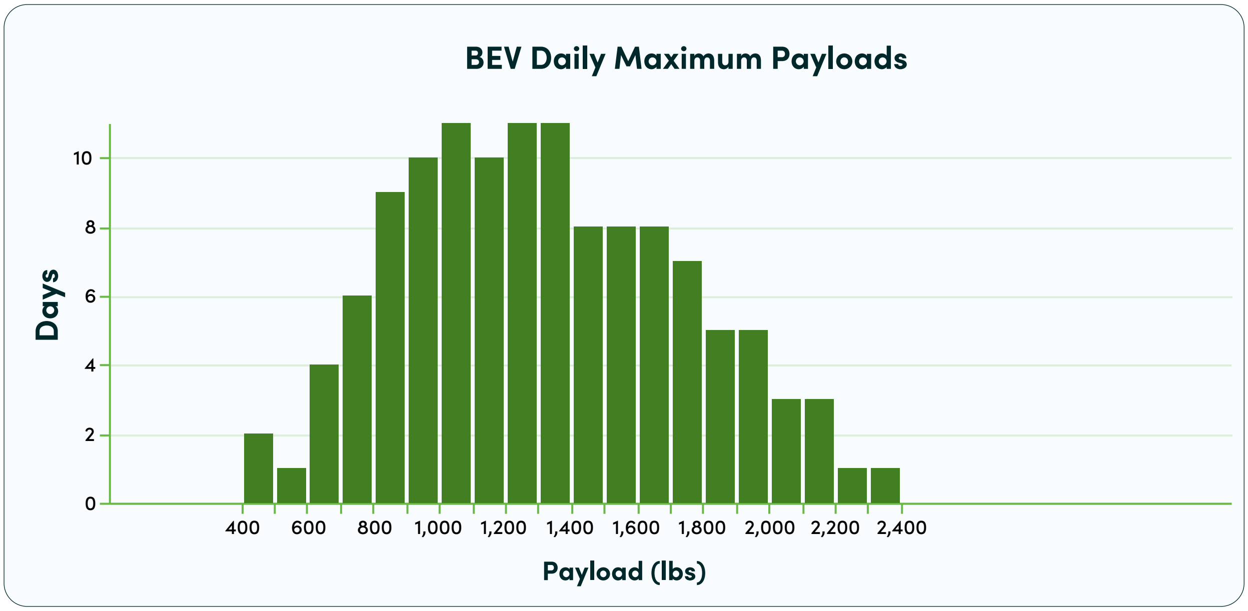


Figure 6 - Purolator (CVP) - BEV Daily Maximum Payloads

A larger payload was associated with higher energy consumption. The exact impact is hard to measure because many things affect it like temperature, hills, traffic, and how people drive. For example, energy consumption increased by roughly 1.6 percent (0.8 kWh/100 km) on average for every additional 100 lbs of payload in the summer compared to roughly 2.5 percent (1.5 kWh/100 km) on average for every additional 100 lbs of payload in the winter. **Figures 7 and 8** show the summer and winter scatterplots for comparison. When the summer and winter are combined, the energy consumption increased by roughly 2.2 percent (1.2 kWh/100 km) on average for every additional 100 lbs of payload. The interactive dashboard can be used to view all seasons.

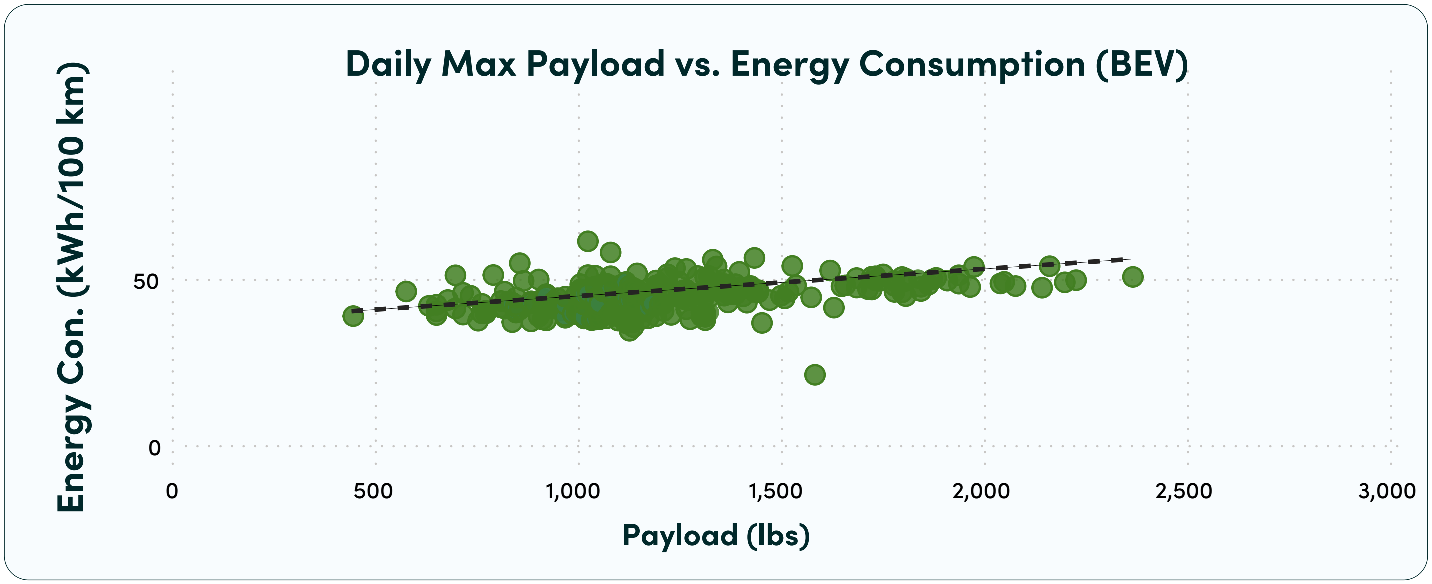


Figure 7 – *Purolator (CVP) – Summertime BEV Payload vs Energy Consumption Scatterplot*

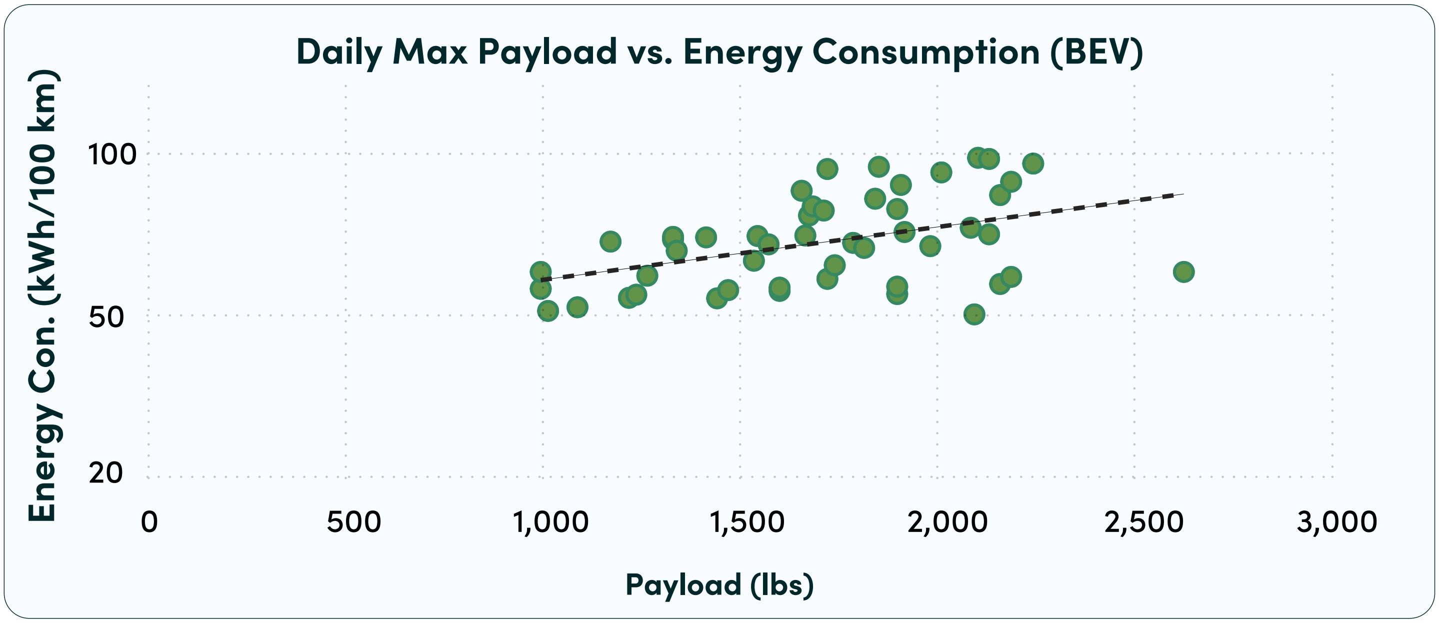


Figure 8 – *Purolator (CVP) – Wintertime BEV Payload vs Energy Consumption Scatterplot*

In the summer, the relationship between payload and energy consumption was consistent across all BEVs with limited exception. We see this by how close the individual points in Figure 7 are to the trend line. In winter, we see a greater amount of variance. The sample size for the winter was small. Due to this, and the previously mentioned untracked factors, we cannot conclude what caused the differences in variance between the summer and winter. The implication is that the colder winter temperatures put more strain on the battery and the impact of payload on energy consumption is amplified. It is possible that energy consumption becomes more sensitive to other influencing factors in the winter compared to the summer as well, like road conditions, driving style, and traffic.

ICE vehicle performance and comparison

The BEVs reduced fuel costs and emissions significantly with similar use cases to the ICE vehicles.

The use of the ICE vehicles was comparable to the BEVs, with the ICE vehicles driving a bit farther each day on average – 65 km compared to 53.2 km. The ICE vehicles did see the longest driving days, traveling up to 219 km, but they were rarely driven beyond 164 km, the maximum daily driven distance seen for the BEVs.

Seasonal fuel consumption patterns were completely different than the BEVs. Fuel consumption stayed more consistent over the year. Although we saw lower (about 10 percent) consumption per 100 km in the cooler fall and winter seasons, as shown in **Figure 9**.[5]

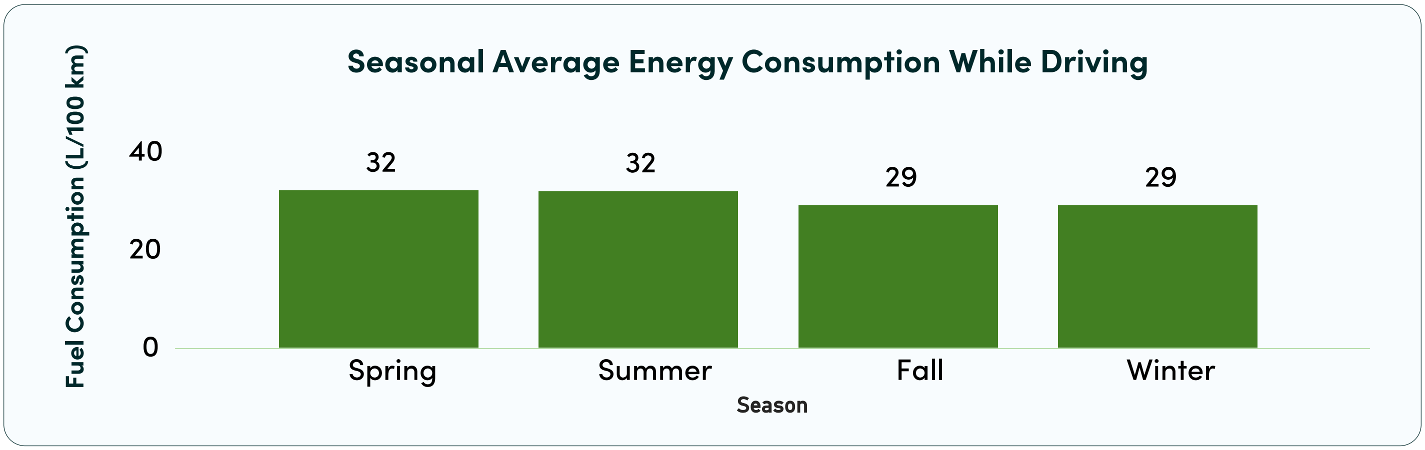


Figure 9 – Purolator (CVP) – Seasonal Average Energy Consumption While Driving

[5] The ambient operating temperature was not captured for the ICE vehicles so more precise fuel consumption data could not be calculated.

The ICE vehicles operated with similar payloads to the BEVs, with a slightly lower average payload of 1,260 lbs compared to 1,339 lbs.

Unlike the BEVs, the energy consumption was higher in the summer compared to the winter, by about 10 percent. For all seasons, there is roughly a 1.4 percent increase (approximately 0.4 l/100 km) in fuel consumption for every 100 lbs of additional payload. Like the BEV data, the payload values taken were only at the start of the service day, and other potential contributing factors to fuel efficiency were not accounted for.

As such, comparison between the BEVs and ICE vehicles are presented as generalizations and may not be applicable under different use cases.

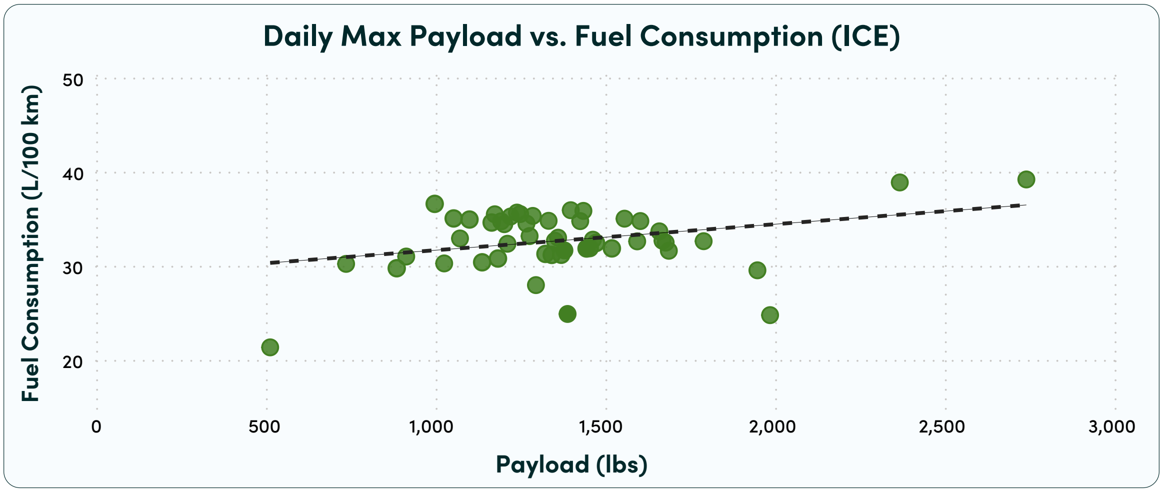


Figure 10 – Purolator (CVP) – Summertime ICE Payload vs Fuel Consumption Scatterplot

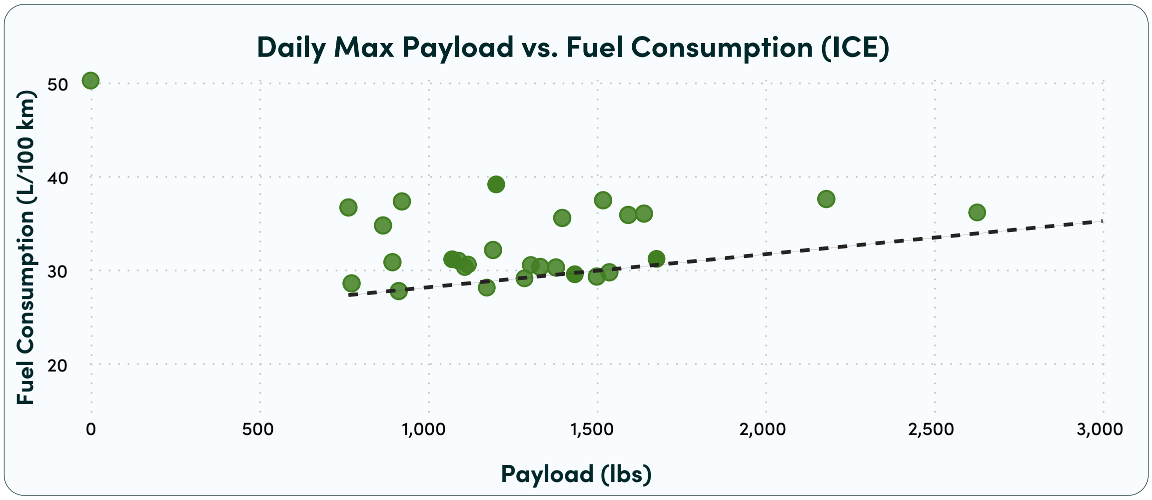


Figure 11 – Purolator (CVP) – Wintertime ICE Payload vs Fuel Consumption Scatterplot

Across the fleet, we calculated annual fuel cost savings of $59,539. This provided an estimated $4,961.58 in fuel cost savings per vehicle compared to an ICE equivalent. Energy costs were $0.09/km for the BEVs compared to $0.56/km for the ICE vehicles. For more information on how energy costs were calculated, please see **Appendix B**.

Operating emissions were nearly 70 times higher for the ICE vehicles than for the BEVs. Details on how the emissions and savings data were calculated in **Figure 12** can be found in Appendix B. The BEVs' CO_2 emissions are calculated from the CO_2 emissions intensity of the BC's grid of 15 g/kWh.

BEV Fleet vs. **ICE Fleet**

	BEV Fleet	ICE Fleet
Number of Vehicles	13	2
Avg. Service Days / Vehicle	186	177
Avg. Daily Distance	53 km	65 km
CO_2 Emissions	10 g/km	697 g/km
Electricity Cost / Fuel Cost	.09 $/km	.56 $/km

***Figure 12** – Purolator (CVP) – BEV Fleet vs. ICE Fleet Comparison*

Charging

Overnight charging was sufficient for meeting operational needs.

The Purolator project used overnight depot charging and did not use public chargers. Midday charging was generally not necessary. As a part of the charging plan developed by Purolator, drivers plugged vehicles in when not in use. This was to ensure the BEVs always had enough energy for a service day. Only two times during the 2,353 tracked service days did the SoC fall below 10 percent. This was partly due to Purolator's policy of not allowing vehicles' battery levels to drop below 10 percent, and partly because the BEVs consumed relatively low levels of energy during daily operations. On average, only 31 kWh of the battery's 158 kWh capacity needed to be charged each day, as shown in **Figure 13**.

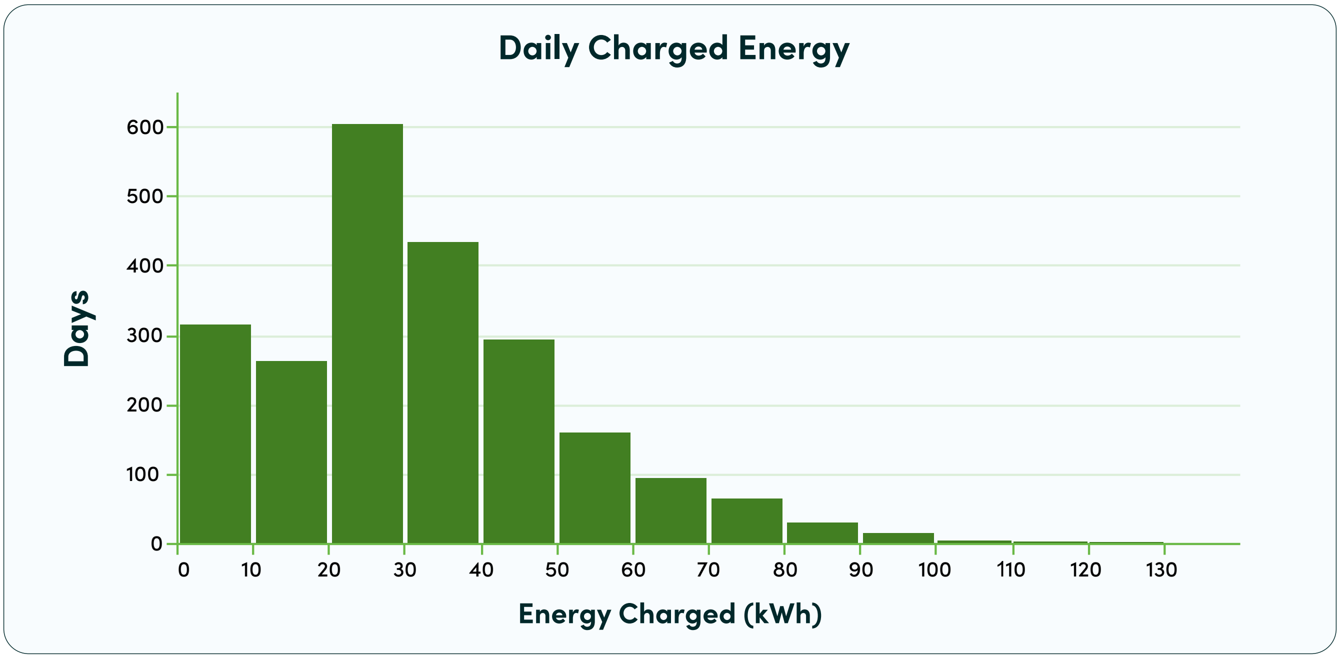


Figure 13 - Purolator (CVP) – Daily Energy Charged

This translated to an average start-of-day SoC of 94 percent and an average end-of-day SoC of 71 percent. A full breakdown of all maximum and minimum SoCs for each day can be seen in Figure 14 and 15. Charging was often stopped before reaching 100 percent charge to leave enough battery capacity for regenerative braking. Regenerative braking is the process where batteries capture some of the kinetic energy from a slowing down vehicle. On average, it provided 11.7 kWh/100 km across all BEVs, or around 1/6th of the BEV's energy consumption.

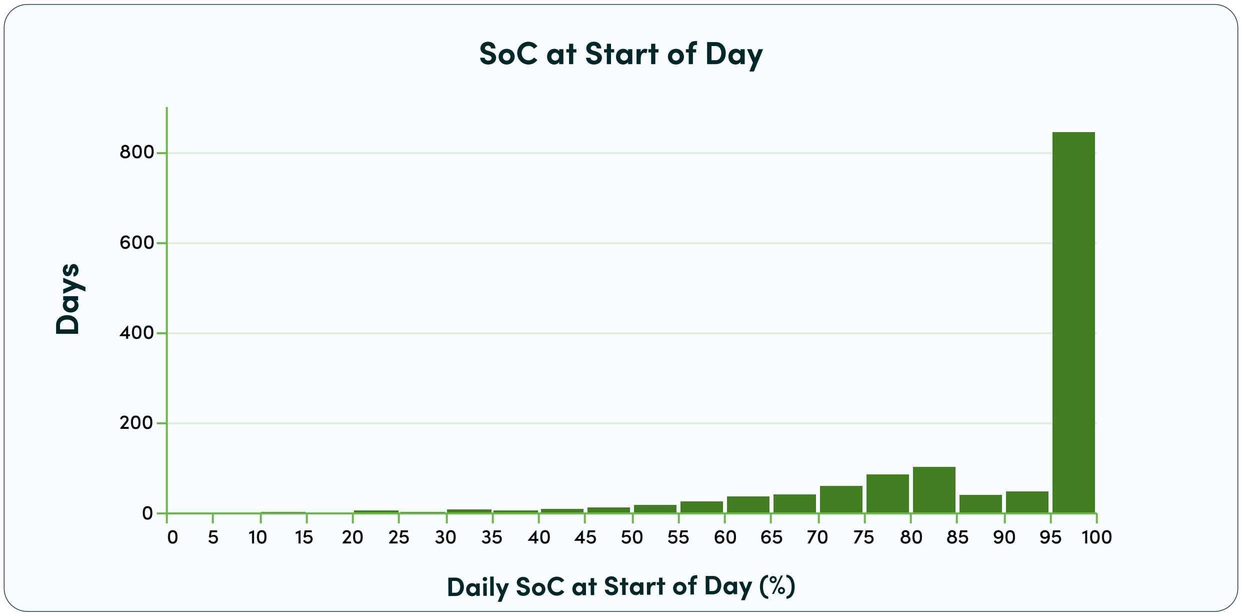


Figure 14 – Purolator (CVP) – Daily SoC at Start of Day

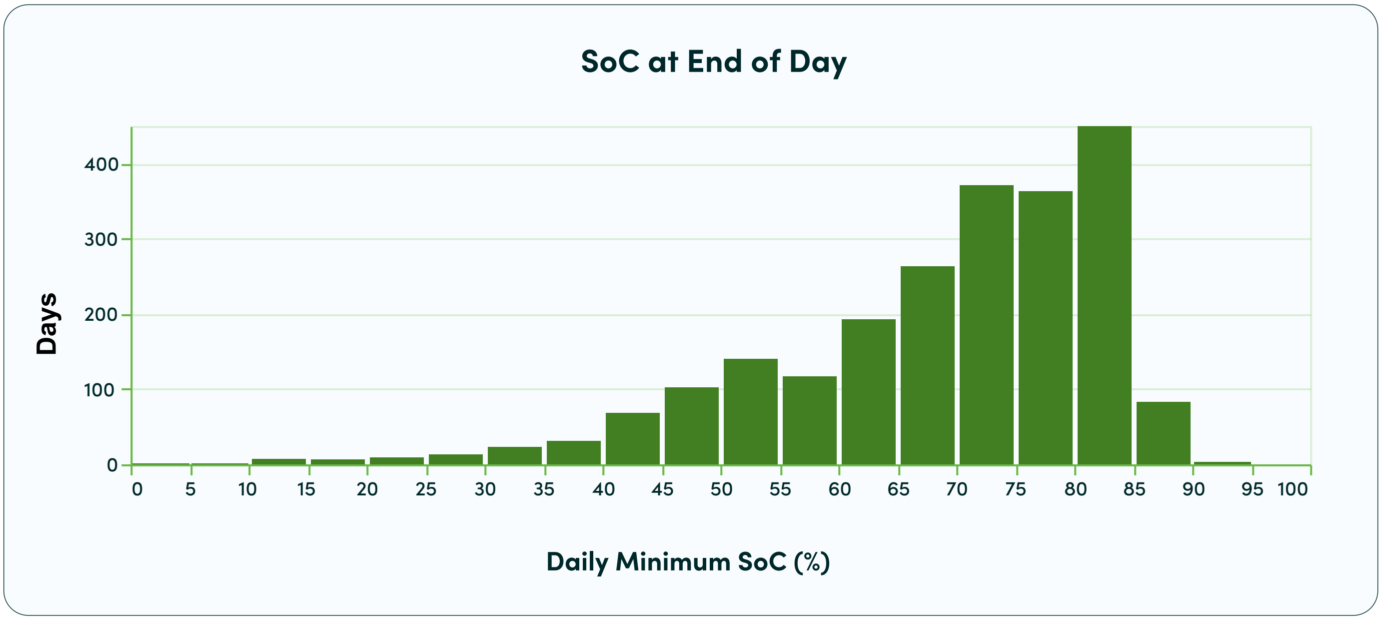


Figure 15 – Purolator (CVP) – Daily SoC at End of Day

Challenges with charging

The most common problem faced was with the connector ports on the vehicles. These often wore down over time with repeated use and needed regular replacement. Original equipment manufacturers (OEMs) and industry groups had already identified this before the project began, so Purolator was aware of it in advance.

To reduce the risk of issues with new equipment, Purolator chose to invest in chargers and BEVs from multiple OEMs across their fleet. This approach also provided contingency if an OEM exited the market. Purolator noted that building and maintaining close relationships with OEMs was vital for identifying and resolving software issues and part malfunctions.

Operations

Driving is the main source of energy use across all 13 BEVs.

Frequent stops for package delivery meant vehicles spent about 30 percent of the day idling compared to just 13 percent spent driving **(Figure 16)**. As the electric motor does not need to run while idling, only 9 percent of the battery's energy was needed to power supplementary vehicle systems like heating and cooling **(Figure 17)**.

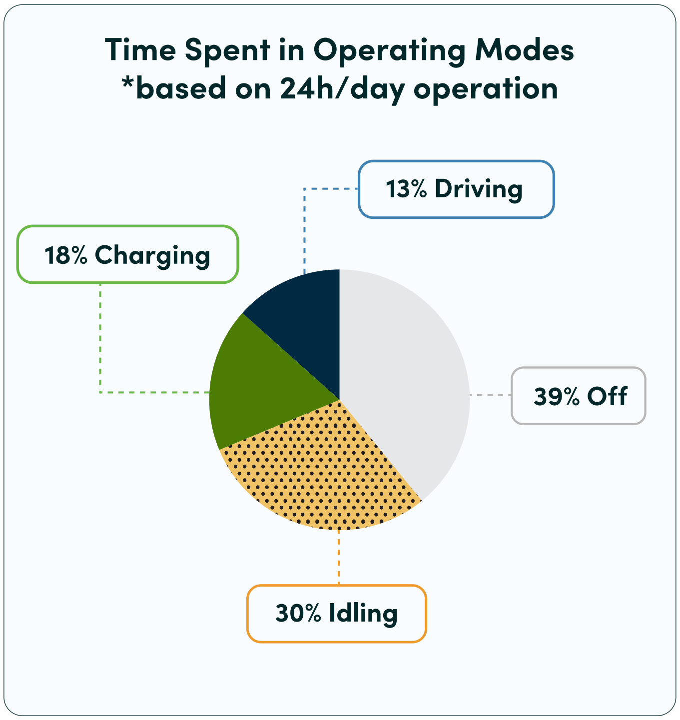


Figure 16 – *Purolator (CVP) Dashboard – Time Spent in Operating Modes*

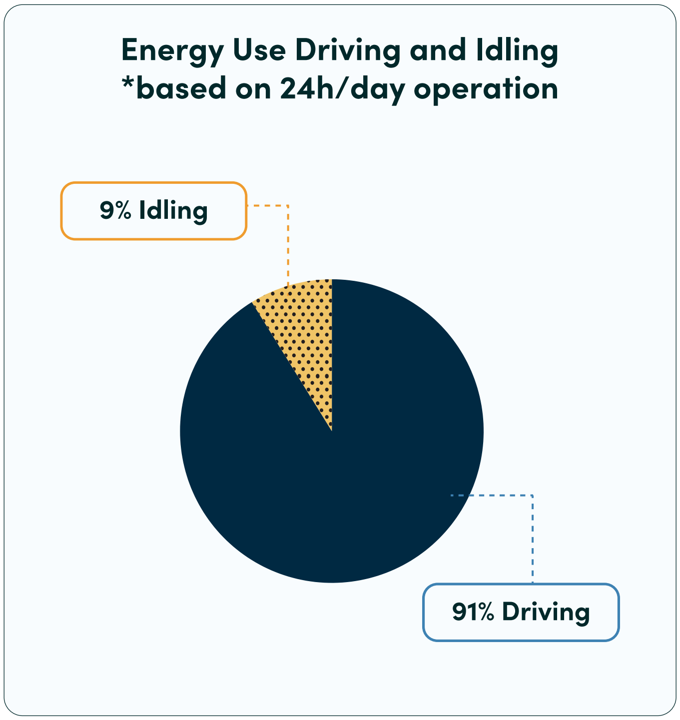


Figure 17 – *Purolator (CVP) – Energy Used for Driving and Idling*

Figure 18 shows a representative sample of a week's work. Each colour shows what a BEV was doing at the time of day listed along the x axis:

- **Yellow for idling**
- **Blue for driving**
- **Green for charging.**

We see frequent stops with short driving sessions, often with a longer driving session to and from base at the start and end of the day. Charging was only done overnight.

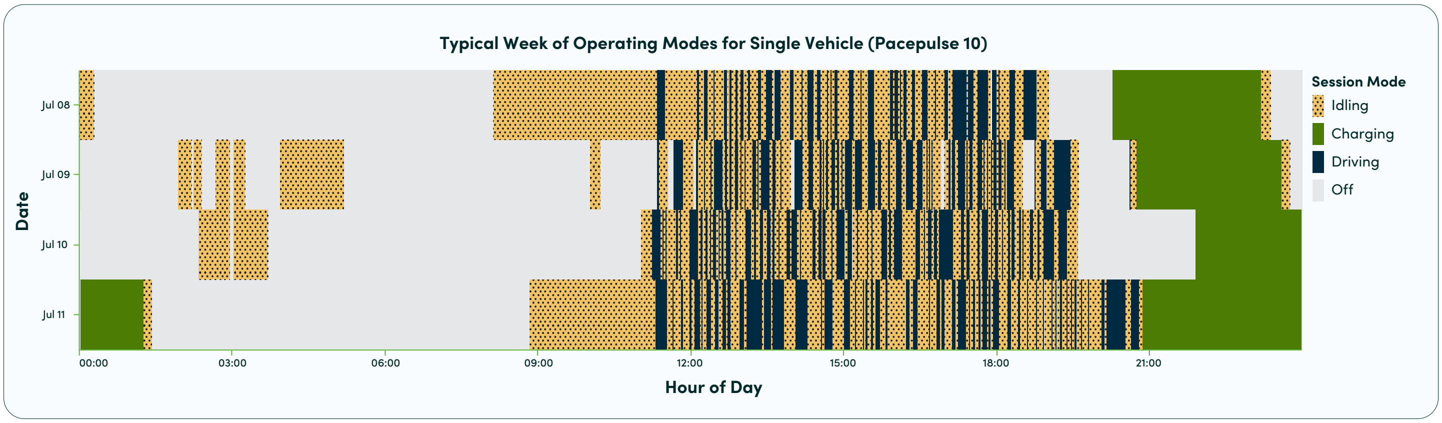


Figure 18 – CVP: Purolator (CVP) – Typical Weekly Operating Patterns

The BEVs experienced challenges that resulted in extended periods of vehicle downtime. In summer 2024, a software recall impacted the electric fleet for approximately 4 weeks. Additionally, the brakes are prone to becoming overworn, requiring replacement parts to be ordered. Any high voltage systems issues need the BEVs to be sent to the dealer for troubleshooting and repairs.

Part C: Lessons Learned and Conclusions

PROJECT IMPACTS	**Purolator remains committed and optimistic in decarbonizing their operations:** Purolator reported that the BEVs were able to fulfill duty-cycle requirements with continued route planning and review. More deployments of ZEVs are continuing across Canada. Organizational commitments to reducing GHG emissions and meeting customer sustainability expectations were cited as reasons for their continued interest in ZEVs.
FUEL COST AND CO_2 SAVINGS	**Energy costs for the BEVs were over 6x cheaper than the equivalent ICE vehicles:** Electricity costs for the 13 BEVs were calculated to be $0.09/km compared to $0.56/km for the ICE vehicles. Total fuel cost savings for the year were estimated to be $59,539 across the 13 BEVs. Operating emissions were nearly 70 times higher for the ICE vehicles than the BEVs.
DRIVER PREFERENCES	**Drivers appreciate benefits provided by the BEVs:** Improved air quality at base, quiet operations, pride in contributing to sustainability efforts, and the enjoyment of 'one pedal' driving were given as reasons drivers preferred the BEVs. Range anxiety and fears of tackling hilly terrain are present but have improved with experience and time. The BEVs also had additional features compared to the ICE vehicles, like air conditioning, which drivers appreciate.
DRIVER TRAINING	**Training is provided to all drivers at facilities that receive ZEVs:** Drivers receive roughly 2 hours of training each to ensure a smooth operating transition. This includes charging policies to ensure vehicles are plugged in properly each night.

IMPLIED RANGE VS STATED RANGE

Real world range can be less than what is listed by the manufacturer: The Motiv Epic 4s' have a manufacturer stated range of 240 km. During the data collection period the BEVs daily implied range was commonly calculated to be between 70-100 percent of the stated range but with large variations. The practical range may be less than the implied range as Purolator aimed for the batteries in the BEVs to hold between 10-95 percent charge to ensure room for regenerative braking and to ensure the BEVs were not stranded away from base.

LOW TEMPERATURES IMPACT RANGE

Cold weather can have a significant impact on range: Implied range peaked at 86 percent of the manufacturer stated range in June of 2024 and fell to a low of 51 percent in January of 2025. Large variations in implied range and energy consumption were observed between vehicles. On average though, seasonal trends were consistent with expected temperatures, with winter seeing the highest average energy consumption, followed by fall, then spring and then summer. The opposite trend was seen in the ICE vehicles, with temperature effects on fuel consumption being more muted overall.

PAYLOAD IMPACTS ON RANGE

Payload increases can reduce range: Larger start-of-day payload amounts were associated with higher energy and fuel consumption for both the BEVs and ICE vehicles. Colder temperatures appear to strain the BEVs far more, however, with payload impacts observed to be larger in the winter than in the summer.

MAINTENANCE AND UPTIME ISSUES	**Uptime issues are being addressed but are the largest issue faced:** The BEVs have been down for a variety of reasons. Some of these have been addressed like overwear on the brake systems and a software update that was performed in July of 2024. Others are ongoing like the depletion of the 12V battery, the charger connector port being worn down, and issues with the electrical sensors and shifters. Downtime can be extended as high voltage troubleshooting and repairs require sending the vehicles to the dealer.
EQUIPMENT AND SERVICE PROVIDER RELATIONSHIPS	**Purolator recommends maintaining relationships with a variety of OEMs:** Due to the novelty of the technology being employed Purolator recommends building and maintaining close relationships with OEMs to help alleviate any issues faced as quickly as possible. The market remains volatile with manufacturers entering and leaving regularly. As such, Purolator has stated that diversifying their suppliers helps shield them from the risk of having an unsupported fleet while allowing them to test innovative and new options.
ELECTRICAL AND CHARGING PLANNING FOR SAFE ZEV FLEET DEPLOYMENTS	**Planning is important to ensure charging reliability:** Purolator developed a charging plan to ensure that the BEVs are operational each day. This includes ensuring there is sufficient power available to meet their needs and that the BEVs are plugged in correctly and at appropriate times. New safety and fire policies also needed to be developed. This process can take longer than expected as there are few industry examples or standards to pull from.

Appendix A: The Commercial VEHICLE PILOTS PROGRAM

The **CleanBC Go Electric Commercial Vehicle Pilots (CVP) Program**, launched in 2021, intends to encourage and accelerate the adoption of commercial on- and off-road ZEVs. It is for BC-based businesses, non-profits, local governments, Indigenous communities, and eligible public entities looking to deploy ZEV technology in commercial applications along with supporting infrastructure. The CVP Program is one of a suite of programs offered under the Province's CleanBC Go Electric Program, designed to reduce barriers to the adoption of ZEVs to realize both their environmental and economic benefits.

The focus on in-depth data collection, commitment to reporting, and inclusion of off-road marine, rail, and aviation ZEVs makes the CVP Program unique amongst similar programs in North America. BC's place as a world leader in the transition to ZEV technology has been reinforced by the innovative projects supported by the CVP Program.

As of December of 2025, the CVP Program has committed $53 million to 24 projects with a total estimated value of $197 million. These projects include the first ever commercial electric aircraft in Canada, the second electric tugboat in Canada, a hybrid locomotive, and Island-Class electric ferries. A full list of supported projects can be found here: https://cvpbc.ca/funded-projects/

Appendix B: Details on Metrics Calculations

Emissions and Cost Savings

AVOIDED CO_2

Calculated by using hypothetical emissions from a Class 4 internal combustion engine (ICE) fleet covering the equivalent distance subtracted by the grid emissions from electricity used in charging the electric fleet. The following values were used in the calculation:

CO_2 intensity of burning gasoline in I.C.E.: 2.3 kg/liter.
Source: https://natural-resources.canada.ca/sites/www.nrcan.gc.ca/files/oee/pdf/transportation/fuel-efficient-technologies/autosmart_factsheet_6_e.pdf

CO_2 intensity of grid electricity in B.C.: 15 g/kWh.
Source: https://www.canada.ca/en/environment-climate-change/services/climate-change/pricing-pollution-how-it-will-work/output-based-pricing-system/federal-greenhouse-gas-offset-system/emission-factors-reference-values.html

FUEL COST SAVINGS

Calculated by subtracting the cost of electricity used for charging the fleet from the estimated fuel cost for the Class 4 ICE driven fleet in the project covering the equivalent distance. The following values were used in the calculation:

Average fuel cost in the area where the fleet was operated for 2024: C$1.85/liter.
Source: https://www2.nrcan-rncan.gc.ca/eneene/sources/pripri

Average fuel efficiency of Class 4 vans: 30 litres/100 km.
Source: Real fleet telematics data from the CVP Program Purolator Project

Operation and Performance

DAYS DRIVEN

Includes days where more than 5 km were driven (indication of service day)

IMPLIED RANGE

Calculated by dividing the distance driven by the % drop in state of charge (SoC) and multiplying by 100.

SESSION

Session is used to describe uninterrupted charging, driving, idling, and data collection intervals.

Charging and Energy

ENERGY CONSUMPTION WHILE DRIVING + IDLING

Calculated based on the net energy discharged (accounts for regenerative braking) from the battery during driving and idling sessions, divided by the total distance driven.

ENERGY CONSUMPTION WHILE DRIVING

Calculated based on the net energy discharged (accounts for regenerative braking) from the battery during driving (includes stops up to two minutes), divided by the total distance driven.

OVERALL ENERGY CONSUMPTION

Calculated based on energy charged to the battery divided by the total distance driven.

Appendix C: Qualitative Data and Survey Results

After preliminary analysis of the acquired qualitative data and surveys from the CVP Program's Purolator Project, the qualitative data analysis results are classified as follows:

1. **Technical** results (results related to EV technology)
2. **Project/Fleet Management and Communication** results
3. **Human Factors** related results (results related to how people interact with EV technology)
4. **Other** results

The qualitative data and survey analysis results are presented in Tables 3-6 below.

Table 3 *- Technical Results from Qualitative Data Analysis*

Technical Results - Categories	Survey results, lessons learned, and recommendations from CVP Program Purolator Project
Safety	▪ Constant education for the teams.
Grid, Charging, Charger	▪ EVs mostly fit on the routes the company has. ▪ Proponent: "We typically charge at terminals." ▪ Proponent: "Realistic battery capacity is between 10% to 90-95%. If the SoC is below 10% we don't use the vehicle. Max. SoC should be lower than 90-95% to be able to handle regenerative braking." ▪ Proponent: "We say to the drivers: if you don't drive the vehicles, if you are not using them, please charge the vehicles." ▪ Charge planning – ensuring vehicles are charged prior to leaving for their routes. Building charging plans requires additional review as the proponent continues to review their overall electric vehicle rollout and overall strategy.

***Continuation of Table 3** – Technical Results from Qualitative Data Analysis*

Breakdowns, Maintenance, Warranty	Reported issues: ■ vehicle not charging, 12V battery drained, 12V battery replaced (the 12V battery drains when system power depletes) ■ vehicle does not start, engine coolant error code, Motiv repaired ■ vehicle does not move, motor temp issue, motor replaced ■ charger port damaged (the charger connector port has been found to be a high wear area and requires ongoing replacement. This is consistent with what the proponent has learned from other OEMs and industry groups.) ■ electrical sensor issues ■ electrical shifter issues ■ issues related to brake system overwear (This has been remedied by installing new replacement parts and has been resolved) ■ Purolator experienced a fleet-wide software recall which impacted the entire Motiv fleet for approximately 4 weeks. All vehicles are back on routes as of July 2024, and are not facing additional issues related to the software recall. ■ No training yet for in-house mechanics for high voltage troubleshooting & repairs. All repairs are required to be sent to the dealer. This adds additional time to repairs.
Telematics	Challenges have occurred with telematics equipment as Purolator had to confirm how this equipment can be installed into the Motiv vehicles.
Climatic conditions	Proponent: "We did our own cold weather testing, for checking if the fleet would work in Edmonton. We did also summer testing."

***Table 4** – Project Management and Communication Results from Qualitative Data Analysis*

Project Management and Communication Results - Categories	Survey results, lessons learned, and recommendations from CVP Program Purolator Project
Communication with Partners and Interested Parties	Purolator appreciated the ease of reporting, and the good relationship built with the Province CVP team, which facilitated their project management. Purolator stressed the importance of maintaining strong relationships with OEMs to ensure support and stability in their EV deployment efforts. Proponent: A key component of our electric vehicle rollout has been working directly with EV vendors and suppliers to provide feedback and opportunities for improvement based on our use cases. Proponent: "The biggest barriers are the terminal upgrades, permits, and OEM supply chain. Other barriers: High Capital Costs, lack of infrastructure, reliability and durability of ZEV technology, familiarity with the technology; finding a vehicle make or model that met our needs." Uncertainties: Government changes; Provincial government change, Federal government change and US government change. Proponent reported a short power loss due to BC Hydro maintenance. If this occurs over an extended period, this equates with "no charging".
Battery degradation	Within the CVP Program, battery degradation is not expected, or will be negligible, since the program incorporates tracking of only one full year of operation of the MHD ZEVs involved. Battery degradation seems to be a technical problem, but it is also a fleet management issue and a criteria for purchasing decisions (TCO calculations).

Continuation of Table 4 *- Project Management and Communication Results from Qualitative Data Analysis*

Fleet integration	**In general, the Purolator project team reported that the MHD ZEVs were able to fulfill the typical duty cycles of their fleet without issues. The battery capacities selected in this project were generous enough to complete the daily workload.** **The cargo capacity of the Motiv Step Vans as well as the overall payload of the vehicles has been positive for the Purolator business case.** Chargers being included in the CVP program as well as vehicles were additional drivers (positive contributions to the project). Proponent: “We look for possibilities, for different partnerships, for rental partnerships of parking lots with chargers.” There have been some issues related to reliability (vehicles don’t start, 12V battery being drained, motor temperature faults, issues pertaining to hill climb / rollback, etc.), as well as initial ground clearance issues. Purolator has also noticed some vehicles have issues related to a lack of torque due to programming inconsistencies / issues, and there have been harness issues with some vehicles. Regarding the early months of the project: Vehicle uptime remains the most pressing challenge, with opportunity to improve. Vehicles show intermittent performance issues, related to electronics (electrical powertrain, software).
Cost Tracking	See Appendix E.
Role of Data Dashboards	The Province’s Engineering and Data Science teams created a comprehensive **data analysis and visualization dashboard** to analyze and present program participant data. The results are provided in the previous section of this report. Proponent: “Data is very important in this particular realm.”
Company Culture	This CVP Program supported project is one of the company’s biggest pilot projects. It goes through many levels of leadership and approvals. Most people at Purolator know and understand what CVP is (especially staff in the organization’s leadership). The proponent visits expos and exhibitions, keep innovation as a regular agenda.

Table 5 - Human Factors related Results from Qualitative Data Analysis

Human Factors Related Results - Categories	Survey results, lessons learned, and recommendations from CVP Program Purolator Project
Training needs	Operator training requires additional time (~ 2hrs / driver) Training is provided for drivers at all facilities which are scheduled to receive electric vehicles, to ensure a smooth transition once vehicles and infrastructure arrive.
Feelings (Joy, Frustration, Anxiety) related with vehicle attributes (performance, comfort, reliability, etc.)	The vehicles were well received, the couriers loved it. With better vehicles the proponent got better engagement. Good feedback from the couriers in general. Staff have been excited about greater air quality within the terminal due to a lack of exhaust fumes. Overall, drivers have reported having positive experiences. The most common concern tends to be related to battery range. As drivers become more familiar with these vehicles, range anxiety is improving, and drivers are feeling more comfortable and confident in the vehicles. Some drivers reported concerns related to hills, as they think that these vehicles are less responsive than their ICE counterparts, although this has improved with time and experience.
Image	Proponent: "Customers have been vocal in their support for our electric vehicle program. We have consistently seen customer feedback indicate that they prefer electric or alternative fuel (e.g., renewable diesel) vehicles for their shipments."

Please refer to the **Appendix D** for quotes and anecdotes from Purolator fleet.

Appendix D: Quotes and Anecdotes from Purolator Project

This appendix of the project report is intended to summarize distinct quotes and anecdotes from the project.

Excerpts from Purolator Project Exit Surveys

“Through CVP program, our team was able to more effectively trial and deploy 13 Motiv step vans. This case study has empowered us to focus our future deployments on specific vehicles (make/models) and charging infrastructure based on the lessons learned with these units.”

“The CVP program has played a significant role in our ability to deploy vehicles at scale. Purolator's STBI target of 42% reduction in Scope 1 and 2 emissions (2020 baseline) and 60% electrification of last-mile delivery routes requires that we deploy a significant number of electric vehicles, e-bikes, and LSVs between now - 2030. Programs such as CVP are highly beneficial for us, and we are extremely grateful for the support provided by the Province. We hope to see additional funding programs similar to the CVP program be deployed in the future, as vehicles and charging infrastructure continue to be the most significant costs associated with our emissions reduction targets.”

Team Member Anecdotes from the Purolator project

Anecdote 1:
“Transitioning to electric vehicles has meaningfully reduced our fuel costs while improving air quality within our facilities, creating a healthier and more comfortable work environment for our employees. This shift supports both our operational goals and our commitment to the well-being of our team and the environment.”

Anecdote 2:
“There is no way I’m going back to my old, non-electric, truck.”

Anecdote 3:
“Many people will stop me and comment on how good it is to see Purolator focused on the environment. It gives me a real sense of pride.”

Anecdote 4:
“My ‘office’ is so quiet now – I used to go home and speak loudly because the truck was so loud.”

Anecdote 5:
“I love one pedal (driving) and regenerative braking!”

Appendix E: Costs (Proponent Submitted)

Energy Costs (per vehicle per year):

C$1,407.31

Insurance (per vehicle per year):

C$2575.00

Repair Costs:

C$18,535.60 (including all x13 vehicles funded under the CVP program. Note that this cost was covered under vehicle warranties.)

Towing Costs:

C$800 across two events.

Appendix F: Charging Specifications (Proponent Submitted)

The following relate to all x13 Level 2 Chargers covered under the scope of the CVP program:

Length of fueling/charging sessions:

Max 6-8hrs

Energy dispensed:

Typ. 40-50 kWh / day

Rate of charging/fueling:

15.6 kW (75A@208V)

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