CVP 1: 7GEN-GOBOLT

COMMERCIAL VEHICLE PILOTS PROGRAM

CLASS 6 DELIVERY TRUCK PROJECT

FINAL REPORT

British Columbia | cleanBC GO ELECTRIC

Transport Canada / Transports Canada

Executive Summary

Lion 6 Electric Class 6 Truck Cab and Chassis in North Vancouver

Project Overview

The 7Gen–GoBolt project was the first initiative funded under the CleanBC Go Electric Commercial Vehicle Pilots (CVP) Program to complete a full year of telematics data collection, surveys, and interviews.

The project deployed four 2021 Lion6 Class 6 battery-electric trucks (BETs) delivering furniture in British Columbia's Lower Mainland between November 2023 and November 2024. Each truck featured a 252-kWh battery, a manufacturer-rated range of 350 km, and a weight rating of 26,000 lbs. CVP Program funding supported charging infrastructure only, totaling $160,940 for six 100 kW+ chargers.

Key Findings

RANGE

The daily implied range[1] for this project was most commonly found to be between 40–70% of the Original Equipment Manufacturer (OEM) stated range of 350 km. Implied ranges significantly impacted by the duty-cycle[2] of the end-user.

Colder temperatures reduced range and increased energy consumption. On average, energy consumption increased by 1.28 kWh/100 km per °C drop. Temperature effects increased once temperatures dropped below 2-3°C.

Real world range and energy consumption is impacted by temperature, wind, topography, driver behaviour, payload, and average speeds.

[1] 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. See page 11 for more details.

[2] 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. See page 11 for more details.

CHARGING

The battery in the BETs had sufficient capacity to complete a day's work. On average, the BETs started service days at 95% state-of-charge (SoC) and ended at 48% SoC; SoC fell below 10% on only 0.6% of service days. Midday charging, when utilized, was usually out of convenience, not necessity.

Overnight charging was generally sufficient for the fleet's operational needs. Total charging time in a 24-hour period, averaged 3.1 hours.

Early reliability issues decreased with time and experience. Driver training, internal policy updates, and collaboration with equipment and service providers were provided as ways to address charging issues.

The charging was prone to failing but happened less often as the reasons for failure were better understood. These were often the result of 'handshake errors' between the charger and vehicle caused by operator error or software updates being needed or initiated during charging.

On route charging was generally unfeasible. Public fast chargers are often not accessible for class 6 trucks. Most public fast chargers are intended for light duty-vehicle use and may have vertical and horizontal size restrictions.

Two DC fast chargers

OPERATING PATTERNS AND FLEET INTEGRATION

Idling accounted for only 9% of energy use. This was despite the BETs spending 36% of daily service time (7 AM – 7 PM) idling.

Vehicles operated 7 days/week. Peak activity was between 10 AM and 2 PM.

Limited parts and technician availability led to extended downtime on several occasions.

Volatility of the OEM market proved a risk for 7Gen-GoBolt when making longer term integration plans. Lion Electric, the OEM of the vehicles tracked for this report, is no longer active in the market.

The project delivered an estimated $34,481 in fuel cost savings and displaced 51,289 kg of CO_2 across four vehicles during its duration.

Drivers strongly favored BETs over their internal combustion engine (ICE) counterparts. They cited greater comfort, quieter operations, and reduced fatigue at the end of the workday.

Proper training of vehicle operators can help lessen range anxiety and ensure effective overnight charging routines.

Early and continuous engagement with manufacturers and service providers was repeatedly emphasized by 7Gen/GoBolt. It was deemed essential for mitigating growing pains from BET fleet integration.

Investing in BET maintenance capabilities, keeping spare parts on hand, and engaging utility providers early in the procurement process can minimize delays and vehicle downtime.

Part A: Introduction

Transportation sector emissions in 2022 were up 18% from 2007 and continued to account for the largest share (42%) of British Columbia's (BC) greenhouse gas (GHG) emissions. Commercial on-road transport (primarily heavy-duty vehicles) made the largest contribution with a 21% 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 a lack of reliable real-world data relevant to the BC context for organizations to consult when considering zero emission vehicles (ZEVs) for their commercial operations.

The Province aims to fill this gap with a series of outcome packages produced from data collected on CleanBC Go Electric Commercial Vehicle Pilots (CVP) Program funded vehicles. All projects supported through the CVP Program are required to collect one year of telematics data, alongside the completion of quarterly and final surveys, and an exit interview. More information on the CVP Program can be found in **Appendix A**. The non-evaluative, data-driven approach of this report is 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. By providing tools for insight rather than prescribing outcomes, this report aims 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. This report is intended to encourage the reader 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. Range, reliability, payload, and costs/savings information have frequently been given as the most important metrics to include for those considering the purchase of a ZEV. Range and reliability have been given significant attention in this report, and the Province is working to improve payload information for reports on future projects.

Fuel costs savings have been clearly identified but estimates related to total cost of ownership (TCO) have not been included. While this was a frequently requested metric, the Province feels 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 specific project, followed by a discussion of quantitative and qualitative findings.

For further insights and investigations into the data collected, please refer to the accompanying interactive **dashboard.**

7Gen–GoBolt Project

The 7Gen–GoBolt project is the first project in the CVP Program to complete its data collection requirements. This includes one year of vehicle telematics data collection and completion of quarterly and final surveys for qualitative data collection. The data collection period was November 2023 – November 2024.

The 7Gen–GoBolt fleet consists of **four 2021 "Lion 6" Class 6 battery-electric trucks (BET)** manufactured by Lion Electric. All trucks were operating in the Lower Mainland of BC, delivering furniture. The trucks have a battery capacity of 252 kWh, a factory rated range of 350 kilometres (km), and a weight rating of 26,000 lbs. The project and vehicle specifications are presented in **Table 1**.

Fleet Name (and size)	7Gen-GoBolt (4 Vehicles)
CVP Program Funding Call	1
Project Type (Procurement, Retrofit, New Design)	Procurement
Make/Model/Year	Lion Electric* / Lion 6 / 2021
Vehicle Class	6
Use Case	Furniture Delivery
Powertrain	Battery-Electric
Vehicle Range	350 km
Battery Capacity	252 kWh
Weight Rating	11,793 kg (26000 lbs)
Chargers / Hydrogen Filling Stations (if funded)	6 chargers (100 kW and above)
Project Start	November 2023
Project End	November 2024
Location	BC Mainland/ Southwest
CVP Program Approved Funding	Chargers only, C$160,940

Table 1 *– Project and Vehicle Specifications*
** At the time of this report, the vehicle manufacturer is not active in the market.*

This project does not include telematics data from equivalent vehicles with an internal combustion engine (ICE) propulsion system in the project partner's fleet. This means that insights derived from this work are done by evaluating the performance of the BETs in response to their own duty-cycles, without an explicit comparison as to how ICE vehicles are used in the fleet. The comparison of fuel savings and avoided GHG emissions are determined by using hypothetical Class 6 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.

Partners

Transport Canada Transports Canada

7GEN

GoBolt

TECIUM

MNP

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 battery state-of-charge (SoC) at the end of day, and others.

	Metric	Unit	Value
Emissions and Cost Savings	Avoided CO_2 (operational)	kg	51,289
	Average CO_2 emissions per km	g/km	11
	Fuel Cost Savings	C$	34,481
Operation and Performance	Average Daily Distance	km	95.3
	Distance Driven	km	79,417
	Days Driven	days	833
	Max. Daily Distance	km	182.1
	Average Daily Implied Range	km	197.6
	Average Speed	km/h	24.4
	Average Daily Drive Time	h	3.1
	% Full Charge Days ending with SoC < 10%	%	0.6
Charging and Energy	Average End of Day SoC	%	48.0
	Average Start of Day SoC	%	95.2
	Average Daily Charge Time	h	3.1
	Average Daily Charged Energy	kWh	72
	Energy Consumption While Driving	kWh/100 km	68.9
	Energy Consumption While Driving + Idling	kWh/100 km	77.3

***Table 2** – 7Gen-GoBolt Project Data – Key Metrics*

KEY TERMS

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. The equation for calculating implied range is:

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

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. 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. As an 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.

Range

The implied range of the BETs most commonly fell between 40-70% of the manufacturer stated range of 350 km, as seen in **Figure 1**. **Figure 2** shows the total compilation of daily distances driven by all tracked vehicles. The average daily implied range was 197 km, which is more than the maximum observed daily distance driven by a BET of 182 km and well above the average daily distance driven of 95 km. In support of this data, 7Gen-GoBolt stated that the BETs were able to meet their operational requirements with some modifications to their existing fleet operating patterns.

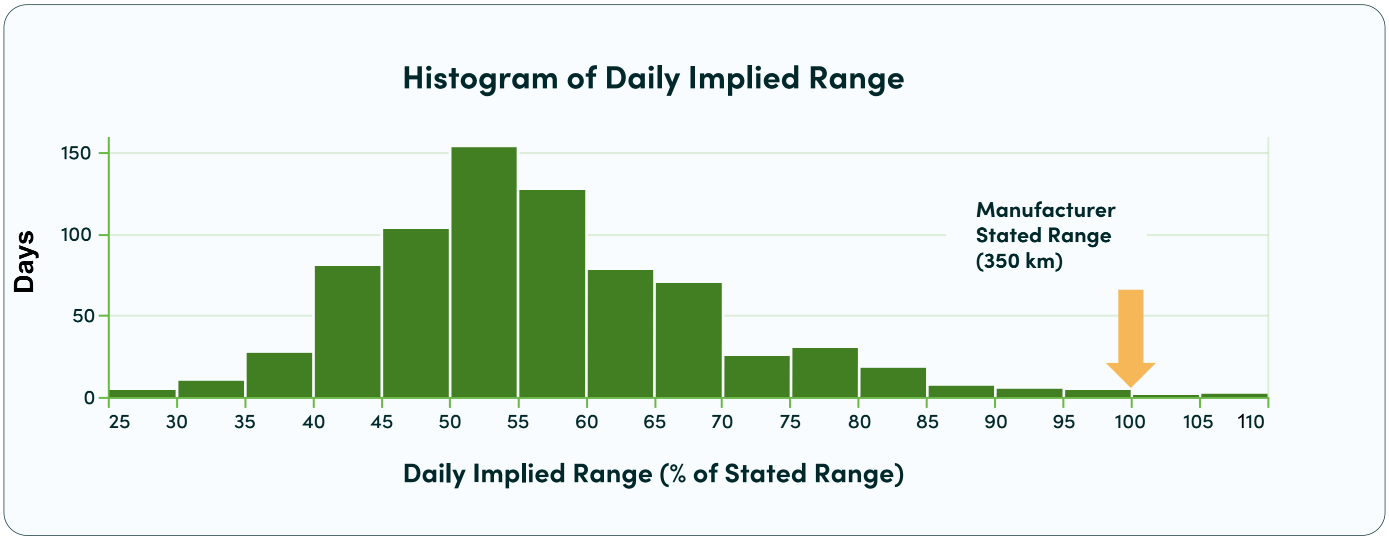


Figure 1 *– CVP Program Data Analysis Dashboard – Daily Implied Range as % of Stated Range*

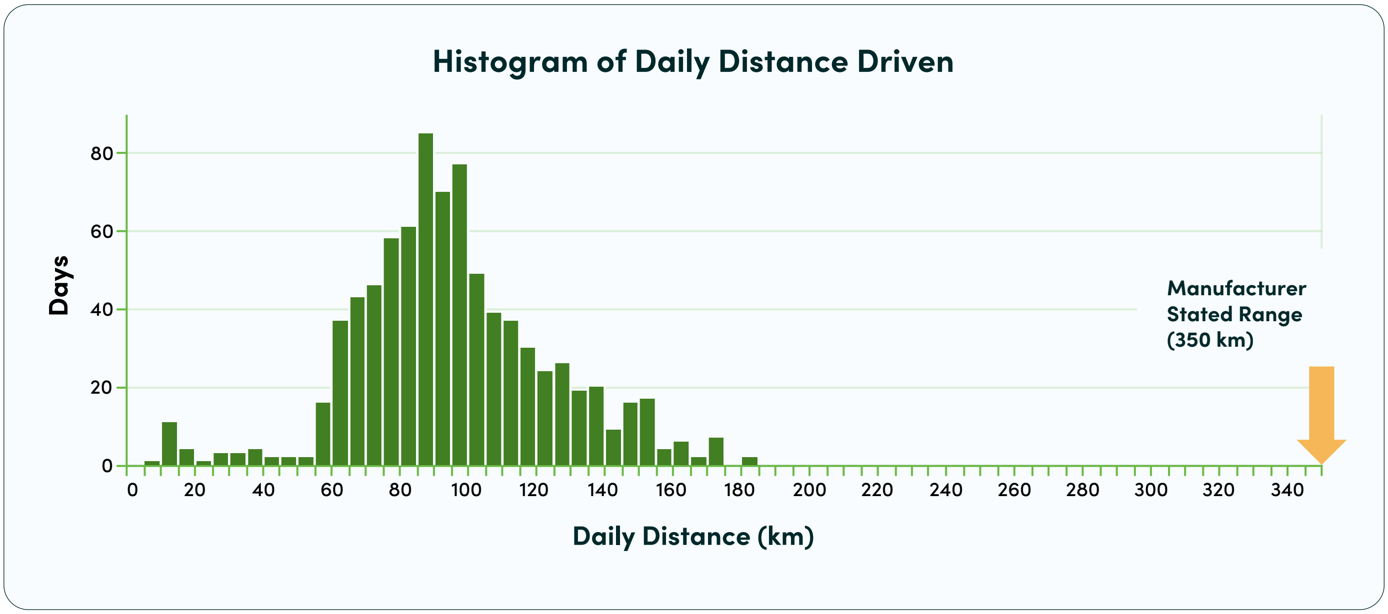
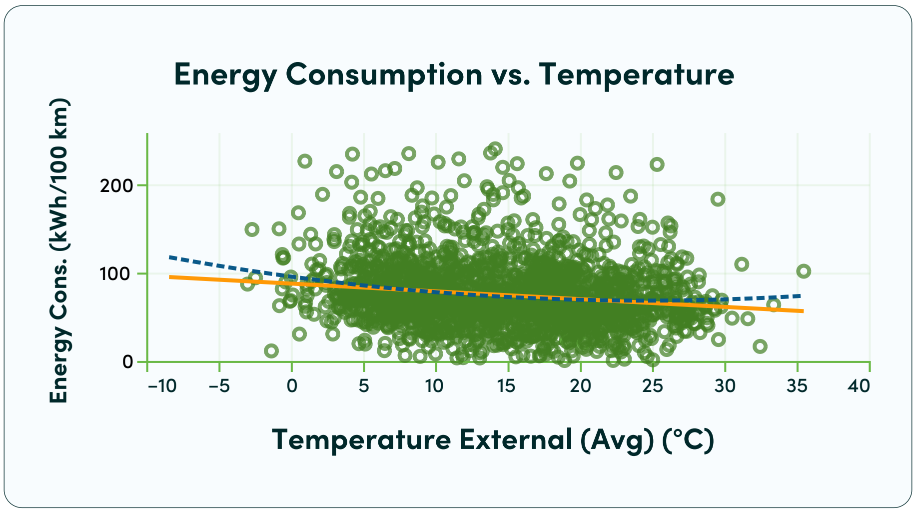


Figure 2 *– CVP Program Data Analysis Dashboard – Daily Driven Distances*

BET range depends on many operational and environmental factors, including payload, driving style, traffic, hills, and temperature. In this project, outside air temperature was a major factor that influenced range. The outside temperatures ranged from -3ºC to +35ºC. The average energy consumption while driving was measured as 68.9 kWh/100 km but trended higher as temperatures decreased.

The blue line in **Figure 3** shows that the BETs were most energy-efficient at around 24-25ºC. **Figure 3** also shows, via the orange trend line, that on average an additional 1.28 kWh of energy is needed to travel 100 km per degree Celsius decrease in outside air temperature.



Temperature Effect on Energy Consumption (linear fit)

-1.28

kWh/100 km°C

Figure 3 - CVP Program Data Analysis Dashboard - Energy Consumption vs Outside Temperature

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

The Province received feedback that providing temperature effects through changes in range would be more impactful than through changes in energy use. In practice this is difficult as range is affected by many factors such as payload, hills, driving style, traffic, and the size of the battery. A BET could easily travel further on a colder day due to other operational differences. All other factors kept the same, the Province calculated that for every drop in degree of celsius, range decreased on average by 8.3 km. This was heavily skewed towards colder temperatures, with an average range decrease of only 3 km for every drop in degree above 5ºC, but an average decrease of 13 km for every drop in degree below 5ºC.

This metric is intended to add additional context to the Range section so that temperature's generalized effect on range can be more broadly understood. The Province cautions 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.

The Lower Mainland's mild climate resulted in relatively consistent energy consumption and implied range between the spring, summer, and fall, with a notable increase in energy consumption and drop in implied range during the winter, as shown in **Figures 4 and 5**. The average implied range across all four vehicles peaked at 66% of the stated manufacturer range in August of 2024, and was at its lowest at 46% of the stated manufacturer range in March of 2024.

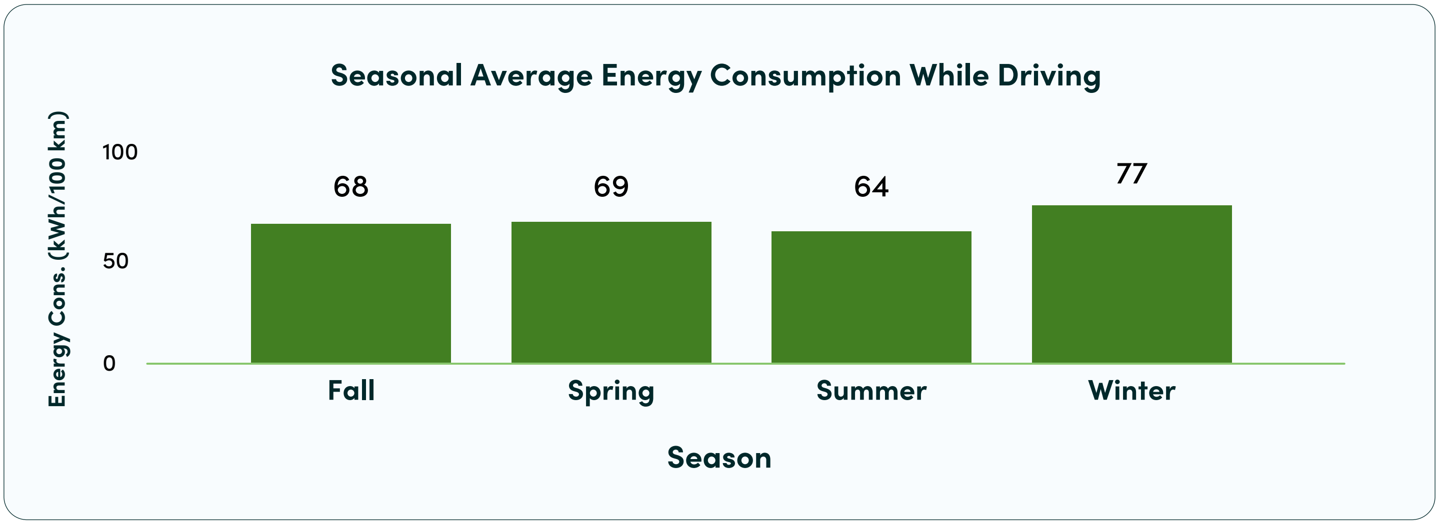


Figure 4 - CVP Program Data Analysis Dashboard - Seasonal Average Energy Consumption While Driving

The implied range of all BETs across each month of operation can be seen in **Figure 5**. Within any given month, the variations in range can primarily be explained from differences in topography, payload, and driver behaviour.

> While the 4 BETs showed relatively consistent implied ranges each month, the variations highlight that medium-and heavy-duty (MHD) ZEV performance is sensitive to differences in duty cycles.

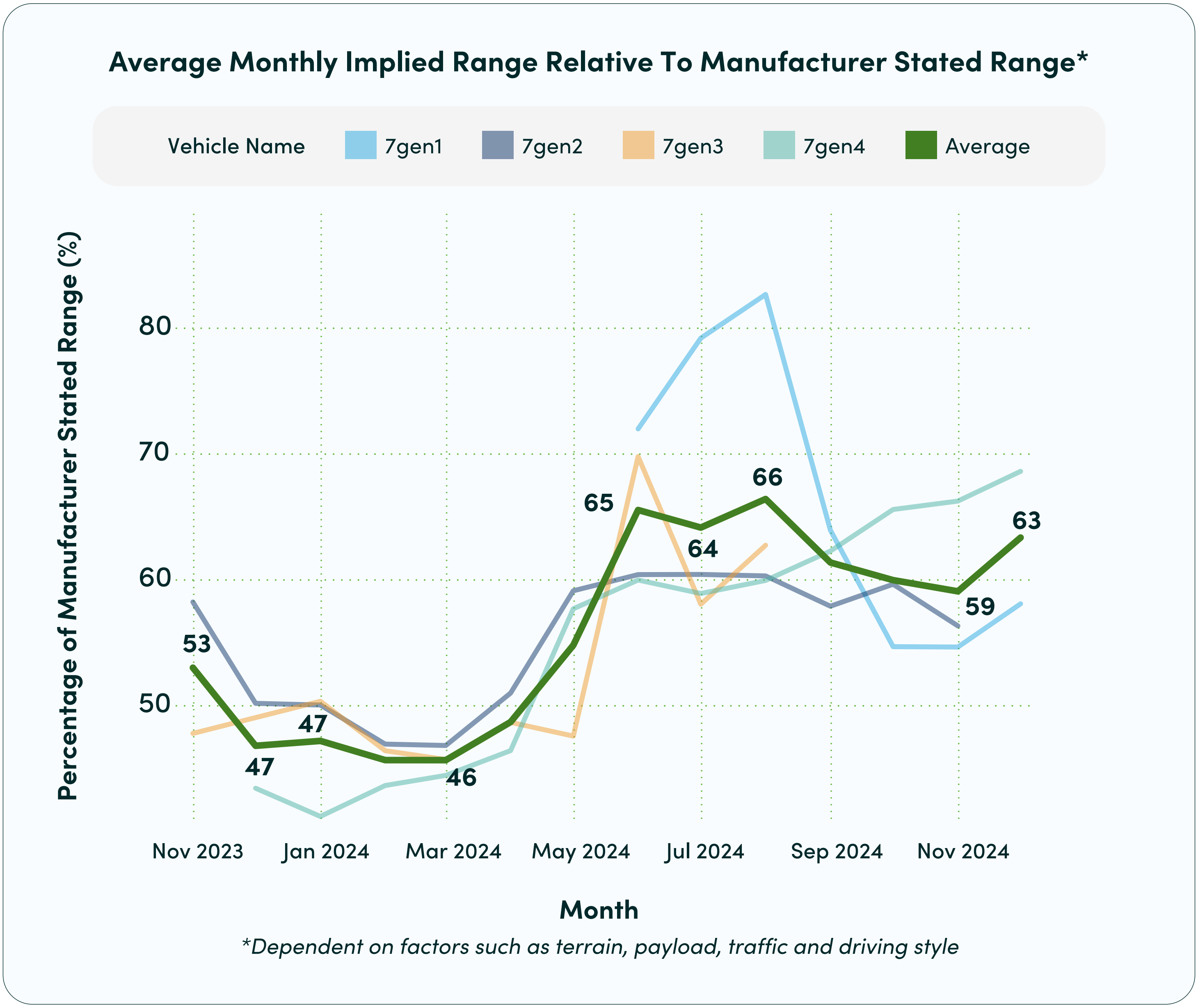


Figure 5 – CVP Program Data Analysis Dashboard – Average Monthly Implied Range

Charging

Drivers rarely needed to charge midday and could complete their daily deliveries. On average, the vehicles started each service day with 95.2% SoC and finished at 48% SoC. Only 0.6% of service days ended below 10% SoC – just five instances out of 833 tracked days across four vehicles. **Figure 6 and 7** provided a full view of start-of-day and end-of-day SoC values.

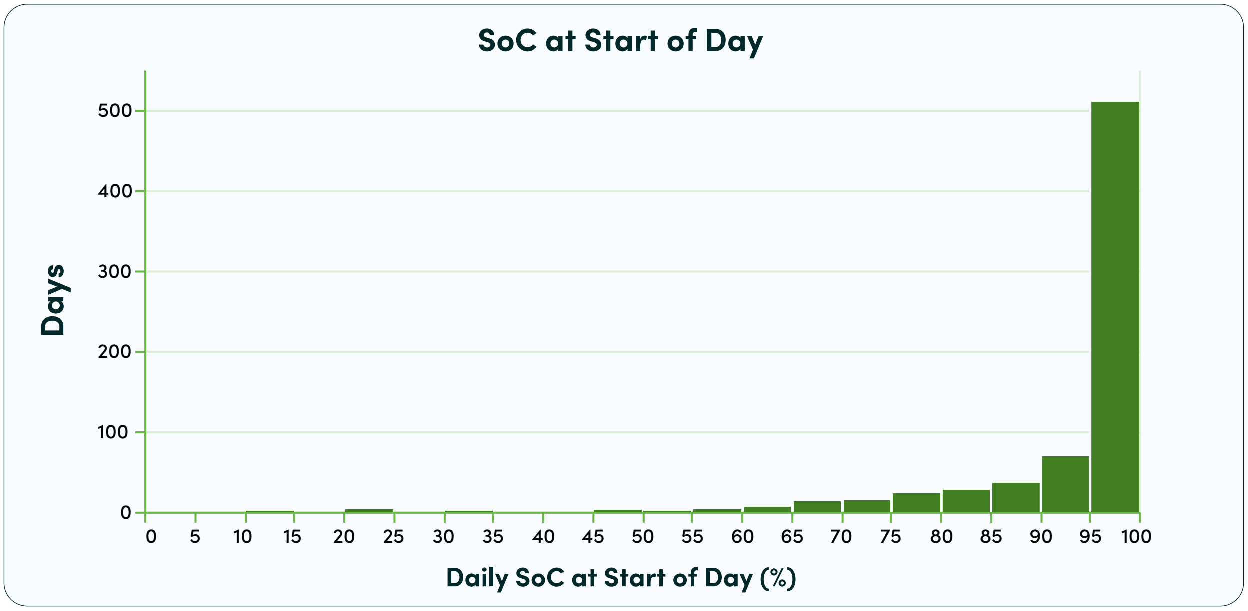


Figure 6 – *CVP Program Data Analysis Dashboard – Daily SoC at Start-of-Day*

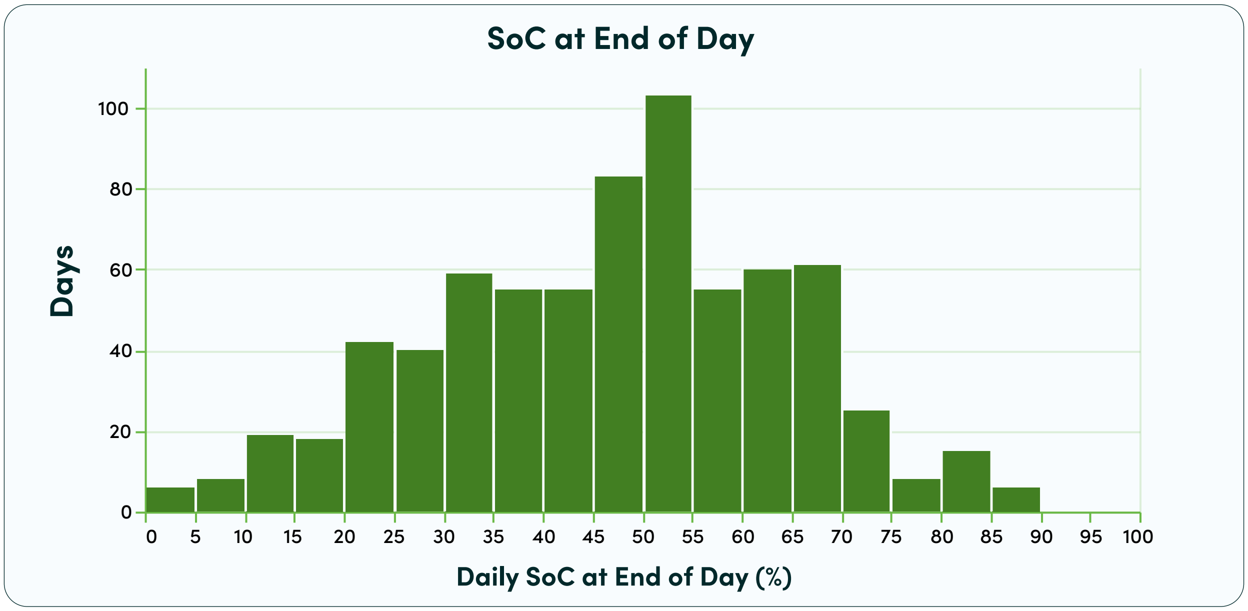


Figure 7 – *CVP Program Data Analysis Dashboard – Daily SoC at End-of-Day*

Midday charging occurred occasionally, but it was rare and never increased the total daily change in SoC to above 100%. In other words, the total amount of charge received by the battery across all charging sessions never exceeded the battery's capacity. This is shown in **Figure 8** where the total energy charged each day was rarely above 160 kWh, or about 63% of battery capacity. This implies that battery capacity was sufficient, and a full charge in the morning would have been enough to complete the day's work.

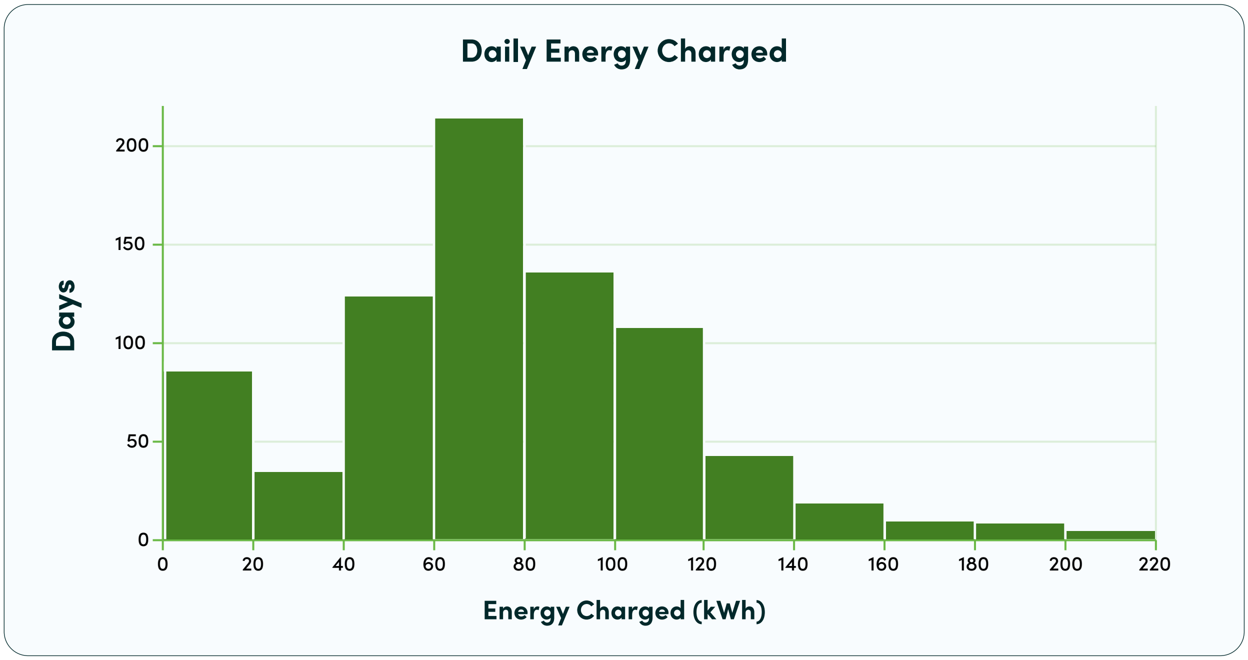


Figure 8 - CVP Program Data Analysis Dashboard - Daily Energy Charged

Midday charging likely happened for convenience, or to make up for incomplete overnight charging. **Figure 9** shows the total duration of charge in a given day. Average total daily charging time was 3.1 hours and days with over 9 combined hours of charging were rare. This shows that overnight charging generally met 7Gen-GoBolt's needs except when there charging problems.

At the start of the project, the vehicle depot experienced charging issues, with sessions occasionally failing to start or being interrupted. This issue was likely caused by a failed 'hand-shake' between the charger and the vehicle, where each recognizes the other and confirms energy can flow. The 'handshake' error stemmed either from driver error when preparing the vehicle to charge or from technical problems with the charger or the vehicle. During the project, active charging session sometimes failed when a software update was needed, or initiated, on either the charger or the vehicle.

Charging issues were addressed through improved driver training and by building stronger relationships with the OEM for both chargers and vehicles to minimize reoccurring issues.

The lack of accessible public third-party fast chargers made it more difficult to navigate depot charging challenges as there was no reliable back-up option. Many public chargers are located in small parking lots or parkades with low clearances that restrict MHD vehicle access. As 7Gen-GoBolt have more vehicles than chargers across their whole fleet, one charger going down could cascade and affect multiple vehicles for the service day.

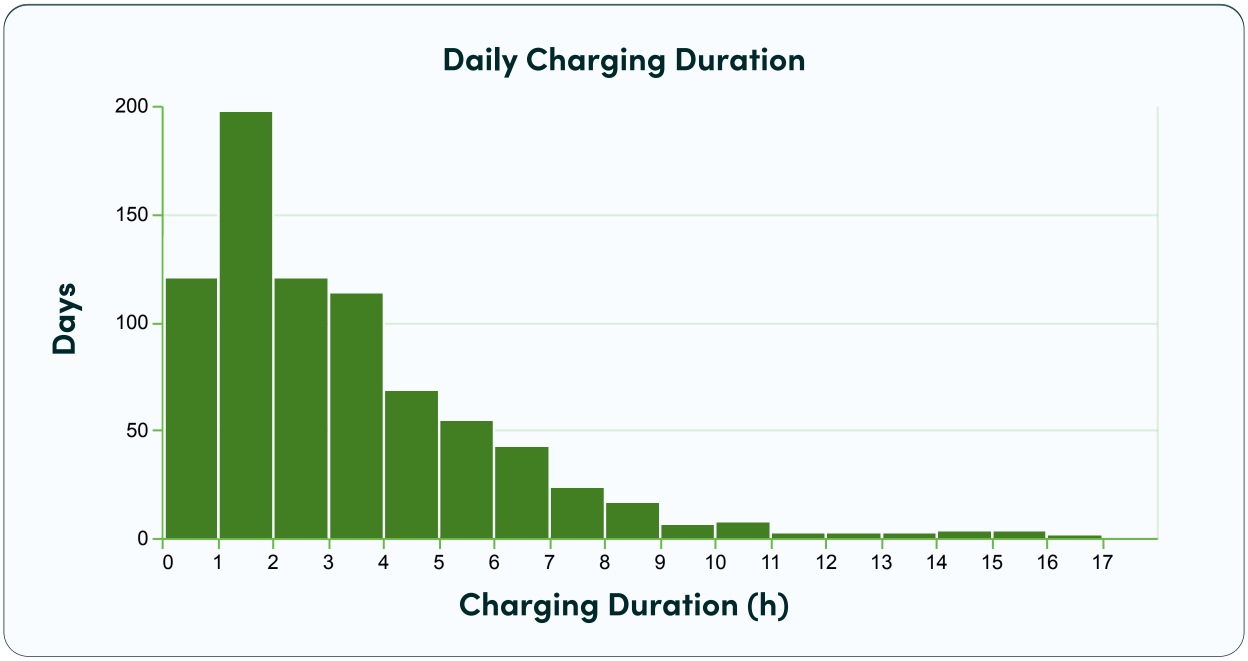


Figure 9 - CVP Program Data Analysis Dashboard - Daily Charging Duration

Operating Patterns and Fleet Integration

Most of the battery's energy was used for driving, even though the vehicle spent a significant amount of time idling. Consistent with what would be expected for furniture delivery, the BETs spent 36% of the service day idling, nearly the same as the time spent driving.

Due to limited auxiliary power demand from supplementary vehicle systems (heating, cooling, etc.), idling was only responsible for 9% of the battery's energy use during the daily duty-cycle. A detailed breakdown of time spent in different operating modes and how energy use varied between driving and idling, is shown in **Figures 10 and 11**.

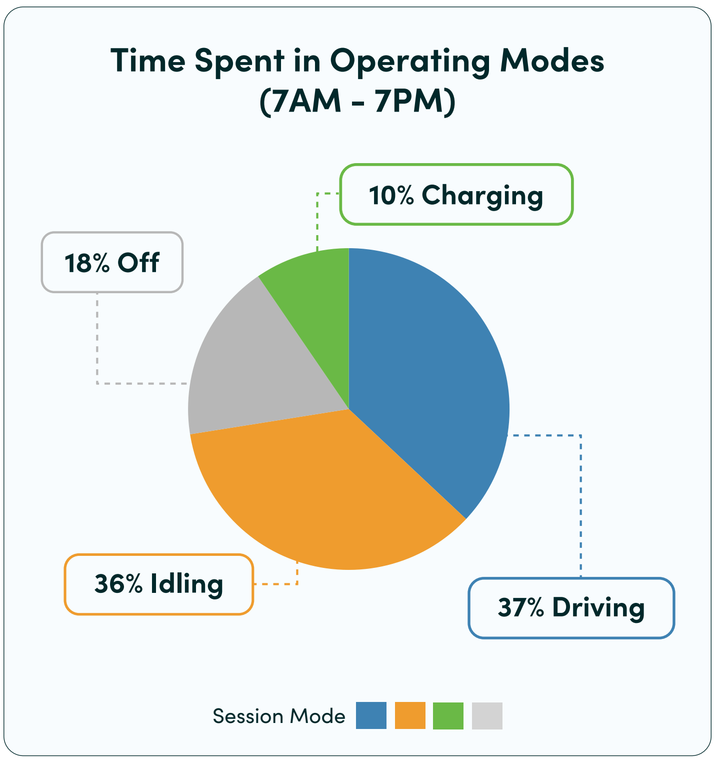


Figure 10 – CVP Program Data Analysis Dashboard – Time Spent in Operating Modes (7 AM – 7 PM)

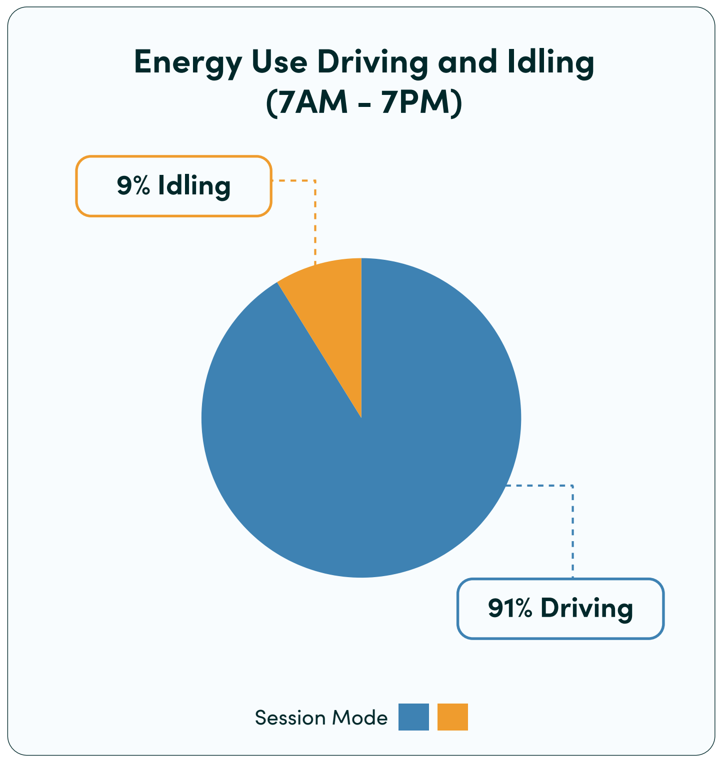


Figure 11 – CVP Program Data Analysis Dashboard – Energy Use for Driving and Idling (7 AM – 7 PM)

The BETs were in service 7 days a week with the most distance traveled on Wednesdays, and the least on Sunday. Driving session times and durations were only tracked on days with total driving distances over 5 km. **Figure 13** shows that the BETs were most active between 10 AM and 2 PM with longer driving sessions near the end of the day when the BETs returned to their service areas.

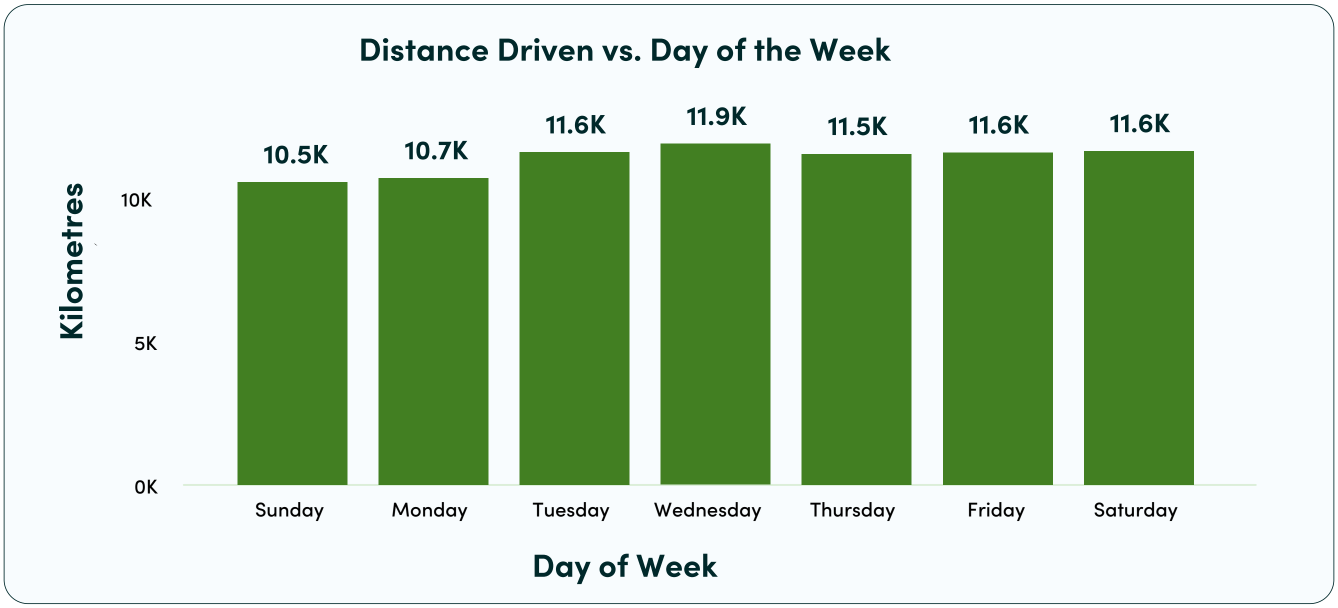


Figure 12 – *CVP Program Data Analysis Dashboard – Distance Driven vs. Day of the Week*

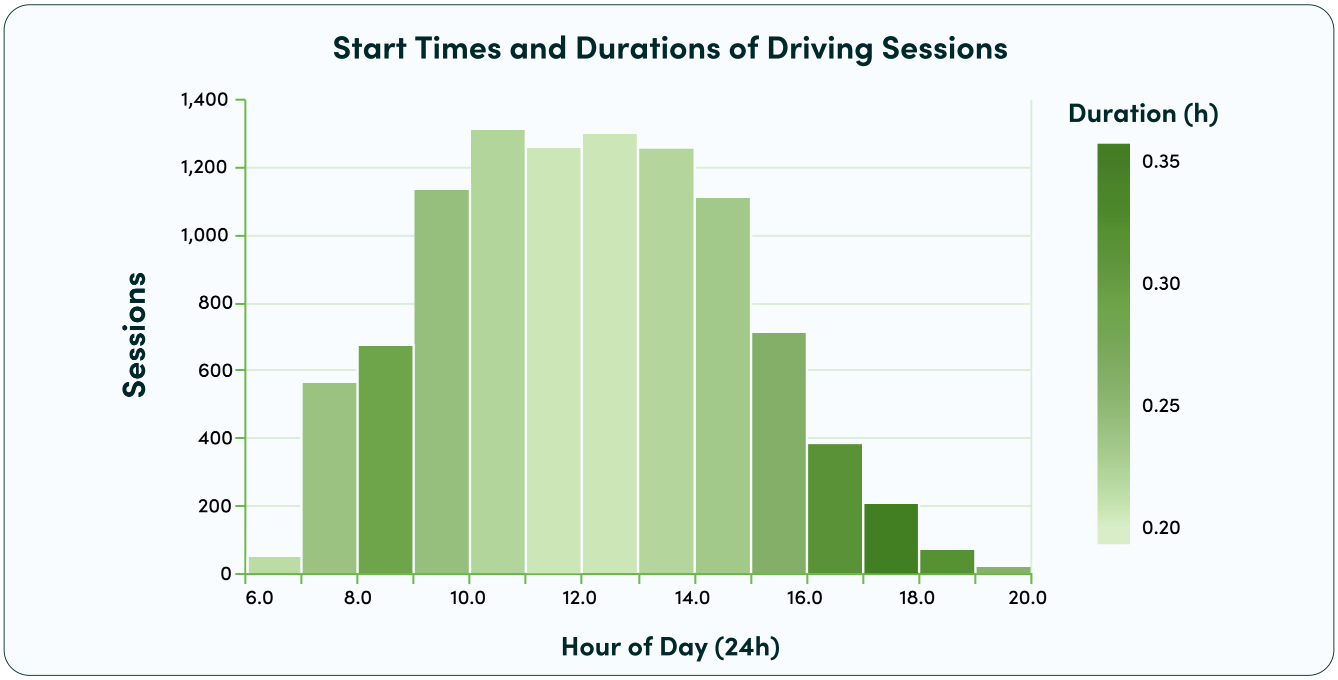


Figure 13 – *CVP Program Data Analysis Dashboard – Start Times and Average Durations of Driving Sessions*

The BETs faced several maintenance issues, most commonly with the 12V battery (a full list of maintenance issues can be found in **Appendix C**). Even relatively simple problems could lead to extended downtime as parts and technicians are more limited than in the ICE industry. An extreme and unfortunate example was when one of the BETs was down for over a month as a new windshield needed to be shipped from the United States and it broke in transit on multiple occasions.

Part C: Lessons Learned and Conclusions

PROJECT IMPACTS

7Gen and GoBolt remain committed to decarbonizing operations: Despite the early reliability issues experienced, GoBolt has significantly increased the size of their ZEV fleet since the project was launched. 7Gen and GoBolt cited reduced operating costs and emissions, progress towards organizational sustainability goals, and personal satisfaction from using cleaner vehicles as reasons for their continued interest in ZEVs.

FUEL COST AND CO2 SAVINGS

Fuel cost savings can be achieved: Annual fuel cost savings were estimated to be $34,481 across the 4 vehicles, or $0.43/km traveled. An estimated 51,289 kg of CO2 was displaced over the duration of the project when compared to a hypothetical ICE equivalent vehicle performing the same work. Details on metric calculations can be found in Appendix B.

DRIVER PREFERENCES

Drivers can end up preferring BETs over ICE: Drivers reported having an initial hesitation to work with BETs, but their impressions changed after using them. One driver responded “if they ever put me back in a gas vehicle, I’ll quit” when asked for their opinion on the BETs. The primary reported reason for the BETs preference is that they are easier on the driver’s body due to the decreased tailpipe emissions, significantly quieter operation, and reduction in vibrations compared to ICE vehicles. Another driver mentioned improvements in their social life as they had noticeably more energy for friends and family in the evening.

DRIVER TRAINING

Driver training is important for fleet integration of BETs: Range anxiety amongst drivers was reported at the start of the project while others pushed the BETs too far, risking battery depletion. The last 10% of charge was found to be used quickly during typical operation and thus drivers were advised to return to base or seek out charging before hitting this level.

Typical end-of-day routines were changed with the BETs as they needed to be prepared for overnight charging. Employee training and new end-of-day policies can reduce instances of charger failure.

IMPLIED RANGE

Real world range can be significantly less than what is listed by the manufacturer: The Lion6 BETs have manufacturer stated range of 350 km. During data collection, the BETs were estimated to have an implied range between 40-70% of the stated range on most service days. This was heavily impacted by the duty-cycle of the end-user, with factors such as driver behaviour, vehicle payload, and topography significantly impacting daily range capabilities.

LOW TEMPERATURES IMPACT RANGE

Colder weather has a measurable impact on the daily range capabilities: Implied ranges and actual energy consumption were relatively consistent across the Spring, Summer, and Fall but in the Winter, when temperatures can consistently fall below 5°C, implied range fell noticeably by as much as 20 percentage points.

EQUIPMENT AND SERVICE PROVIDER RELATIONSHIPS

7Gen and GoBolt recommended connecting early and maintaining relationships with service and equipment providers: The importance of early connection with OEMs, telematics providers, and service crews was emphasized by 7Gen-GoBolt. Periodic meetings and good relationships with the OEMs were shared as a strategy for mitigating technology reliability issues. Parts and service availability challenges can lead to longer downtime when maintenance events occur. It was found that having extra spare parts in some cases could help mitigate this issue in the short-term.

VEHICLE AND SUPPORT EQUIPMENT COSTS

7Gen and GoBolt reported that upfront capital costs remain a barrier to ZEV adoption in the medium- and heavy-duty space. These costs extend into charging infrastructure which can be complex to set up, requiring consultation from third parties and the utility for high-power needs. The ZEV industry has experienced rapid changes with equipment and service providers entering and leaving the market. An OEM leaving the market may lead to a lack of technical and maintenance support for the technology they supplied.

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 6 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.: 2.3kg/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 a Class 6 ICE driven fleet 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 6 truck: 29 liters/100km.
Source: **https://tedb.ornl.gov/**

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.

Appendix C: Qualitative Data and Survey Results

The table below is a summary of the qualitative survey completed with the vehicle operator.

1. Technical results (results related to electric vehicle (EV) technology)
2. Project/Fleet Management and Communication results
3. Human Factors related results (results related to how people interact with electric vehicle (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 7Gen–GoBolt Project
Safety	▪ Training reduces the hesitation of project staff and increases motivation and speed for adaptation. ▪ Ensure early and fulsome training for staff in the aspects of ZEV adoption.
Grid, Charging, Charger Issues	▪ The 7Gen-GoBolt project teams had issues like “charging does not start” or “charging gets interrupted”. ▪ If a vehicle doesn’t charge overnight, it can mean it is down for the whole next day. There are several reasons this can happen: driver error; problems with the ‘handshake’ between charger and vehicle which could be caused by either the vehicle or the charger having an issue or needing a software update (or a software update being initiated). Companies try to have controls in place to help mitigate this, so it doesn’t happen as often. ▪ Public fast chargers can be in small parking lots or underground, which cannot be reached with a bigger MHD ZEV.

Continuation of Table 3 – Technical Results from Qualitative Data Analysis

Technical Results - Categories	Survey results, lessons learned, and recommendations from CVP Program 7Gen–GoBolt Project
Grid, Charging, Charger Issues	▪ The lack of alternative charging infrastructure can make even minor charging issues hugely impactful. ▪ If the organization has more vehicles than chargers, then an added part of their site manager's job is to move vehicles around as necessary to maximize charge on as many vehicles as possible. It is also why one charger going down can cause such big issues. ▪ Chargers should be installed before vehicles arrive for operation, with sufficient time for quality assurance. This helps to avoid project and service disruptions.
Breakdowns, Maintenance, Warranty	The 7Gen-GoBolt project team has encountered the following problems: ▪ Air compressor contamination and failures ▪ Motor coolant pump failures, electric motor cooling issues ▪ High voltage alarms ▪ 12 Volt battery issues (frequent)
Telematics	In early project phases, the data collected (and KPIs calculated) may contain more errors and outliers than usual. Early detection of these errors may be time-consuming and is essential. Allocate enough time to detect data errors, calculation errors and outliers in data you collected or are provided with. Early detection of Telematics errors might need considerable time, and it is essential for correct results. Cross-checking and validation of third-party metrics, data summaries, and KPIs are essential first steps for using the data in later project steps.
Climatic conditions	The CVP Program teams have analyzed energy consumption data for the effects of outside temperature. The results are included in Part B of this report.

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 7Gen–GoBolt Project
Communication with Partners and Interested Parties	The project partners emphasized the importance of early connections with OEMs, telematics providers, and service crews. Periodic meetings with the OEM might be necessary if the vehicle break-downs are more frequent than expected. Frequent contact and good relationships with OEMs help mitigate a lot of reliability issues.
Route Planning	Hills, vehicle loads, and temperatures can have a significant impact on the ability of vehicles to meet daily use cases. As such, organizations should evaluate the performance of vehicles within the context of their own unique use-cases to ensure they can plan appropriately for State of Charge or other performance aspects.
Stretched Timelines and Related Risks	Project administration in general may take a lot of time, especially for projects with more partners. Bigger fleets encounter similar (or diverse) technical issues in all vehicles in the fleet which can be confusing, and time consuming for fleet managers to accommodate.
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*

Project Management and Communication Results - Categories	Survey results, lessons learned, and recommendations from CVP Program 7Gen–GoBolt Project
Fleet integration	**In general, the 7Gen-GoBolt 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.** Concerns of temperature variation implications on range and operability are common at early project stages. Concerns about fulfilling the duty cycle in general are common at early project stages. Shared positive feedback from the project partners: ▪ Less energy costs ▪ GHG reduction ▪ Rewarding experience in general ▪ Helped organization to meet their sustainability goals Challenges experienced from the project partners: ▪ Had to adjust some routes to account for range limitations ▪ Had to stop for charging during the day (charging top up depends on the workload of the day and battery charge levels at the beginning of the day) ▪ Start problems ▪ 12V battery issues ▪ Wiring Harness issues ▪ Vehicle uptime is lower with respect to ICE vehicles (downtime was double compared to Diesel trucks). ▪ The fleet may need some simple spare parts on site to mitigate longer service disruptions for simple breakdowns or easy maintenance tasks. ▪ Local service technicians (geographically close) are needed. Not enough MHD ZEV technicians on most sites or in remote geographical locations. ▪ If the parts are shipped from the US, this is a point of an issue (longer delivery times).

***Continuation of 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 7Gen–GoBolt Project
Cost Tracking	▪ The purchase prices for MHD ZEVs are not at parity yet. ▪ Programs like the CVP Program are encouraging for MHD ZEV adoption since these programs enable that the TCO starts making sense with the supporting funding included. ▪ The purchase price disparity comes closer to 1.0 when the program funding is included in the price and TCO calculations.
Role of Data Dashboards	The Province's Engineering and Data Science teams created a comprehensive data analysis dashboard to monitor and analyze program participant data. The results are presented in the previous section of this report.
Company Culture	Customer expectations can be a significant factor in encouraging businesses to adopt EVs. IKEA, as the client of this project, was a big motivator for the adoption of ZEVs in this project.

Table 5 *- Human Factors related Results from Qualitative Data Analysis*

Human Factors Related Results - Categories	Survey results, lessons learned, and recommendations from CVP Program 7Gen–GoBolt Project
Training needs	▪ Driver training was an essential part of this project. ▪ Driver/Operator training helped to reduce anxiety. ▪ Operators/Drivers wanted to learn what affects range.
Feelings (Joy, Frustration, Anxiety) related with vehicle attributes (performance, comfort, reliability, etc.)	Shared positive feedback from the project partners: ▪ Happy drivers ▪ Enjoying EVs ▪ The operation of EVs improving with continued use ▪ Quiet operation ▪ Comfortable ▪ Fancy ▪ Convenient ▪ Attention grabbing technology ▪ Cutting edge technology ▪ Now, the drivers do not want their EVs taken away. ▪ Improved air quality around the vehicles ▪ Lack of vibrations Shared positive feedback from the project partners: ▪ Operators, staff and technicians were uneasy with the idea of driving/adopting/working with the EVs (range anxiety) at the beginning
Image	In participant feedback surveys, the CVP Program team received feedback about the “cool factor” of MHD ZEVs.

Table 6 *- Other Qualitative Data Analysis Results*

Other Results - Subcategories	Survey results, lessons learned, and recommendations from CVP Program 7Gen–GoBolt Project
Traffic Accidents	None reported from project partners.
Vehicle Damages, Infrastructure Damages	None reported from project partners.
Stolen Vehicles and Equipment	None reported from project partners.
Firefighting	No specific information from project partners.

Please refer to the **Appendix 3** for quotes and anecdotes from 7Gen-GoBolt fleet.

Appendix D: Quotes and Anecdotes from 7Gen–GoBolt Project

This appendix of the project report is intended to summarize distinct quotes and anecdotes from the 7Gen–GoBolt Project.

Excerpts from 7Gen-GoBolt Project Exit Surveys

7GEN EXIT SURVEY:

"The CVP Program was helpful in ensuring that the price point for electrification was reasonable and made sense from a fiscal standpoint as well as a sustainability and emissions standpoint."

GOBOLT EXIT SURVEY:

"The CVP Program was a great assistance to our company in procuring EVs without which would likely have delayed our deployment of EVs in British Columbia. For our company which aims to be 100% emissions free, the support of the CVP has been very significant in allowing us to deploy the volume of EV vehicles in the province that we have."

Excerpts from 7Gen–GoBolt Project Exit Interviews

7GEN EXIT INTERVIEW:

"The upfront cost is high. If you are not sure with the operational savings, then you may stop purchasing EVs."

"CVP program was crucial in making the transition to electric vehicles cost-effective for Go Bolt and [our delivery partner]. Without the program, the installation of chargers and the overall project might not have been feasible."

GOBOLT EXIT INTERVIEW:“

Without this program; we would have less vehicles and we would be slower.”

“CVP program offsets the upfront costs. This is super important.”

“There is still a massive undersupply of charging infrastructure and up-front capital costs for vehicles remain high.”

Drivers’ Anecdotes from the 7Gen–GoBolt project

ANECDOTE 1:

“If they ever put me back in a gas vehicle, I’ll quit!”

ANECDOTE 2:

“I am less tired in the evenings.”

BRITISH COLUMBIA

cleanBC
GO ELECTRIC

goelectricbc.gov.bc.ca