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torbay

MUNICIPAL FLEET ELECTRIFICATION STUDY

July 2025

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DOCUMENT CONTROL

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R0	Emma Power	July 8, 2025	Feasibility study complete – for Town review
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3. Remaining Light & Medium Duty Vehicles by ~2032 (3 units replaced)
4. All Town Heavy-Duty Units by 2050 (13 units replaced)
5. Fire Department Heavy Duty Units by 2050 (4 units replaced)

EV Transition Phase	Projected Annual Cost Savings with EVs	Estimated Annual GHG Reduction (tCO_2e)	% GHG Reduction (of 2024 Total Fleet emissions)
Town - Proposed EVs by 2030 (7 units replaced)	-$18,504.2	-30.3	-17.3%
Fire Dept. - Proposed EVs by 2030 (2 units replaced)	-$1,423.3	-2.33	-1.3%
Remaining Light & Medium Duty Vehicles by ~2032 (3 units replaced)	-$14,285.3	-23.35	-13.3%
All Town Heavy-Duty Units by 2050 (13 units replaced)	-$51,242.6	-107.97	-61.6%
Fire Department Heavy Duty Units by 2050 (4 units replaced)	-$3,147.1	-7.07	-4.0%
Full Electric Fleet	**-$88,602.5**	**-171.0**	**-97.5%**

We recommend that the Town of Torbay adopt a policy which stipulates that all light- and medium-duty vehicle purchases be electric going forward. Heavy-duty EVs should be assessed on a case-by-case basis given the current market conditions and available financial incentives.

This report contains all the calculations and research that was completed to arrive at these conclusions. There are sections dedicated to assisting the Town with EV procurement and operation going forward. Alternative fleet emission and cost reduction strategies are also assessed, and specific information pertaining to the Fire Department is provided.

1. BACKGROUND

Torbay is a coastal, semi-rural community on the Northeast Avalon Peninsula of Newfoundland and Labrador (NL). With a population of 7,852 (2021 census), Torbay is the 10th largest municipality in the province. Adjacent to the capital City of St. John's, Torbay is considered part of the most populous census metropolitan area in NL.

The Town of Torbay is committed to taking action on climate change. In 2019-20, the Town participated in FCM’s Transition 2050 program as part of a cohort of municipalities. Town staff received climate change training, the first corporate greenhouse gas emission inventories were completed, and the Town’s Climate Change Mitigation Plan was developed through a series of workshops.

The Climate Change Mitigation Plan defined overall emission reduction targets for the Town and identified that reducing municipal fleet emissions is an important part of meeting these goals. At the same time, the Town is focused on making fiscally responsible decisions and must continue to maintain and improve levels of service for the growing population.

This study, funded by the Federation of Canadian Municipalities’ Green Municipal Fund, is an important step that aims to bring all these pieces together - to assess the risks and benefits of fleet electrification, and determine whether alignment with the emission reduction goals can be reached in a way that makes financial and logistical sense.

2. BASELINE ASSESSMENT

The Town of Torbay currently maintains a Fleet Replacement and Acquisition Strategy which details the conditions that surround the replacement of vehicles and equipment. According to this strategy:

- Light-Duty vehicles (office and admin uses) are typically replaced between 7-9 years or 150,000 km, whichever comes first.
- Medium-Duty vehicles (work trucks) are typically replaced every 5-7 years or 160,000 km, whichever comes first.
- Heavy-Duty vehicles (dump trucks, loaders, excavators, etc.) are usually replaced between 10-14 years or within 6,000-10,000 hours.

As of the writing of this report, the Town owns and operates 23 vehicles (10 light-medium duty and 13 heavy duty), and the Fire Department owns/operates 6 vehicles (2 light-medium duty and 4 heavy duty), as outlined in the tables below. The vehicles have been organized in order of currently projected replacement year.

Table 2.1 Town Light-Medium Duty Vehicle List

TOWN LIGHT-MEDIUM DUTY				
Unit #	Vehicle Model	Current Use	Duty	Planned Replacement Year
02-09	2014 GMC 1500	Public Works	Medium	2026
02-11	2016 Ford F250	Public Works (Backup)	Medium	2026-2027
02-13	2017 Ford Escape	Office/Admin	Light	2027
02-15	2020 Colorado	Public Works (Supervisor)	Light	2028
02-14	2020 Colorado	Planning	Light	2029
02-16	2022 Chevrolet Silverado	Water & Sewer	Medium	2029
02-18	2023 GMC Canyon	Office/Admin	Light	2030
02-17	2023 GMC Canyon	Shared Use (includes snow clearing)	Light	2031
02-19	2024 Chev Silverado 2500 HD	Public Works	Medium	2031
02-20	2025 Chev Silverado	Public Works	Medium	2032

Table 2.2 Town Heavy Duty Vehicle List

TOWN HEAVY DUTY		
Unit #	Vehicle Model	Planned Replacement Year
04-03	2013 Cat Backhoe	2025 (Determined)
05-01	2007 Blower	2025-26
05-05	2013 John Deer Loader	2025
03-04	2016 Western Star Dump Truck	2026
05-06	2013 Yanmar Excavator	2027
03-05	2018 Freight Liner Dump Truck	2028
05-07	2019 Cat Loader	2029
04-08	2023 JCB Backhoe	2031
05-08	2023 JBC 437 Loader	2032
04-07	2022 Trackless Backhoe	2032
05-09	2023 JBC 437 Loader	2033
05-10	2025 John Deer	2034
03-06	2024 Ford F550 with Dump	2034

Table 2.3 Fire Department Vehicle List

FIRE DEPARTMENT			
Unit #	Vehicle Model	Duty	Planned Replacement Year
U3	2014 Dodge Ram 5500	Medium	2026
P2	2012 Freightliner Pumper	Heavy	2027
U5	2017 Chev Silverado	Light	2029
U4	2017 Freightliner Rescue	Heavy	2037
U6	2018 Freightliner Tanker	Heavy	2038
P1	2023 Freightliner Pumper	Heavy	2038

The Town maintains annual fuel consumption and maintenance cost records for each of their vehicles. The Fire Department utilizes the same fuel tanks as the Town vehicles, but maintenance is managed separately.

During 2024, the fuel tracking system at the Town malfunctioned for a period of 6 months which created a data gap from June through November. Since the available data largely represents the winter months (December through May, where fuel usage is typically higher due to colder weather and snow clearing operations), simply multiplying the available fuel data by 2 may have been an overestimate. Instead, multiplication factors were chosen for the diesel and gas amounts by reconciling the fuel volumes with the total fuel expenditures recorded. Details related to the GHG calculations can be explored in the **Torbay EV Feasibility Excel file**.

The Town also utilizes software that monitors vehicle idle time and runtime, allowing us to easily identify which vehicles idle the most (see Section 4.B.).

2.A. COSTS

The table below summarizes the total fuel and maintenance costs across 2022, 2023, and 2024. The maintenance costs presented include the actual costs incurred by the Town associated with the 23 vehicles included in the study, as well as the annual maintenance budget allocated to the 6 Fire Department vehicles. The Town records include some additional maintenance costs that are not directly attributed to the specific vehicles included in this study (i.e. fleet tracking subscription fees, welding supplies, etc.), hence, those expenses were excluded.

Table 2.4 Fleet Fuel & Maintenance Costs 2022-2024

Year	Fuel Costs	Maintenance Costs	Total Operating Cost
2022	$129,925.78	$214,225.50	**$344,151.28**
2023	$153,745.32	$191,491.91	**$345,237.23**
2024	$120,323.74	$224,487.97	**$344,811.71**

Overall costs have remained quite consistent, despite fuel and maintenance costs varying year-to-year. To account for this normal variation, the average of these three years of maintenance costs for each vehicle was used for the detailed analysis.

Comparing across fleet categories, we see that the heavy-duty vehicles account for the majority of the annual fuel costs (61%) and maintenance costs (76%). Fire Department fuel costs are relatively low since the vehicles generally have low annual mileage.

Table 2.5 Fleet Fuel & Maintenance Costs by Category, 2024

Fleet Category	Total Fuel Costs (2024)	Average Maintenance Costs (2022-2024)	% of Fuel Costs	% of Maintenance Costs
Town Light-Medium Duty	$40,137.06	$25,285.50	33%	12%
Town Heavy-Duty	$73,638.80	$159,782.96	61%	76%
Fire Department	$6,547.88	$25,000.00	5%	12%

2.B. GHG EMISSIONS

The Town of Torbay completed its first corporate greenhouse gas (GHG) emissions inventories (2018 and 2019) and Climate Change Mitigation Plan in 2020. Corporate GHG inventories estimate the emissions from all Town-owned and operated facilities and equipment including municipal buildings, the municipal fleet, water and wastewater operations, and solid waste management.

The 2020 Climate Change Mitigation Plan identified the following emission reduction targets:

- 3-7% below 2018 levels by 2023
- 30-45% below 2018 levels by 2030
- Net-Zero by 2050

The graph below shows an overall decline in total corporate GHG emissions from 2018 to 2023. **In 2023, the Town of Torbay proudly surpassed the first reduction target, achieving a 12.8% drop in overall corporate emissions**. This reduction was largely due to improvements in building energy efficiency and fuel switching. The increase between 2022 and 2023 is likely due to the easing of COVID-19 restrictions (resumption of more typical Town operations).

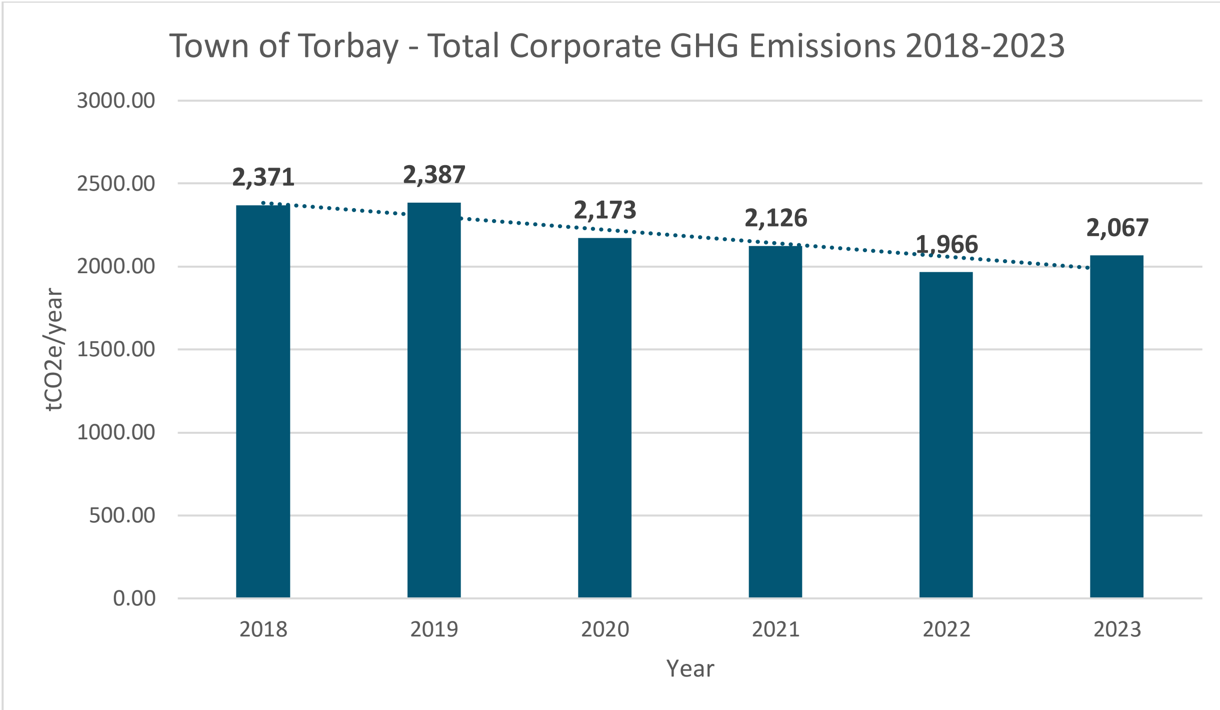


Figure 2.1 Total Corporate GHG Emissions 2018-2023

This study assesses the 2024 fleet emissions only - a full corporate inventory for the year 2024 has not yet been completed.

Looking specifically at the fuel-related GHG emissions, it appears that 2024 saw the lowest GHG emissions since 2018. However, fluctuations are normal for a fleet of any type since weather conditions and circumstances change year to year (for example, the COVID-19 pandemic may have had an impact in 2021 and 2022). It is best practice to observe several years of consistent declines before declaring that a true reduction in emissions has taken place.

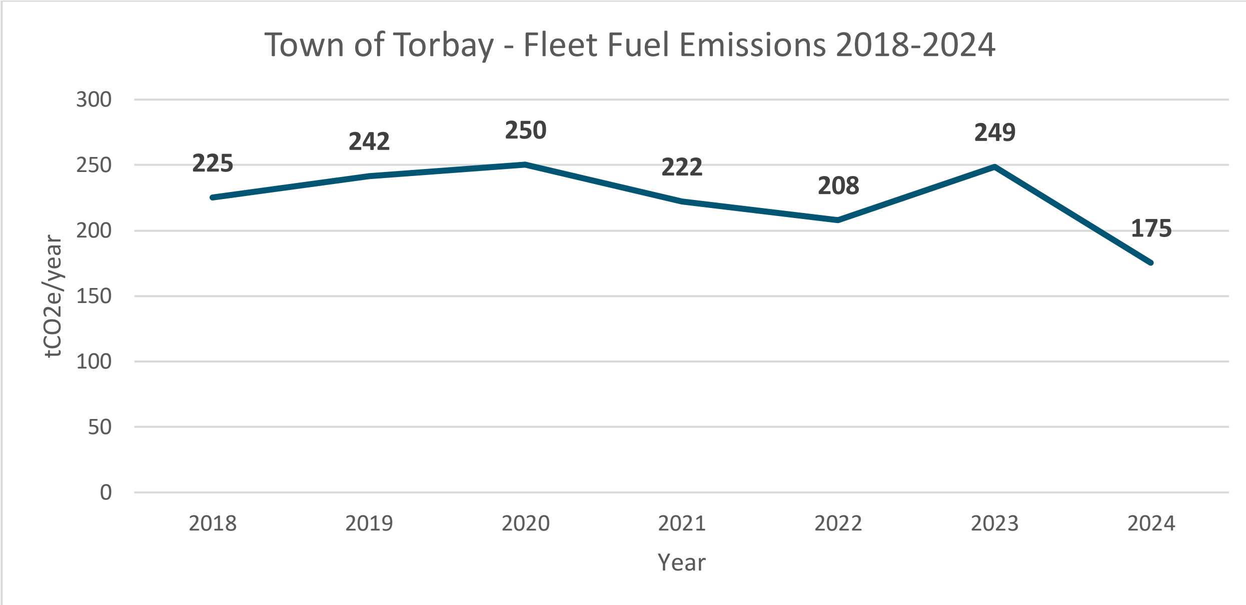
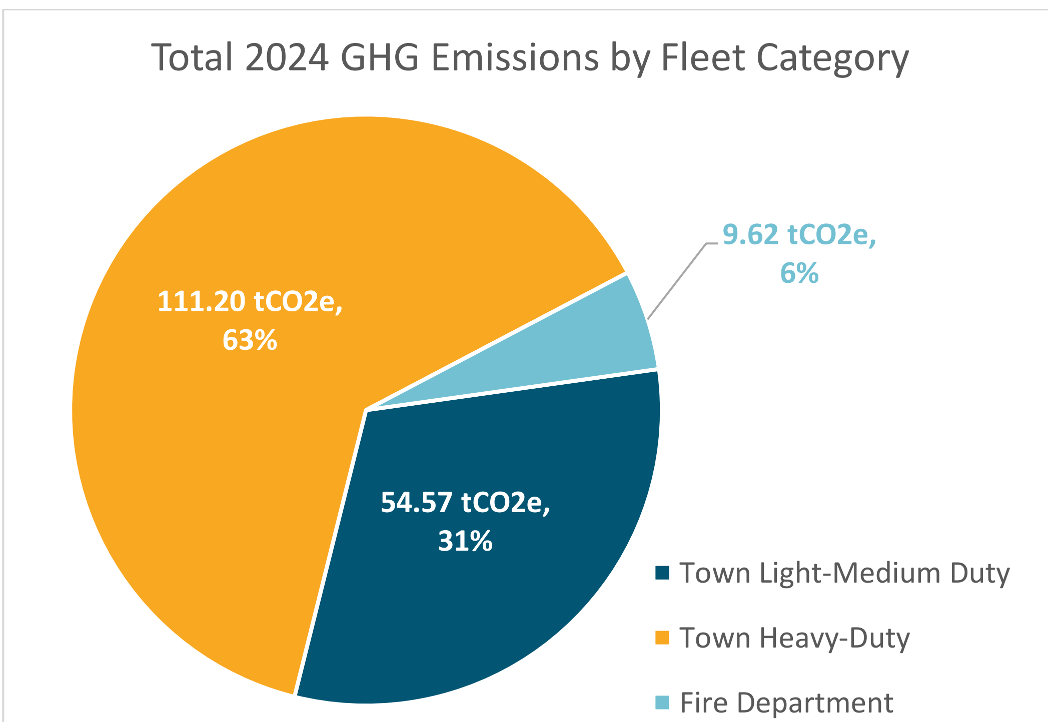


Figure 2.2 Total Fleet Fuel GHG Emissions 2018-2024

Comparing across fleet categories, we see that the heavy-duty vehicles account for the majority of the GHG emissions (63%). The Fire Department vehicles conversely have a relatively small impact due to their low annual mileage.



3. POTENTIAL ELECTRIFICATION PATHWAY

Quite simply, our assessment indicates that it would be possible - and financially and environmentally responsible - to replace each existing light and medium-duty Town and Fire Department vehicle with a suitable 100% electric alternative according to the current replacement schedule outlined in the Town's Fleet Replacement and Acquisition Strategy. Proceeding in this way will enable the Town to achieve its 2030 GHG reduction target.

The following sections of this report describe the rationale for this determination in detail. In summary, our analysis was based on the following factors:

- Workshop with Town staff to clarify performance requirements for each vehicle
- Assessment of currently available electric models and general operation/performance
- Lifecycle cost assessment and research
- Operational GHG assessment and lifecycle carbon research
- Municipal fleet electrification case study review

Assessing the viability of electric alternatives for heavy-duty vehicles is more difficult. While some options do exist, the technology is still evolving, availability is limited, and suitability to the Town's operations must be considered on a case-by-case basis due to the nature of how heavy equipment is used. At the time of the preparation of this report, we were able to get information from a couple of heavy-duty equipment providers that service NL – see Section 5.C.

Only electric vehicles (EVs) were considered in this assessment as no hydrogen fuel infrastructure exists in the province. Compared to many other provinces in Canada, NL does not have a natural gas grid so there is no opportunity to utilize existing piped infrastructure for the energy transition. 100% battery electric vehicles (BEVs) are the focus of the following analysis. Plug-in-hybrid electric vehicles (PHEVs) are considered in Section 4.C. Going forward, use of the acronym "EVs" refers to BEVs.

For the financial and GHG assessments, the fleet electrification plan has been organized into the following categories:

6. Town - Proposed EVs by 2030 (7 units replaced)
7. Fire Dept. - Proposed EVs by 2030 (2 units replaced)
8. Remaining Light & Medium Duty Vehicles by ~2032 (3 units replaced)
9. All Town Heavy-Duty Units by 2050 (13 units replaced)
10. Fire Department Heavy Duty Units by 2050 (4 units replaced)

By year, this corresponds to the following breakdown for the light-medium duty units:

Table 3.1 Proposed EV Replacements by 2030

LIGHT-MEDIUM DUTY REPLACEMENTS BY 2030			
Unit #	Vehicle Model	Current Use	Planned Replacement Year
02-09	2014 GMC 1500	Public Works	2026
02-11	2016 Ford F250	Public Works (Backup)	2026-2027
02-13	2017 Ford Escape	Office/Admin	2027
02-15	2020 Colorado	Public Works (Supervisor)	2028
02-14	2020 Colorado	Planning	2029
02-16	2022 Chevrolet Silverado	Water & Sewer	2029
02-18	2023 Canyon	Office/Admin	2030
U3	2014 Dodge Ram 5500	Fire Department	2026
U5	2017 Chev Silverado	Fire Department	2029

Table 3.2 Proposed EV Replacement by ~2032

LIGHT-MEDIUM DUTY REPLACEMENTS BY ~2032			
Unit #	Vehicle Model	Current Use	Planned Replacement Year
02-17	2023 Canyon	Shared Use (includes snow clearing)	2031
02-19	2024 Chev Silverado 2500 HD	Public Works	2031
02-20	2025 Chev Silverado	Public Works	2032

This study does not aim to recommend a specific vehicle for each replacement. Under the Public Procurement Act, the Town must undertake a tender or Request for Quotation process for all vehicle acquisitions, therefore, having a specific vehicle model in mind is not necessarily ideal. At the same time, the EV market is rapidly evolving – what is available months or years from now may be significantly different from today.

What this report does aim to provide is background information, assessment methodology, and examples to help the Town make informed procurement decisions going forward. Section 5.A. looks at some specific EV models that are available in NL at the time of this study and illustrates how you may compare these options to each other and to an internal combustion engine (ICE) option.

3.A. PRACTICALITY

A workshop was held on April 11th with the consultant team and 12 Town of Torbay staff members who each have direct or indirect contact with fleet vehicles on a regular basis including: the Directors of Public Works, Planning, Finance, and Economic Development; public works supervisor, foreman, facility manager, heavy equipment operators, and the Fire Chief.

During this meeting, each of the light-medium vehicles were discussed in turn to review their typical operations. No vehicles were identified as being driven more than 100 km per day, generally, and none require significant towing capacity. These are key factors that indicate that EVs would be suitable. EVs become less manageable if the user must travel long distances or tow heavy loads often. Due to the demand that these activities place on the battery, it can be difficult to schedule charging in these cases. For Torbay, most trips remain within the town boundaries and most vehicles are used lightly.

All-wheel drive is preferred, which is a feature offered in many new EVs. Pick-up trucks are also preferred for most applications due to the need to drive on uneven terrain and/or carry equipment and supplies. Two electric pick-up trucks are currently on the market in NL (see Section 5.A.). When discussing opportunities for right-sizing (potential to get by with smaller vehicles) or down-sizing (potential to get by with fewer vehicles), there was consensus among the staff that the fleet's capacity is already being stretched to accommodate the growing population, and that expansion of the fleet will likely be necessary in the coming years.

EVs would be able to be charged overnight, on weekends, and during breaks throughout the day. The only concern raised was that some vehicles are currently driven home at the end of the day by employees. If this were to remain the case, there could be issues regarding reimbursement of personal electricity costs and charging ability or speed (EVs can be charged by any outlet, but charging will be slower – see Section 5.A.). This, however, is not seen as an insurmountable barrier – it would just require some changes to current procedures.

There was a higher level of uncertainty around the use of electric heavy-duty equipment, particularly vehicles that must perform critical tasks like snow clearing. In severe events, plows could need to be on the road for 24 hours at a time. Other equipment, like excavators or plows, are typically left on a work site until the job is done – needing to charge could disrupt this process if an electricity source is not available. For these reasons, and given the 'newness' of the heavy-duty EV market, this study focuses on the light-medium duty fleet. As mentioned above, we did gather some information related to electric heavy-duty equipment from NL suppliers as part of this study (see Section 5.C.), but in general, it is suggested that the Town 'keep an eye out' in the coming years as technology progresses. Cost and GHG projections related to electrification of the heavy-duty fleet is included in this study for completeness.

3.B. COSTS

3.B.I. OPERATIONAL ENERGY

Considering the 2024 gas/diesel costs and the August 2024 NL Power electricity rates, the following energy cost savings are projected annually if electrification proceeds as described. These calculations do not consider any changes in fleet operation (changes in kilometers driven, idling time, or number of vehicles) – it is simply a translation of the 2024/2025 fleet energy data from fossil fuel-based technology to electric.

Table 3.3 Projected Operational Energy Cost Savings

EV Transition Phase	2024 Annual Fuel Cost (gas or diesel)	Projected Annual EV Electricity Cost	Projected Annual Cost Savings with EVs
Town - Proposed EVs by 2030 (7 units replaced)	$22,681.1	$4,176.8	-$18,504.2
Fire Dept. - Proposed EVs by 2030 (2 units replaced)	$1,744.6	$321.3	-$1,423.3
Remaining Light & Medium Duty Vehicles by ~2032 (3 units replaced)	$17,456.00	$3,170.7	-$14,285.3
All Town Heavy-Duty Units by 2050 (13 units replaced)	$73,638.8	$22,396.2	-$51,242.6
Fire Department Heavy Duty Units by 2050 (4 units replaced)	$4,803.3	$1,656.2	-$3,147.1
Full Electric Fleet	**$120,323.7**	**$31,721.2**	**-$88,602.5**

The graph below illustrates how the Town's total energy costs will reduce if electrification occurs in this order (again, considering current fuel and electricity costs).

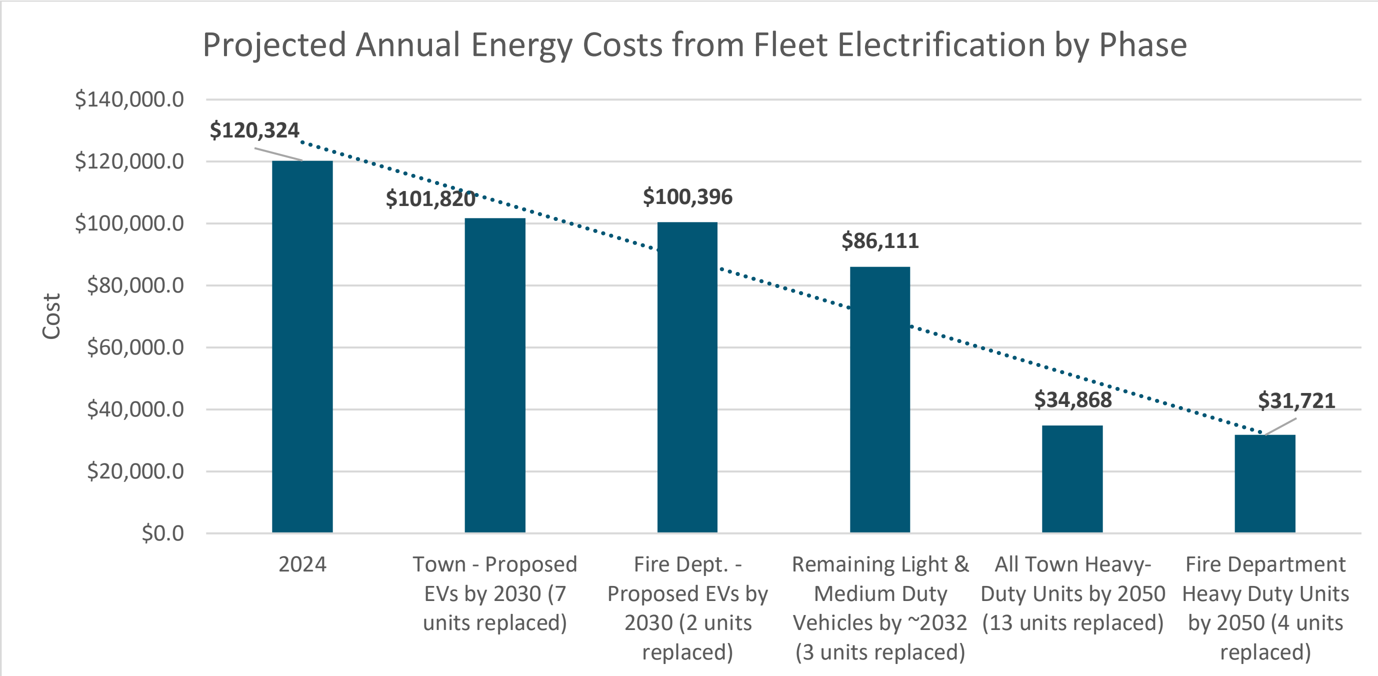


Figure 3.1 Projected Annual Energy Costs from Fleet Electrification by Phase

Of course, future electricity, gasoline, and diesel costs are unknown. The following graph depicts the potential circumstances that could arise, considering cost changes from -75% to 200% for both fuel and electricity. The costs depicted include all the light-medium duty vehicles (proposed replacement by 2032).

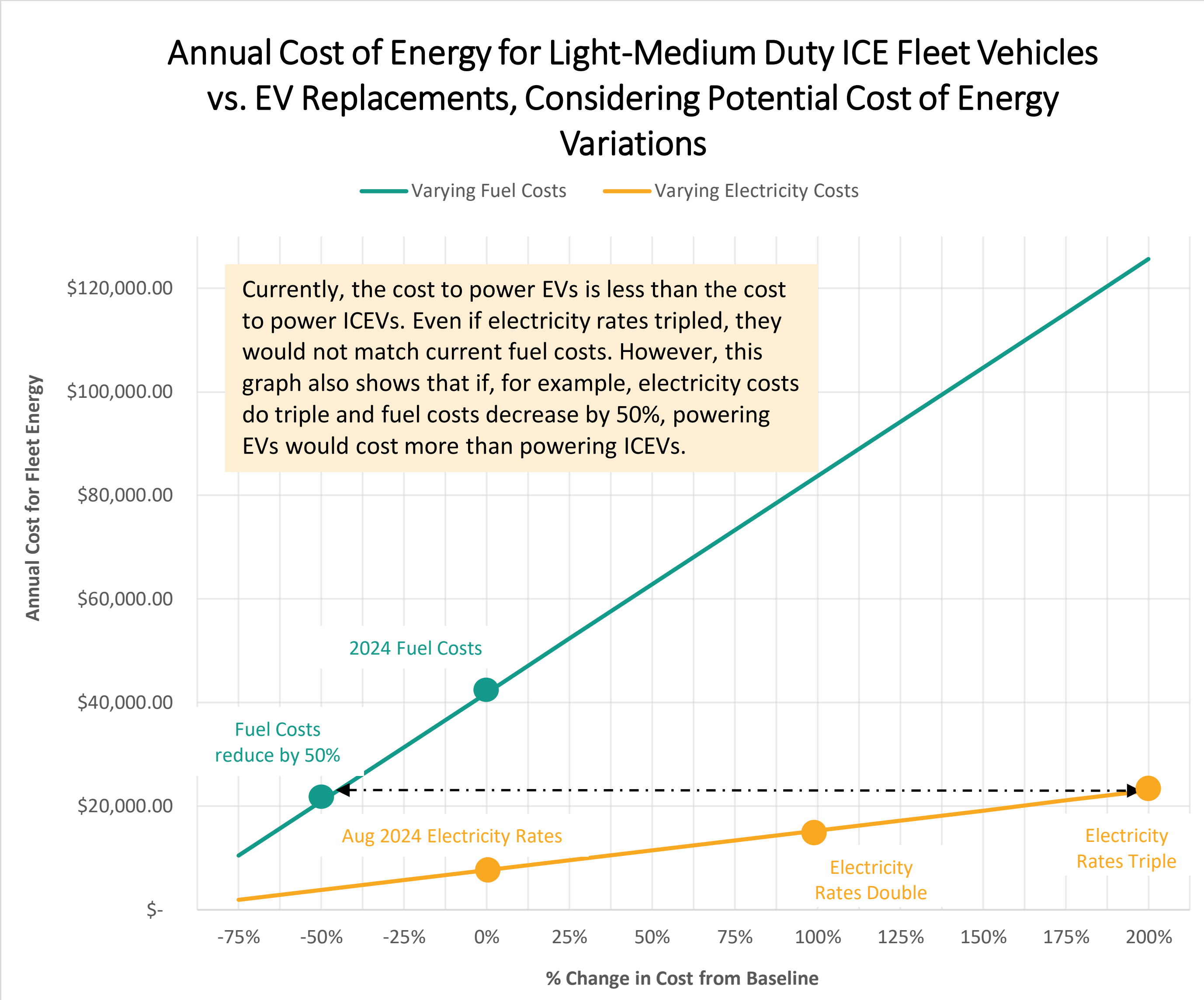


Figure 3.2 Potential Cost of Energy Variations - Annual Costs for Light-Medium Duty ICEVs vs. EVs

As described on the graph, the cost to power EVs is currently less than the cost to power ICEVs. Electricity rates would need to more than triple for the cost of EV fueling to meet the current cost of ICEV fueling. However, if gasoline and/or diesel costs decrease significantly while electricity costs increase, it is not impossible for EV operation to cost more than ICEVs (for example, if electricity rates triple and fuel costs reduce by 50%). Given expected increases in both electricity and fuel costs, it appears quite unlikely for the balance to shift in favour of ICEVs.

3.B.II. MAINTENANCE

EV owners save an average of 40-50% on maintenance costs compared to ICEVs. EVs have fewer moving parts so there is less that can go wrong, there is no oil to change and no exhaust system to maintain. Brakes typically last longer in EVs because of the regenerative braking system. The regenerative braking system can also be overused – if a driver relies entirely on this system and engages the friction (pedal) breaks very infrequently, the brakes could 'seize up' and rust. It's important to use both systems to maintain a balance.

Because EVs are heavier than ICEVs due to their batteries, they need specialized tires. The tires may be more expensive (20-30% more than 'regular' tires) and may need to be replaced more often due to the extra weight and the instant torque that the electric motor provides. Using inappropriate tires or having underinflated tires on an EV could result in reduced range/suboptimal performance.

Many EVs are available from local dealerships which can directly service them (in NL, this includes Ford, Chevrolet, Hyundai, Volkswagen, etc.). Since EVs are still less popular than ICEVs, it can be more difficult to find independent garages that are trained to service them, but this is changing as EV adoption increases.

There is a significant amount of misinformation circling in Torbay and elsewhere about EV batteries.

All new EVs come with an 8-10 year or 160,000 km warranty on the battery. The Town's current vehicle procurement policy for light and medium duty vehicles follows 7-9 and 5-7 year replacement cycles, respectively. Given that the vehicles only drive within the Town's boundaries, they are unlikely to surpass 160,000 km in this time. **As long as replacement timelines for each vehicle are aligned with its specific warranty period, it is very unlikely that the Town would be on the hook for the cost of a battery replacement**.

Along with this, EV battery replacements are very rare overall. A 2023-24 study of 20,000 EVs showed that of the oldest EVs on the road (which are now 10-15 years old), 13% have had battery replacements. Of EVs that were manufactured after 2016, the figure drops to less than 1% (the average across all EVs from all years is 2.5%). While these newer EVs have not been around long enough for us to know for sure how long they will last, battery and battery management technology has advanced so much since those first models, that we have good reason to expect that replacement rates will continue to be low.

Also, the cost of batteries (and therefore battery replacement cost) has dramatically decreased – prices reduced by 85% between 2013 and 2024. This downward trend is attributed to advancements in battery technology, economies of scale in production, and a decrease in raw material prices.

While the actual maintenance requirements of any specific vehicle are always difficult to predict (all vehicles can experience issues, ICEV or EV), we can assume given the available information and statistics, that the Town could expect to spend about 50% less on maintenance than it has in the past.

Table 3.4 Projected Maintenance Cost Savings

EV Transition Phase	Average Annual Maintenance Cost (2022-2024)	Projected Annual Savings with EVs (50%)
Town - Proposed EVs by 2030 (7 units replaced)	$15,104.6	$7,552.3
Fire Dept. - Proposed EVs by 2030 (2 units replaced)	$8,333.3	$4,166.7
Remaining Light & Medium Duty Vehicles by ~2032 (3 units replaced)	$10,180.9	$5,090.4
All Town Heavy-Duty Units by 2050 (13 units replaced)	$16,666.7	$8,333.3
Fire Department Heavy Duty Units by 2050 (4 units replaced)	$159,783.0	$79,891.5
Full Electric Fleet	**$210,068.5**	**$105,034.2**

3.B.III. INSURANCE

"Will my insurance be higher or lower for an EV compared to an ICEV?". This is a common question, but there is not a straight answer. So many factors contribute to vehicle insurance rates - the specific vehicle model, anticipated vehicle use, driver history, location, etc. - that the only way to know for sure is to get quotes from insurance providers. Some insurance companies have special rates for EVs, like TD and Aviva. Like any type of insurance, shopping around is recommended.

Anecdotally, we're aware of EV owners which pay less, more, and about the same as they did for their previous ICEV. The differences in either direction are often not that much – not enough to impact the overall financial case for going electric.

3.B.IV. TOTAL LIFECYCLE COST

At present, EVs typically have a higher upfront cost than an ICEV of the same type. Whether this higher upfront cost pays off in the end is dependent on a number of factors which vary throughout the world - the cost of electricity vs. fuel, how much you drive, maintenance and insurance costs, and whether there are any Government financial incentives involved. In Canada, the consensus is that an investment in an EV will usually pay off in less than 5 years.

Currently, there is a $2,500 Provincial rebate for EVs available from NL Hydro. The Federal rebate is also expected to be reinstated shortly (was $5,000 in previous years, though the amount for the next round has not been officially announced as of July 8th, 2025). A combined grant and loan for municipal fleet electrification is available from the Federation of Canadian Municipalities.

In 2022, Clean Energy Canada completed lifecycle cost analyses for several EV models and their ICEV equivalent and found that most result in significant savings over the long term. Below are two of the 'postcards' available at the bottom of the linked webpage which illustrate the lifecycle savings associated with an EV SUV and EV Truck, updated in 2024.

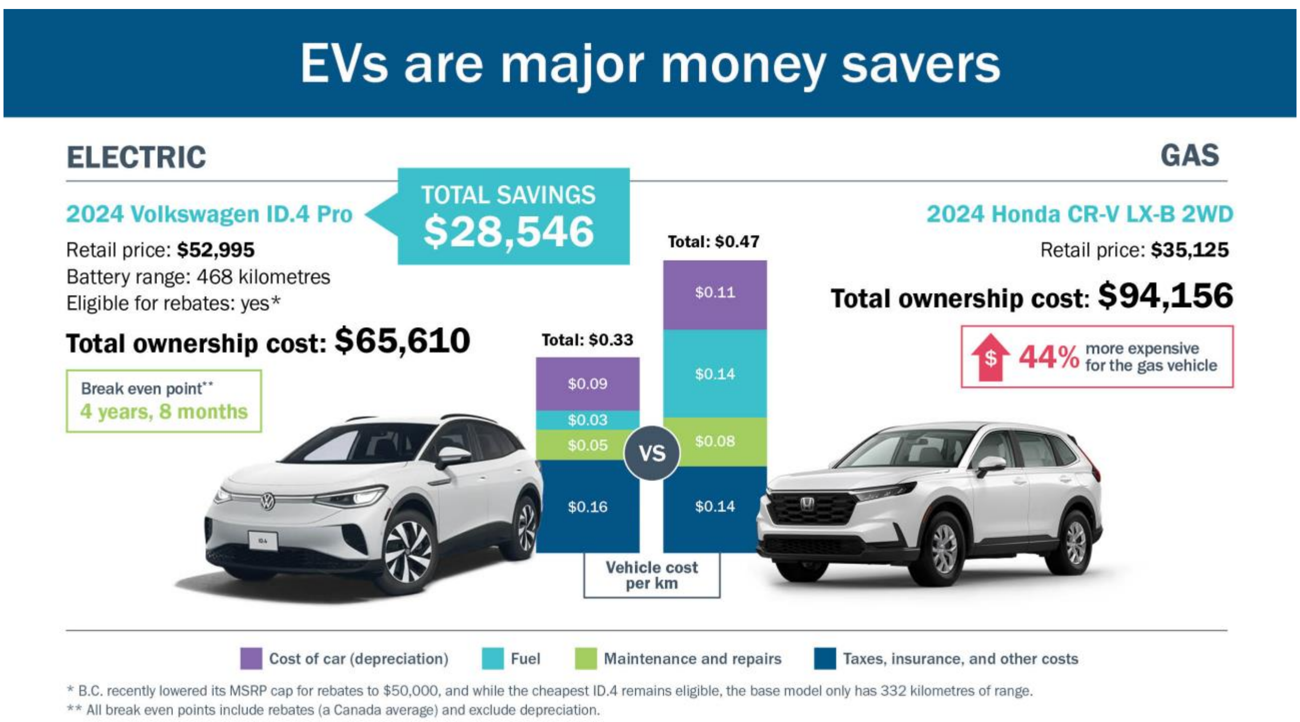


Figure 3.3 Clean Energy Canada SUV EV vs. ICEV Lifecycle Cost Assessment

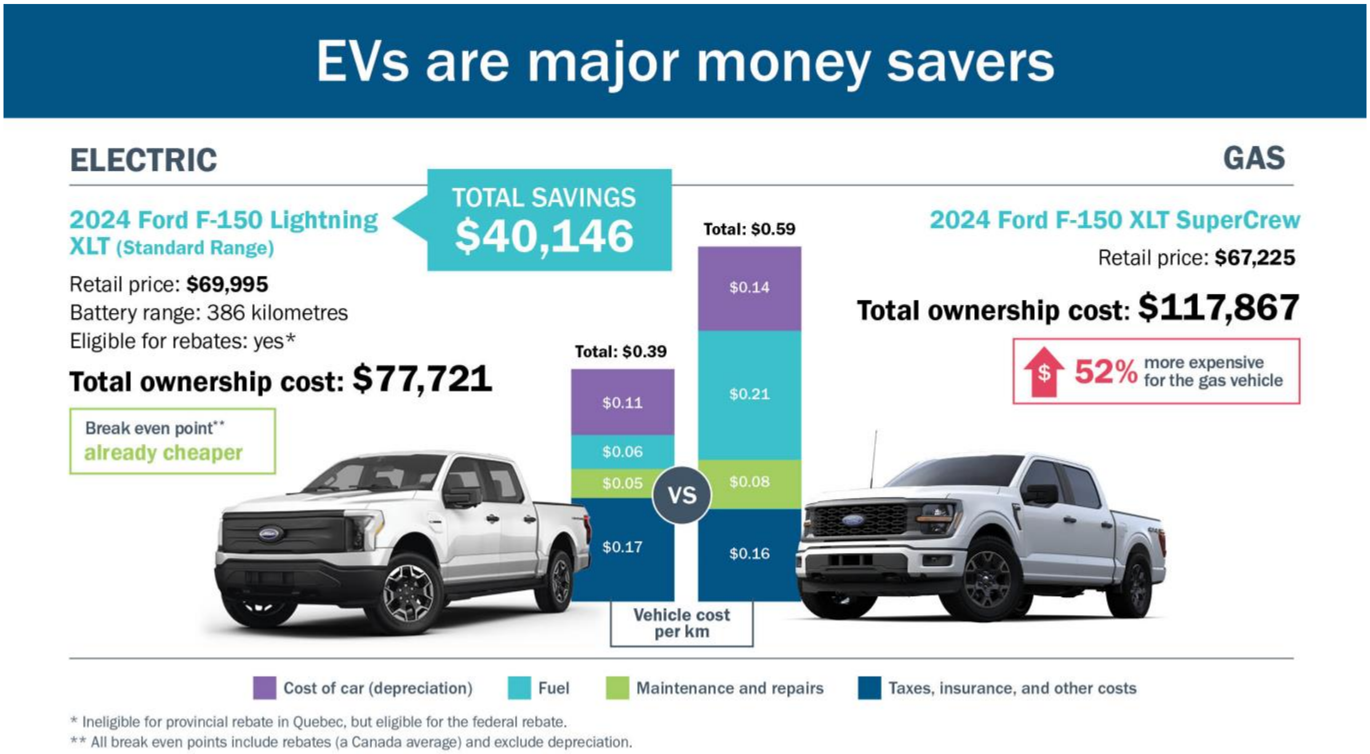


Figure 3.4 Clean Energy Canada Truck EV vs. ICEV Lifecycle Cost Assessment

Considering that upfront costs change over time, from model to model, and in response to market conditions such as supply/demand, competition, and international relations (i.e. the tariffs being imposed by the United States at the time of the preparation of this report), attempting to do a robust analysis of lifecycle cost for any specific potential Torbay replacement vehicle is not especially useful at this time. The purchase price we use today could be irrelevant a few months or even days from now. Ultimately, this type of assessment must be done at the time that a vehicle is to be procured. All this being said, we did complete a comparative analysis of some vehicles in Section 5.A, but this is meant to be more illustrative than informative – the goal of this section is to provide an example and template for future decision making rather than make the case for any particular vehicle option right now.

3.C. GHG EMISSIONS

3.C.I. OPERATIONAL ENERGY

Considering the 2024 fleet energy consumption and the most recent emission factor for the NL electricity grid, the following GHG emission savings are projected annually if electrification proceeds as described. Similar to the cost estimations, these calculations do not consider any changes in fleet operation (changes in kilometers driven, idling time, or number of vehicles) – it is simply a translation of the 2024/2025 fleet energy data from fossil fuel-based technology to electric.

Table 3.5 Projected Operational Energy GHG Savings

EV Transition Phase	Estimated GHG Reduction (tCO_2e)	% GHG Reduction (of 2024 Total Fleet emissions)
Town - Proposed EVs by 2030 (7 units replaced)	30.3	-17.3%
Fire Dept. - Proposed EVs by 2030 (2 units replaced)	2.33	-1.3%
Remaining Light & Medium Duty Vehicles by ~2032 (3 units replaced)	23.35	-13.3%
All Town Heavy-Duty Units by 2050 (13 units replaced)	107.97	-61.6%
Fire Department Heavy Duty Units by 2050 (4 units replaced)	7.07	-4.0%
Full Electric Fleet	**171.0**	**-97.5%**

The graph below illustrates how the Town's total fleet emissions will reduce if electrification occurs in this order.

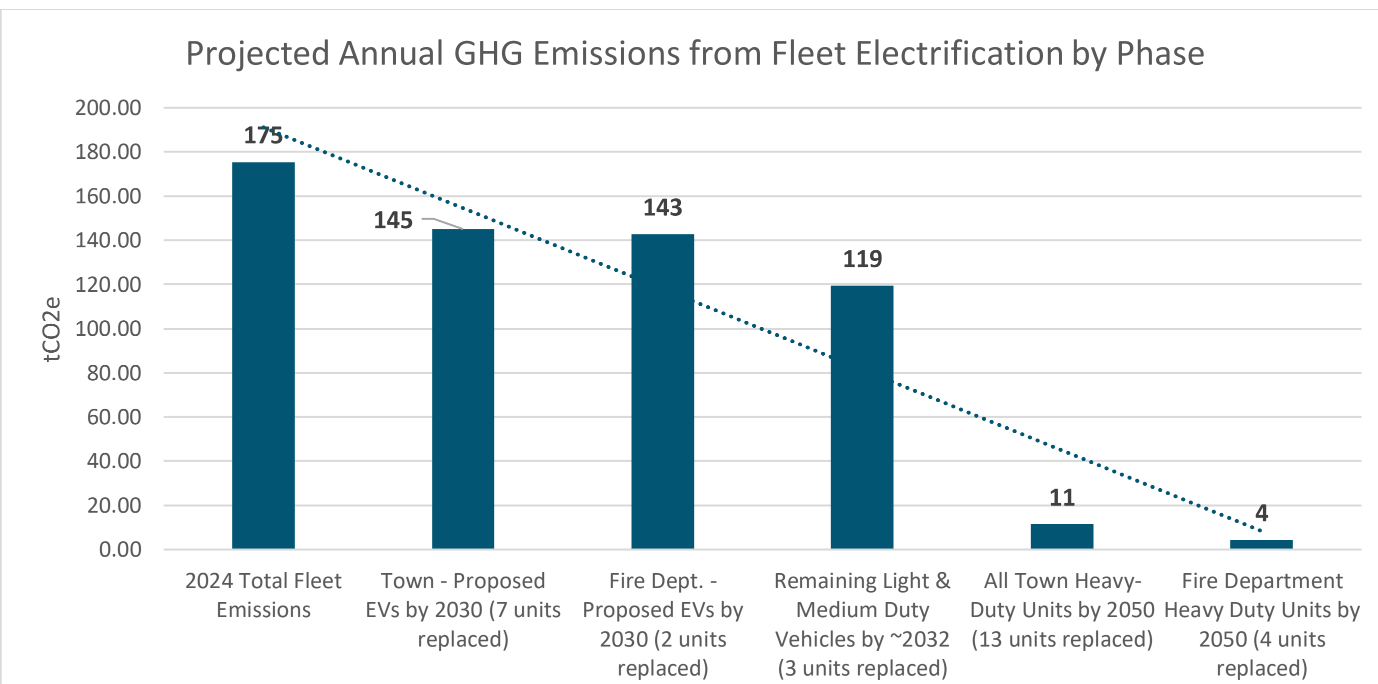


Figure 3.5 Projected Annual GHG Emissions from Fleet Electrification by Phase

The ~4 tCO2e remaining in 2050 after all fleet vehicles have been electrified reflects the emissions associated with the electricity grid considering its current emissions intensity. This is likely to be even closer to zero by this point in time as the goal Provincially, Nationally, and Internationally is to transition away from all fossil-fuel based power sources (in the NL context, this means shutting down the Holyrood Thermal Generation Plant and increasing renewable energy generation).

As described in Section 2.B., the Town of Torbay's current emission reduction targets are:

- 30-45% below 2018 levels by 2030
- Net-Zero by 2050

While these targets are relevant to the Town's overall corporate emissions (which also includes buildings, waste, etc.), the proposed fleet electrification pathway aligns with these goals.

According to the fleet emission estimate for 2024, a 22% reduction has already occurred since 2018 (despite emissions rising during some of the intermediate years – see Section 2.B.). As shown in the table below, this means that the upper goal of a 45% reduction from 2018 levels may be surpassed in 2030 if all light-medium duty vehicles are replaced with EVs. The lower 30% reduction goal is likely to be surpassed even if only a few ICEVs are replaced with EVs in the next 5 years. If 2024 is considered the baseline, a 30% reduction will still occur by 2030 if following this plan.

As heavy-duty vehicles account for the largest share of the Town's fleet emissions, achieving reductions beyond this (toward net-zero), will require some amount of electrification or other reduction in fossil fuel use by 2050.

Table 3.6 Projected Cumulative Emission Reductions vs. 2018 and 2024 Levels

EV Transition Phase	Cumulative % GHG Reduction (vs. 2024)	Cumulative % GHG Reduction (vs. 2018)
Town - Proposed EVs by 2030 (7 units replaced)	-17.3%	-35.6%
Fire Dept. - Proposed EVs by 2030 (2 units replaced)	-18.6%	-36.6%
Remaining Light & Medium Duty Vehicles by ~2032 (3 units replaced)	-31.9%	-47.0%
All Town Heavy-Duty Units by 2050 (13 units replaced)	-93.5%	-94.9%
Fire Department Heavy Duty Units by 2050 (4 units replaced)	-97.5%	-98.1%

3.C.II. LIFECYCLE CARBON

GHG emissions are causing climate change. When it comes to vehicles, we usually think about the emissions from the use stage (driving it), but there are also emissions associated with extracting, processing, and assembling the materials to make it (the production stage) and the emissions that occur when we recycle or landfill the materials when the car is retired (disposal stage). A lifecycle GHG assessment (sometimes called a carbon footprint) considers all of the sources of emissions that a vehicle creates from production to the end of its life. Doing a lifecycle GHG assessment is a complex scientific process and there are many variables involved.

A 2022 study analyzed 790 different vehicle models and concluded that BEVs have lower overall lifecycle GHG emissions compared to conventional ICEV vehicles, despite having higher GHG emissions associated with the production stage (due to their lithium-ion batteries). If renewable energy is used to charge the BEV, this study said the lifecycle emissions of BEVs are up to 89% lower than an ICEV (this is the case here in NL where our electricity is primarily from hydro power).

A 2023 literature review analyzed the results of 122 different publications and found that the lifecycle emissions for a gas vehicle are 97% higher than that of an electric vehicle, and 70% higher for a diesel vehicle.

According to the public survey conducted as part of this project, many people in Torbay have misconceptions around this topic, despite the most recent research (see Section 10). This is a commonly believed myth that has been debunked repeatedly by scientific assessment.

3.C.III. OTHER ENVIRONMENTAL IMPACTS

GHG emissions are one type of environmental impact, but there are several other metrics that lifecycle assessments often look at related to ecosystem and human health.

The 2023 study noted above found that EVs result in better air quality than ICEVs (which makes sense intuitively - no fuel means no exhaust), but extraction of the metals used to make lithium-ion batteries currently has more negative environmental and social impacts than the production of ICEVs. Proper recycling and reuse of the batteries at the end of their life can reduce these impacts. Significant research and development is underway around the world to make recycling processes more efficient and to develop new types of batteries that use less (or none) of these rare metals.

4. OTHER FLEET EMISSION & COST REDUCTION OPPORTUNITIES

4.A. FOCUS ON "HEAVY HITTERS"

Section 3 outlined a pathway that involves electrifying every light-medium duty vehicle as it is due to be replaced. Given the cumulative cost and emission savings, this is still the preferred approach. However, considering the 2024 fleet operations (some vehicles drive more or are less fuel efficient than others), not all EV replacements have the same impact.

The units responsible for the most emissions in the light-medium category (which therefore would result in the largest emission reductions due to electrification) are listed in the table below. Since emissions are directly connected to fuel usage, electrifying these vehicles would also result in the greatest cost savings.

Unit #	Vehicle Model	Current Use	Planned Replacement Year	EV Emission Reduction (tCO2e)	% of Total 2024 Fleet Emissions
02-16	2022 Chevrolet Silverado	Water & Sewer	2029	17.1	9.7%
02-20	2025 Chev Silverado	Public Works	2032	14.9	8.5%
02-09	2014 GMC 1500	Public Works	2026	5.6	3.2%
02-19	2024 Chev Silverado 2500 HD	Public Works	2031	5.1	2.9%
			TOTAL	**42.7**	**24.3%**

Electrifying these 4 vehicles would reduce emissions (with respect to the 2024 total) by 24.3%. Compare this with the assessment that replacing all 12 light-medium duty vehicles (both Town and Fire Dept.) would result in a total emission reduction of 31.9%. In other words, these 4 vehicles account for 76% of the GHG emissions from the light-medium duty fleet.

Note that the fuel use and emissions of Unit 02-20, acquired in 2025, have been estimated based on the data associated with the vehicle that it replaced (Unit 02-12) – i.e. it is assumed that the replacement will behave similarly to its predecessor.

Considering that overall fleet emissions do not rise beyond the 2024 level (the 22% reduction from 2018 levels remains intact), electrifying Unit 02-09 and Unit 02-16 as planned (or even just 02-16, the highest impact vehicle), would result in the 2030 target being reached (31.7%-34.9% reduction from 2018 levels). However, it may be premature to assume that the 2018-2024 reduction of 22% is permanent (as it is more likely due to normal variations in operations than any specific action).

While targeting the largest emitters/spenders is a sound strategy, replacing other light-medium duty ICEVs in the near-term with other ICEVs may not be. Also, these "heavy hitter" vehicles are heavy-hitters because they have higher operational demands. It is possible that there would be more challenges associated with electrifying these vehicles compared to the ones that are used more lightly (battery capacity and charging time requirements may be more critical).

4.B. REDUCE IDLING

Due to the Town's fleet tracking software, we can assess the idling behaviour of the fleet and its cost and emissions impacts. The following graphs and tables consider the Town's light-medium duty fleet (note that Unit 02-13 is not included in this record).

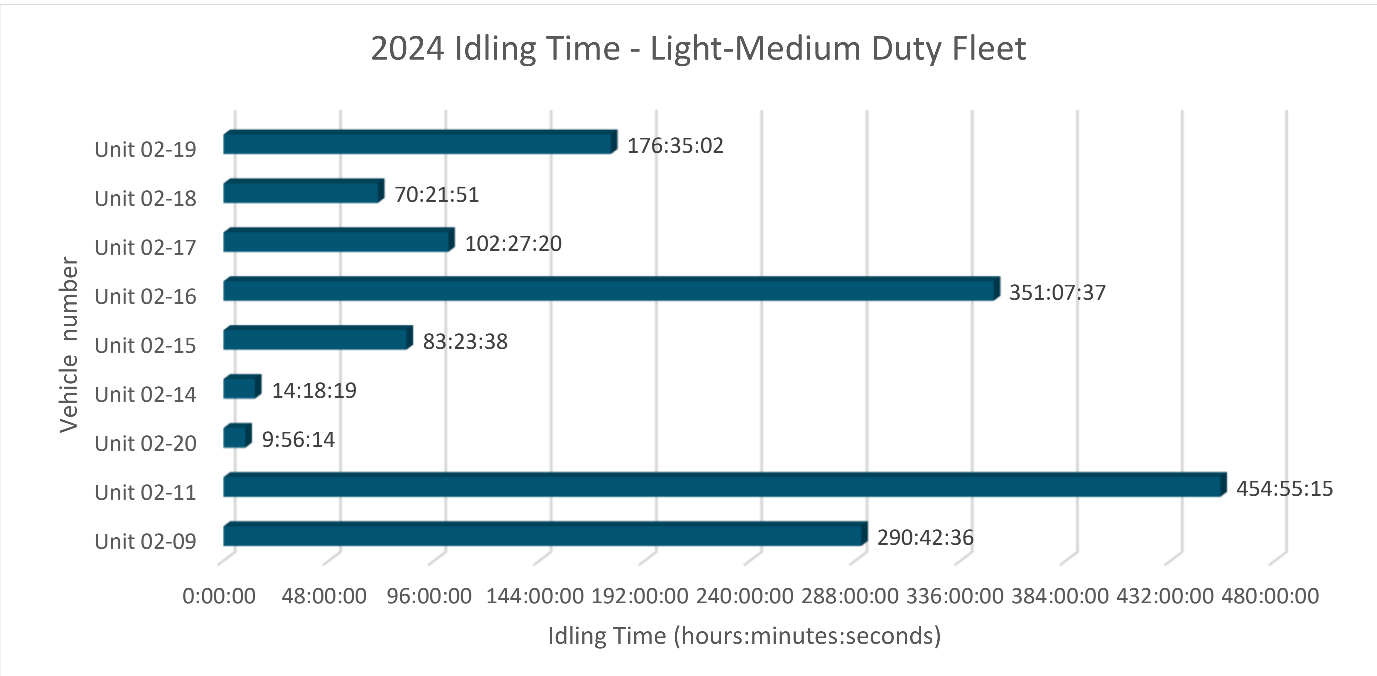


Figure 4.1 2024 Idling Time - Light-Medium Duty Fleet

Table 4.1 Estimated Idling Impacts of Light-Medium Duty Fleet

Estimated Idling Impacts of Light-Medium Duty Fleet	
Total Hours Idling	1553
Estimated Fuel burned while idling (L)	2,734
Corresponding Fuel Cost ($)	$4,659
Corresponding Emissions (tCO2e)	6.3
% of Light-Medium Duty Fleet Emissions	12%

Fuel burned while idling was estimated by determining the idle fuel flow rate (L/hour) for each vehicle using values from Natural Resources Canada.

Reducing idling time would certainly result in cost savings and GHG reductions and is a worthy endeavour; however, the majority of GHG emissions from fleet vehicles come from driving/operation. Combined with phased electrification of units, reductions in idling can contribute to reaching or exceeding the Town's goals.

If all of these vehicles were 100% electric but idled the same amount of time, the cost in extra electricity would be $781 and the emissions would be basically negligible (0.0001 tCO_2e or about 100 gCO_2e) – unnecessary idling would still be a 'waste' of money, but the environmental impact would be much lower.

4.C. PLUG-IN HYBRIDS & HYBRIDS

Plug-in Hybrid Electric Vehicles (PHEVs) combine electric propulsion with a gasoline engine. They have a battery system that is much smaller than a BEVs, but which must be plugged in to charge like a BEV. This small battery system allows the vehicle to be driven using electricity only for a limited range (i.e. 50-80 km), before 'switching over' to the gas engine.

Hybrid vehicles are primarily gasoline-powered with some electric assist. They are not plugged in for charging – the only 'charging' that occurs is due to regenerative breaking (which BEVs and PHEVs also do to recover additional electrical energy). Often just called "hybrids", these types of vehicles are not considered a type of EV at all. While they are more fuel efficient than a non-hybrid ICEV, the emission reduction impact is significantly less than a BEV or PHEV. Hybrid ICEVs are not eligible for any type of government financial incentive or funding programs related to reducing emissions, including the FCM Municipal Fleet Electrification program that has funded this study. PHEVs are typically eligible for lower rebate amounts than BEVs (in the NL program, you can get back $2,500 for BEVs and $1,500 for PHEVs).

PHEVs are allowed under this FCM program, but FCM does advise that BEVs be prioritized over PHEVs. While a PHEV can potentially behave like a BEV by never or rarely being driven in 'gas mode', they can also be used more like an ICEV and ultimately not reduce emissions that much (behaving more like a 'regular' hybrid). This happens when the PHEV is not plugged in regularly. Because the battery is small, it charges quickly, but also depletes quickly. Because the vehicle will switch to the gas engine when the battery is depleted, it's easy not to notice the change and forget to plug in. If this happens often enough, the PHEV could be driving as a gas vehicle quite a lot, basically eliminating the benefits of the battery system. In fact, operating a PHEV in this way could be less efficient than operating a regular hybrid – a PHEV is heavier due to the battery, so its fuel efficiency is compromised compared to a lighter hybrid ICEV. A 2022 study estimated that this operational behaviour is a common problem – it concluded that the fuel consumption of PHEVs may be 42-67% higher than assumed by regulators.

If operated properly, PHEVs can be a good choice for consumers that don't drive far in a typical day, but do need to drive longer distances or haul heavy loads here and there. It is possible to operate 100% electrically the majority of the time (staying within the battery's range) and to only allow the vehicle to enter 'gas mode' during long distance or heavy load trips. However, similar to the regenerative breaking system of all hybrid and electric vehicles, there are also risks involved in not using the gas system enough. If fuel sits in the tank for too long and components go unused and unlubricated, you could run into maintenance issues.

Overall, PHEVs are known to have more reliability issues and higher maintenance costs than ICEVs, conventional hybrids, and BEVs. This is because they have two completely different propulsions systems at the same time – an electric motor and battery, and a gas motor. They need all the same maintenance that an ICEV needs (oil and filter changes, exhaust maintenance, spark plugs, etc.) plus additional inspections related to the electric system. Interactions between the two systems can lead to some more complicated situations compared to the simplified system of a BEV.

Some may choose a PHEV over a BEV simply for the peace of mind that the fuel tank provides, but as described above, operating a PHEV optimally can be a tricky balancing act and some of the benefits of going electric are lost due to the presence of a combustion engine. The pros and cons need to be weighed carefully on a case-by-case basis to determine whether a PHEV is really better for a given situation.

Because the Town of Torbay's light and medium duty fleet vehicles are generally lightly used (driven less than 100 km a day and do not haul heavy loads), the 'range safety net' of PHEVs is likely not a significant enough benefit to outweigh the downsides (lower fuel and maintenance cost savings, fewer GHG reductions, and more complicated operation).

The only vehicle that was identified to occasionally travel a further distance was Unit 02-13 (a Ford Escape used for Office/Admin purposes) which is taken by staff to conferences in Gander. Torbay is about 340 km from Gander. There are BEV options with ranges that exceed this, though the time of year of the event (temperature) will also be important to consider when planning the trip (see Section 7.C. regarding the impact of cold on EV batteries). There are multiple EV chargers available in Gander and along the way (see Section 7.D.) - this is a route commonly taken by EV owners in NL. Overall, the Town needs to consider how much influence an event that occurs once or twice a year has on the selection of any particular vehicle compared to its typical day-to-day operation.

Other situations that may warrant the consideration of a PHEV instead of a BEV include:

- Vehicles which are likely to use the majority of their battery capacity in a given day and could also need to be used at short notice in emergency situations (i.e. could end up in a situation where the vehicle is needed suddenly afterhours but there is insufficient charge remaining to complete the task).
- Heavy-duty vehicles which may use battery power more quickly and operate in locations without electricity access.

In general, we recommend the following:

- Prioritize BEV over PHEVs wherever suitable to maximize fuel and maintenance cost savings and minimize emissions.
- If PHEVs are procured, have procedures in place to ensure that they are charged frequently to maximize their time in electric mode but not compromise the function of the ICE system.

At present, there are many PHEV cars and SUVs on the market (including the Ford Escape PHEV, Hyundai Santa Fe PHEV, Kia Sportage PHEV, Toyota Prius PHEV etc.), but we are awaiting the release of any PHEV pick-up trucks. The Ram 1500 Ramcharger is expected to be the first PHEV truck to hit the North American market in 2026 (Ram will also be releasing a 100% BEV truck around the same time).

4.D. FLEET OPTIMIZATION

Discussions with Town Staff indicated that now may not be the time for down-sizing the fleet (reducing the number of vehicles) due to the growth that the municipality is experiencing. Replacing an existing vehicle with a smaller vehicle is considered "right-sizing". Pick-up trucks are preferred by the Town for most applications, though one case was noted where a cargo van could similarly meet performance requirements (Unit 02-17, currently a GMC Canyon which is used to transport snow clearing equipment like snowblowers but is not used as a plow).

If an electric vehicle is being targeted as a replacement, the size of the vehicle has less of an impact on operational costs and GHG emissions than it would if an ICEV were being purchased. An EV truck will certainly use more electricity than an EV car/SUV, but the magnitude of the impact will be less than the difference between an ICE truck and an ICE car/SUV. This is illustrated by the example in the table below – the F-150 and Kona have similar energy consumption differences whether both are ICEV or both are EV (39% and 41%, respectively), but (relatively speaking) you save a lot more by getting an ICE Kona over an ICE F-150 than you save by getting an EV Kona over an EV F-150.

Table 4.2 Comparison of larger and smaller ICEVs and EVs

ICEV	Consumption Rating (Combined)	EV	Consumption Rating (Combined)
2025 Ford F-150 4X4	12.4 L/100km	2025 Ford F-150 Lightning Standard	3.4 L_e/100km*
2025 Hyundai Kona	7.6 L/100km	2025 Hyundai Kona EV	2.0 L_e/100km
Difference in consumption	39%	Difference in consumption	41%
Energy Cost Difference in 100,000 km	$8,181	Energy Cost Difference in 100,000 km	$1,756
Emissions Difference in 100,000 km	11 tCO2e	Emissions Difference in 100,000 km	0.2 tCO2e

*L_e/100 km is a factor used to compare the energy consumption of EVs with that of ICEVs. L_e represents "equivalent liters" of gasoline – the energy of 1 L of gas is equal to about 8.9 kWh of electricity. All consumption ratings in the table above were gathered from NRCan's Fuel consumption ratings search tool.

This assessment shows that rightsizing efforts are worth considering where electrification is not suitable, but may be less of a priority if electrification is planned.

However, if we look beyond operational energy use, smaller vehicles will always be better when it comes to lifecycle carbon, whether EV or ICE. Every kilogram of material used to manufacture any product that we make has associated emissions, so reducing material quantities inherently reduces embodied carbon. In fact, the transition to larger and larger vehicles across our society has been a major contributor to the climate crisis and we cannot expect to meet our global sustainability goals without reversing this trend (and reducing the overall number of vehicles on the road). Transitioning to zero emission vehicles alone without changing these other factors will keep us in a cycle of overconsumption, compromised pedestrian safety, inactivity, and heavy traffic.

Returning to Unit 02-17, the Ford eTransit or Ram ProMaster EV are two electric cargo vans that could be considered alongside an EV truck replacement. Whether the upfront cost, anticipated energy use, and functionality would be more or less favourable than an EV truck would have to be considered at the time of procurement. If there is a need/desire not to electrify Unit 02-17 upon the next replacement date, we recommend considering an ICE cargo van instead of an ICE truck to experience some fuel cost savings and operational and lifecycle emission reductions.

5. ASSESSING VEHICLE OPTIONS

According to the current replacement schedule, the vehicles that will be replaced soonest are:

Unit #	Vehicle Model	Current Use	Duty	Planned Replacement Year
02-09	2014 GMC 1500	Public Works	Medium	2026
02-11	2016 Ford F250	Public Works (Backup)	Medium	2026-2027

Therefore, let's illustrate how EV and ICEV truck options can be compared. The table below considers some key features of an ICEV Ford F-150, the EV Ford F-150, and the EV Chevy Silverado. All are 2025 models with four-wheel drive and towing capacity.

Table 5.1 Comparison of ICEV and EV Trucks

Factor	2025 Ford F-150 XLT 4x4 (ICEV) (2.7/6)	2025 Ford F-150 Lightning XLT Standard Range (EV)	2025 Chevrolet Silverado EV WT Standard Range
Price	$64,840.00	$74,010.00	$67,616.00
Provincial Rebate	$0.00	-$2,500.00	-$2,500.00
Federal Rebate	$0.00	-$5,000.00	-$5,000.00
Net Price	$64,840.00	$66,510.00	$60,116.00
Towing Capacity	8,000 lbs	7,700 lbs (Max Trailer Tow Package)	12,500 lbs
Four Wheel Drive?	Yes	Yes	Yes
Basic Warranty	3 Years/60,000 km	3 Years/60,000 km	3 Years/60,000 km
Fuel Consumption Rating (Combined)	11.8 L/100 km	3.4 Le/100km	3.5 Le/100km
Range	737 km	386 km	454 km
Battery Size	87 L gas tank	98 kWh	119 kWh
Onboard Battery Charger		11.3 kW	11.5 kW
Maximum DC Fast Charging Rate		15%-80% in 32 minutes	Up to 160 km in 10 minutes (350 kW DC)
Onboard Power Source		2.4 kW (120V) 9.6 kW (240V) – + $1,200	2.4 kW (120V) 7.2 kW (240V) – Extended Range WT
Battery Warranty		8 Years/160,000 km	8 Years/160,000 km

Some of these factors are familiar – price, towing capacity, warranty length, etc. When it comes to evaluating EVs, there are additional specifications that require some explanation to understand. When comparing EVs to ICEVs, some math may also be required. Let's break this down piece by piece.

5.A. INCORPORATING ESTIMATED FUEL COST

These purchase prices were gathered from the "Build & Price" feature on the Ford and Chevy websites. Currently, there is a $2,500 Provincial rebate for EVs available from NL Hydro. The Federal rebate is also expected to be reinstated shortly (was $5,000 in previous years, though the amount for the next round has not been officially announced as of July 3rd, 2025 - $5,000 is used in the below example).

Factor	2025 Ford F-150 XLT 4x4 (ICEV) (2.7/6)	2025 Ford F-150 Lightning LXT Standard Range (EV)	2025 Chevrolet Silverado EV WT Standard Range
Price	$64,840.00	$74,010.00	$67,616.00
Provincial Rebate	$0.00	-$2,500.00	-$2,500.00
Federal Rebate	$0.00	-$5,000.00	-$5,000.00
Net Price	$64,840.00	$66,510.00	$60,116.00

Considering the rebates, the Silverado EV is actually cheaper than the ICE F-150, but other comparisons may not be so obvious. This is upfront cost only, but throughout this report we discuss the importance of considering the entire lifecycle of the vehicle. How can you determine this quickly while making procurement decisions?

In the analysis of Section 3, we estimated what the electricity cost for an EV replacement would be based on the recorded fuel consumption of each existing fleet vehicle and assumptions around EV efficiency in general. When you are looking at specific vehicle models, we can use another, simpler method - Natural Resources Canada maintains a Fuel Consumption Ratings Tool which allows you find the energy consumption information for any vehicle model. With these numbers and a little multiplication, you can roughly calculate the expected energy cost.

Factor	2025 Ford F-150 XLT 4x4 (ICEV) (2.7/6)	2025 Ford F-150 Lightning XLT Standard Range (EV)	2025 Chevrolet Silverado EV WT Standard Range
Fuel Consumption Rating (Combined)	11.8 L/100 km	3.4 L_e/100km	3.5 L_e/100km

L/100km is a common metric for vehicle energy efficiency. If we know this value, we can calculate how many litres of gas a vehicle will use to drive a certain number of kilometers. In order to compare "apples-to-apples" the metric Le/100 km was developed to represent the "equivalent litres" of gasoline that an EV uses. The energy of 1 L of gas is equal to about 8.9 kWh of electricity. Knowing this, we can calculate how much electricity an EV will use to drive the same distance. With total L and total kWh, we can multiply by the current fuel and electricity rates to estimate the total energy cost. Let's do this step-by-step for these trucks considering 160,000 km driven:

<u>2025 Ford F-150 XLT (ICEV)</u>

First, let's get rid of the "100" that could mess us up later:

$$11.8\frac{L}{100km} = 0.118\frac{L}{km}$$

Now multiply by the number of kilometers (which is arbitrary):

$$0.118\frac{L}{km} * 160{,}000\ km = 18{,}880\ L$$

Using the average cost of gas in 2024:

$$18{,}880\ L * \frac{\$1.705}{L} = \$32{,}190$$

<u>2025 Ford F-150 Lightning XLT (EV)</u>

We still want to get rid of the 100:

$$3.4\frac{L_e}{100km} = 0.034\frac{L_e}{km}$$

Now we want to convert from litres of gas to kWh of electricity:

$$0.034\frac{L_e}{km} * 8.9\frac{kWh}{L_e} = 0.3026\frac{kWh}{km}$$

Using the same number of kilometers that we used for the ICEV:

$$0.3026\frac{kWh}{km} * 160{,}000\ km = 48{,}416\ kWh$$

Now we can find the energy cost using the relevant electricity rate (for the Town, this would be General Service #2.1):

[1] The first 3,500 kWh per month used by a particular meter costs more per kWh ($0.14098) than each kWh used after ($0.11143). If an EV charger is connected to an existing meter at a Town facility which already uses more than 3,500 kWh per month, the lower rate is a more accurate representation of what the EV contributes. If using the higher rate, the total cost for 160,000 km is $6,825.

$$48{,}416\ kWh * \frac{\$0.11143}{kWh} = \$5{,}394$$

The calculation for the Chevrolet Silverado EV is done in the same way, resulting in $5,553.

An **Excel spreadsheet template (ICE vs EV Energy Cost Estimator)** has been provided to the Town which will allow these calculations to be completed for any vehicles with just a few inputs.

Once complete, the resulting values can be added to the comparison:

Table 5.2 ICEV vs. EV Trucks: Upfront + Fuel Costs

Factor	2025 Ford F-150 XLT 4x4 (ICEV) (2.7/6)	2025 Ford F-150 Lightning LXT Standard Range (EV)	2025 Chevrolet Silverado EV WT Standard Range
Price	$64,840.00	$74,010.00	$67,616.00
Provincial Rebate	$0.00	-$2,500.00	-$2,500.00
Federal Rebate	$0.00	-$5,000.00	-$5,000.00
Net Price	$64,840.00	$66,510.00	$60,116.00
Estimated Energy Cost for 160,000 km	$32,190.40	$5,394.99	$5,553.67
Upfront + Fuel Cost	$97,030.40	$71,904.99	$65,669.67

Prior to doing these simple calculations, there didn't seem to be a huge difference between the gas F-150 and EVs once the rebates are included. Once we consider fuel costs, the gas truck is clearly the most expensive option - $25,000 to over $30,000 more. Removing the rebates ($7,500) does not significantly change this profound difference. Procurement of an EV will also require procurement and installation of a charging station, but that cost (a few thousand, at most) is also not significant considering this magnitude of overall cost difference. More on this in Section 7.B.

As discussed in Section 3, maintenance costs are hard to estimate in advance, but in general, EVs tend to cost 40-50% less than ICEVs. Insurance costs must be determined by getting quotes for each specific vehicle – once obtained, this can be added to the total cost for each option as well.

5.B. EV-SPECIFIC SPECS

New technology comes with new terminology. Here are a few of the key things to understand when trying to decipher what an EV offers:

Range – how far the vehicle can travel on a single charge. That's the simple definition – in reality, range is impacted by a variety of factors (as discussed in Section 5.B.). The 'rated' range stated by an EV manufacturer is based on their specific and averaged test conditions, which may or may not match the conditions you drive it in. For example, you may experience a bit more than the stated range in summer and less range in the winter.

While winter performance is not yet a standardized factor that is included in vehicle specifications, some independent testing conducted by the Canadian Automobile Association (CAA) in 2025 showed that the Chevrolet Silverado EV drove 14% less than it's rated range in the winter, while the Ford F-150 Lightning EV lost 35% of its rated range. Looking online for additional information such as this may be helpful when comparing EV models.

We don't usually talk about the range of an ICEV, but they too can only go a certain number of kilometers on single tank of gas. We can calculate the range by using the fuel consumption rate and the size of the gas tank. For the 2025 Ford F-150 XLT:

$$87 \text{ L tank } \div 11.8 \frac{L}{100km} = 737 \text{ km}$$

Battery Size – the battery size is directly related to the range. Knowing the battery size in kWh can be helpful if you want to do calculations related to charging time.

A kWh (kilowatt-hour) is a unit of measurement for *energy*. Energy is *power* used over time. A water analogy is often helpful to understand the difference between power and energy:

Power is like the strength of water flowing from a hose into a container. Energy is like the amount of water in the container. It takes time to fill up the container, and it will take more or less time depending on how fast the water is flowing out of the hose. The EV battery is the container in this case, the hose is the charger, and the water is electricity.

A 100 kWh battery can supply 100 kW of power for 1 hour, 1 kW of power for 100 hours, or anything in between. Similarly, it can take 1 hour to charge if it's being charged by a 100 kW power source or 100 hours to charge with a 1 kW power source. So, if you know the battery size of an EV and the power rating of the charger, you can roughly estimate how long it will take to charge. Like any energy system, there are some losses and other factors that impact speed (see Section 7.B.), but very simply, this is how it works:

$$\text{Energy (kWh)} = \text{Power (kW)} * \text{Time (h)}$$

$$\text{Battery energy (kWh)} \div \text{ Charger power (kW)} = \text{Approx. Charging time (h)}$$

One other science lesson before the next EV explanation -

Power is current (the movement of electrons, like water flowing) times voltage (a 'potential' difference that makes the electrons flow, similar to a pressure difference that makes water flow). There is alternating current (AC) and direct current (DC). The electrical grid that powers our buildings is AC, but the energy stored in batteries is DC. This means that the energy must be converted from AC to DC before the vehicle (or your phone, laptop, etc.) can accept it. This is done using an inverter which will be in one of two places – in the device, or in the charger.

Onboard Battery Charger – the 'onboard battery charger' rating in an EV tells you how much AC power the vehicle can accept based on its onboard inverter. Level 1 and Level 2 EV chargers provide AC power. Level 2 chargers can have power ratings of up to 20 kW, but if a particular EV has an onboard battery charger of 10 kW, for example, 10 kW is the maximum power that it can draw from that 20 kW charger. Without understanding this, it is easy for a person or organization to spend extra money on a 'faster' charger without realizing that the EV they have can't actually benefit from the higher power.

EVs can charge faster/at higher power than their onboard charger maximum thanks to Level 3/Fast chargers which have inverters in them. These charging stations they take AC power from the grid just like Level 1 and 2, but they do the conversion to DC with their own inverter so it can go straight to the EV battery, bypassing the onboard inverter. This is why fast charging stations are big and expensive.

There are still limits to how much DC power an EV can accept. It may be stated explicitly in kW, or the manufacturer may describe the fastest possible charge using time and distance or battery percentage (for example, "up to 100 km in 10 minutes" or "from 20% to 80% in 45 minutes"). I'm calling this "**Maximum DC Fast Charging Rate**" but it may not always be listed explicitly in the vehicle specs in this way.

Table 5.3 Comparison of EV specifications: Ford vs. Chevy

Factor	2025 Ford F-150 XLT 4x4 (ICEV) (2.7/6)	2025 Ford F-150 Lightning LXT Standard Range (EV)	2025 Chevrolet Silverado EV WT Standard Range
Range	737 km	386 km	454 km
Battery Size	87 L gas tank	98 kWh	119 kWh
Onboard Battery Charger		11.3 kW	11.5 kW (19.2 kW Extended Range WT)
Maximum DC Fast Charging Rate		15%-80% in 32 minutes	Up to 160 km in 10 minutes (350 kW DC)
Onboard Power Source		2.4 kW (120V) 9.6 kW (240V) – + $1,200	2.4 kW (120V) 7.2 kW (240V) – Extended Range WT

Onboard Power Source – EVs on the market today also allow their batteries to power other things. The "onboard power source" rating describes this capability. The baseline trim of the EV F-150 and EV Silverado both allow 2.4 kW of power to be pulled from the battery from 120V outlets (two 20A circuits). This is enough to charge electronics, use power tools, or even to top up another EV's battery (a slow, Level 1 charge). You can upgrade this capacity to 9.6 kW (Ford) or 7.2 kW (Chevy) which adds a 240V outlet (30A circuit), allowing even larger devices and equipment to be powered, or to charge another EV at Level 2 speed. Of course, if you are using the battery to power large things, the driving range of the EV will decrease.

Within Torbay's fleet, there is an opportunity to replace diesel generators by using the onboard power capacity from an EV. **Unit 02-16** used for Water and Sewer (2022 ICEV Silverado), currently carries around a small generator to run a 115V, 16A pump. Either the F-150 EV or Silverado EV should be able to power this, eliminating the need for the generator and further reducing fuel cost and emissions.

This ability to use the EV battery power for other things is sometimes referred to as "bidirectional charging" or "vehicle-to-load technology". The large batteries in EVs can even effectively be used as emergency back-up power to a building or other infrastructure. They can also provide refuge in extreme heat or cold as the climate control system can operate for quite a while when the vehicle is stationary – with no fumes!

5.C. ELECTRIC HEAVY-DUTY EQUIPMENT

As part of this feasibility study, we reached out to several heavy-duty equipment providers to see if there were any electric models available within NL.

A representative from Toromount (local distributor) informed us via email that Caterpillar is actively developing battery electric excavators and loaders but they are not yet on the North American market.

A meeting was facilitated on June 13th, 2025 with Volvo Construction Equipment (manufacturer) and Nors (local distributor). Several Volvo electric excavators and loaders are available in North America – a few are being used in Atlantic Canada (Nova Scotia and New Brunswick). It was identified that their electric L120H machine was most applicable to Torbay's operations (primarily for snow clearing). The electric model uses all the same parts as it's diesel counterpart except for the electric vs. diesel motors, and operates largely the same way. The EV option has increased responsiveness and torque with significantly less noise. It's 282 kWh battery has been tested to perform for 5 to 9 hours depending on the intensity of the activity. The battery is thermally regulated, as is the cabin.

The only concern that we have with this current model is its limited charging capacity. It can only charge using a Level 3 (DC) charger (there is no onboard inverter that allows charging at Level 1 or 2, though it is planned that this feature will be incorporated into subsequent models). This is an issue because installing a Level 3 charger is an expensive undertaking that is not otherwise necessary for electrification of the Town's light- and medium-duty fleet. Nors and Volvo mentioned that a demo period could be arranged with the Town, but a Level 3 charger would be required even for this. It is unclear as of now if this will be a common requirement of electric heavy-duty equipment or if this is a unique situation. If multiple heavy-duty EVs are planned which require a Level 3 charger and/or if funding is available to cover some of the cost of the charger, it may make sense to make the investment.

Quotes were received for the electric L120H as well as the diesel L120H and a comparison was made:

Table 5.4 Volvo Electric vs. Diesel Loader Cost Comparison

	Volvo L120H Diesel	Volvo L120H Electric (no rebates)	Volvo L120H Electric (w/ rebates)
Unit Price	$463,400.00	$652,500.00	$552,500.00 (-$100,000, pending)
Extended Warranty (6 years, 3000 hrs) - full machine	$14,300.00	$14,300.00	$14,300.00
Total Upfront Cost	**$477,700.00**	**$666,800.00**	**$566,800.00**
Upfront Cost Difference		**+$189,100.00**	**+$89,100.00**
% Difference		**+40%**	**+19%**
Estimated fuel cost over 6 years (considering 2024 diesel consumption of Unit 05-05 and 2024 fuel and electricity rates)	$44,535.32	$12,875.52	$12,875.52
Estimated 3 years of maintenance costs (considering 2022-2024 record of Unit 05-05 and 50% reduction assumption for EV)	$94,463.29	$47,231.65	$47,231.65
Level 3 EV Charger estimate		$75,000	$37,500 (-50%, pending)
Estimated Total Lifecycle Cost	**$616,698.61**	**$801,907.16**	**$664,407.16**
Overall Cost Difference Estimate		**+$185,208.56**	**+$47,708.56**
% Difference		**+30%**	**+8%**

The Electric L120H is not currently listed as an eligible vehicle through the Federal Medium-Heavy Duty Zero Emission Vehicle program, however, it may just be too new to the market to have made it onto the list yet. Considering its battery size compared to other Volvo equipment on the list, we expect the rebate could be $100,000. If a 50% rebate for the Level 3 charger also becomes available (as has been available in the past), the electric loader will only be 8% more expensive overall. Given the uncertainty in the fuel and maintenance cost estimations (which may ultimately be beyond +/- 8% anyway), the difference between the two models becomes nominal when these sources of funding are available.

If the Level 3 charger was not required at all (if the loader had Level 2 charging capacity and the Town was planning to install these anyway), the percent difference would reduce to +18% and +2%, respectively.

In terms of GHG emissions, the difference between the two options is substantial: Less than 2 tCO_2e for 6 years of operation of the electric loader compared to over 67 tCO_2e for 6 years of operation of the diesel loader.

Overall, we recommend keeping a close eye on the available rebates and sources of funding. Trying out an electric loader may be worthwhile if these supports are available.

6. PROCUREMENT POLICY RECOMMENDATIONS

Based on the analysis detailed in this report, **we recommend that the Town of Torbay adopt a policy which stipulates that all light- and medium-duty vehicle purchases be electric going forward**. The data quite clearly points out that 1) suitable electric alternatives exist for the types of light- and medium-duty vehicles used by the Town, 2) the total lifecycle cost for light/medium-duty EVs is undeniably less than their ICEV counterparts, and 3) fleet electrification is required to reach the Town's GHG reduction targets as outlined in the council-adopted Climate Change Mitigation Plan.

With this policy in place, electrification of the light- and medium-duty fleet would proceed according to the existing fleet replacement schedule, without the need for deliberation each time a replacement approaches.

In some cases, there may only be one or two options for a particular type of EV (for example, the only EV pick-up trucks currently available in NL are the Ford Lightning and the Chevy Silverado). The Public Procurement Act allows exemptions in cases such as these when there are limited vendors. Having a Light/Medium EV Procurement Policy adopted by the Town would be sufficient justification for proceeding with electric options only despite limited vendors (this feasibility study would demonstrate that the Town's policy was put in place based on best value principles).

We recommend that heavy-duty vehicles and equipment be excluded from the overarching EV policy at this stage because the market is still maturing. During the period of this feasibility study, we were unable to assess total lifecycle cost of heavy-duty EVs sufficiently due to a lack of available options in NL. We expect that upfront cost for electric options may vary considerably from one type of equipment to another – the extra upfront cost above the cost of an ICE version may pay back for some equipment but not others depending on the magnitude of the price difference. This is in contrast to our assessment of light- and medium-duty vehicles which we can confidently say have lower lifecycle cost in the majority of cases (if high-end/luxury EV models are not considered). Simply, **heavy-duty EVs will have to be assessed on a case-by-case basis** (total lifecycle cost and total GHG estimates) to determine whether the Town should target an electric or ICE model in the procurement process. Whether or not the Town can access funding to offset higher upfront costs could be a factor in this decision.

This approach is consistent with what many municipalities across Canada are doing (for example, Kingston, Ontario's Electric Vehicle Strategy is very similar to what we've described above.) Kingston has also incorporated leasing into their electrification strategy (read more in Section 9.B.).

The Town of Portugal Cove-St. Philips has drafted a similar policy (pending Council adoption as of July 2025).

Rent-to-purchase options are sometimes available for heavy-duty equipment, which may be an effective way to test whether an electric model meets the Town's needs without a significant upfront investment.

7. EV OPERATION

7.A. STAFF TRAINING

Take Charge NL recently launched a free online course specifically about EV fleets. We recommend that the Town of Torbay take advantage of this resource and have all relevant staff (those that are involved in procurement decisions, vehicle operation or maintenance) complete this course. Encouraging review of the content of this feasibility study would also be a great step for any staff member to take to become familiar with EV concepts and understand the rationale behind electrification.

EV courses and programs are also available for existing automotive service technicians or electricians, such as this offering from George Brown College in Ontario which can be completed entirely online.

7.B. FLEET CHARGING

As introduced in described in Section 5.B., there are 3 Levels of EV Chargers:

Level 1 – a regular 120V outlet that you'd find in a building which charges the vehicle slowly. This is often sufficient for drivers who don't drive very far in a given day and can keep the EV plugged in overnight and whenever it isn't in use. This is sometimes called 'trickle charging'.

Level 2 – equivalent to about a 240V outlet (like what you'd have for an oven or clothes dryer), with varying power output depending on the current. As explained in Section 5.B., Level 2 chargers can provide up to 20 kW of AC power but there is a limit to how much AC power any EV can accept (its Onboard Battery Charger rating). Level 2 chargers are what homeowners and businesses would usually install. Most public EV charging stations within communities are also Level 2.

Level 3 – the fastest chargers available which have built-in inverters to supply DC power to the EV. These are the charging stations you'll see along highways - charging this fast is typically only needed if travelling a long distance. They are large and expensive and generally not necessary for municipal operations.

We recommend that the Town of Torbay install Level 2 charging stations which are dedicated to the fleet vehicles (located in a place that is only accessible by authorized personnel and/or require an access card). Past conversations with charging station providers have highlighted that conflicts can arise when Town charging stations are available to the public. If a member of the public can access the charger, especially if for free, it is possible that they will try to park there for as long as possible, potentially disrupting fleet operations. We have also heard of incidents where residents have been upset about this type of situation, since the Town would effectively be paying for someone else's energy use (though the amounts are often minimal). If the Town wishes to promote broader EV uptake throughout the community, we suggest installing separate public charging stations.

If upon review of this feasibility study, the Town decides to commit to electrification, it may be advisable to install multiple charging stations at once to minimize shipping and installation costs. How many to install initially will depend on available budget (including available funding opportunities), and anticipated timeline for EV replacements. **Considering the pathway outlined in Section 3, three charging stations may be a good place to start as three EVs could be procured in the next 2 years.**

As mentioned in Section 5.B, it is useful to have an idea of which EV models will be obtained prior to choosing the charging station specifications. Selecting a Level 2 charger with a power rating higher than the onboard charging capacity of the vehicle would result in overspending (higher power units will be more expensive). The power rating of the charger only needs to be enough to charge the vehicles in an amount of time that is reasonable for typical operations (estimation method described in Section 5.B. under Battery Size).

The Torbay Town Depot is relatively new (less than 5 years old) and from photos provided by the Town, appears to have sufficient electrical capacity available for at least a couple chargers (this must be confirmed by an electrical contractor or engineer, either of which must be engaged for quoting and permitting of the installation anyway). One Level 2 charger typically needs a 40-60A circuit pending on its power rating (40A is likely sufficient if targeting a Ford Lightning or Chevy Silverado). To support the proposed electrification plan (Section 3), 10 chargers will be required at the Depot by ~2032 (plus 2 at the Fire Department). Multiple EVs can of course use the same charger, it just introduces an element of coordination and scheduling that could result in issues.

Costs associated with installation of charging stations and any accompanying building electrical work that is required are eligible expenses under the FCM Capital Project for Municipal Fleet Electrification. While we don't anticipate any electrical upgrades will be required for the Depot in the very near-term, this will have to be reassessed if ever a Level 3 charger is desired (i.e. for heavy equipment – see Section 5.C.) or when the number of chargers required exceeds existing capacity.

It is possible that rebates for EV charger installation may become available again in the near future (alongside the reinstatement of the Federal EV rebate), but this is not confirmed as of July 8th, 2025. These typically offer a 50% rebate up to a maximum amount depending on the power/speed of the charger (and up to a maximum total amount per applicant).

EV batteries prefer to be charged slowly most of the time - fast charging is safe, but it does strain the battery somewhat. They also prefer to stay within the 20%-80% state of charge range. Charging actually slows down after 80% to prevent battery wear, and most EV models have an on-or-off setting that allows you to limit charging to 80% automatically (in a Chevy, this is called "Hilltop Reserve"). Using Level 1 or Level 2 charging most of the time and not letting the battery completely drain or fill too often (keeping Hilltop Reserve on unless 100% of range is needed), will help an EV battery to perform better for longer. **Making Town Staff aware of this battery behaviour should be part of the EV training process.**

7.C. COLD CLIMATE PERFORMANCE

Globally, EV adoption is highest in Norway, Denmark, and Sweden where the share of new car sales that were fully electric was 89.3%, 50.4% and 34.4%, respectively, in 2024 (in Canada, we hit 14.3% in 2024). What do these places have in common? They are northern – further north than the majority of Canada and similarly cold.

Cold weather does indeed impact EV battery range, but it impacts the range of ICEVs too – we just don't notice as much. Similarly, wind, a hilly landscape, additional passengers or cargo, how fast you drive, and how often you stop and start all impact the efficiency of a vehicle and therefore how far it can go on a full tank or charge. On the other hand, warm weather and a smooth drive can make your EV or ICEV go further than usual with the same amount of energy.

Studies have found significant variation between different EV models when it comes to range loss in the cold, but 20-25% was the average. For the Town of Torbay, fleet vehicles typically do not travel more than 100 km in one day. With rated ranges of around 400 km, currently available EVs should perform as required even if range is significantly impacted by cold or other factors.

New EVs may have included or optional heat pump systems which help to minimize range loss due to the heating system being on.

7.D. CHARGING ACROSS NL

NL's EV charging network has expanded considerably in recent years to enable travel across the island – see below images. Many of the stations have been installed along the Trans-Canada highway by NL Hydro. The Town of Torbay does not usually travel further than Gander.

In 2025, the first 11 ultra-fast chargers in the province will be installed. The linked article also states that charging station usage increased by 40% between 2023 and 2024, indicating higher EV uptake.

PlugShare is a commonly used website and app for locating EV charging stations across North America, ChargeHub is another. Specific charger manufacturers may also have their own apps like ChargePoint or Flo, and Google Maps will often show you EV chargers as well.

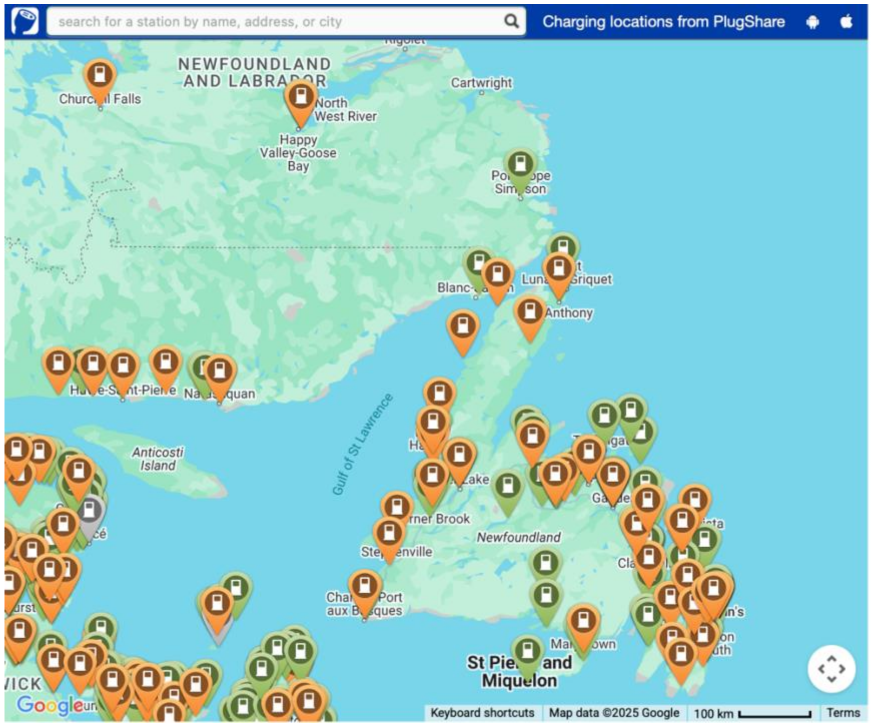


Figure 7.1 EV Chargers across NL

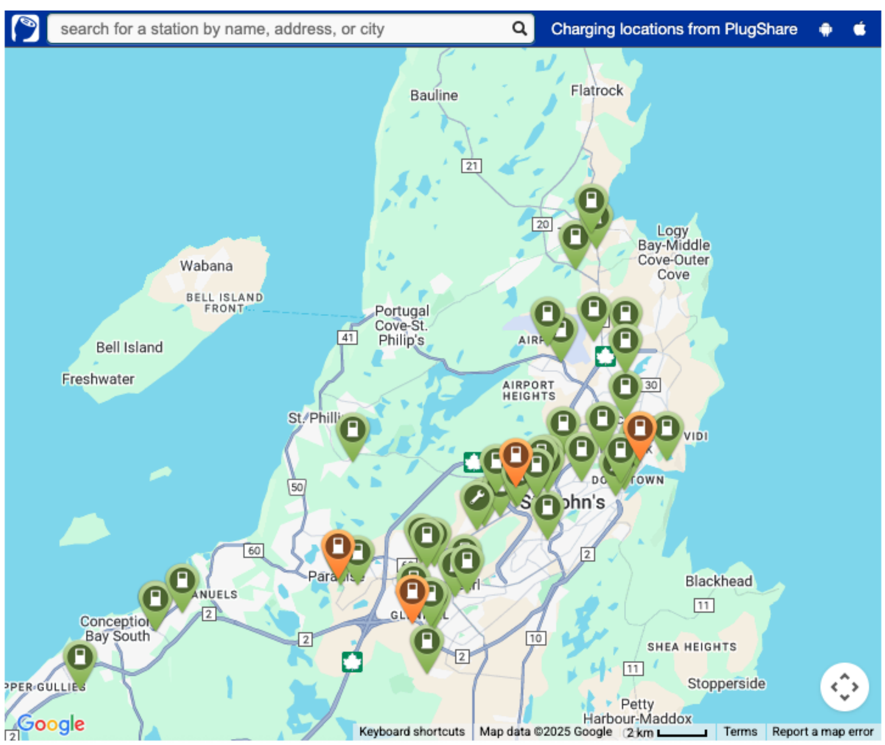


Figure 7.2 EV Chargers in the St. John's Metro Area

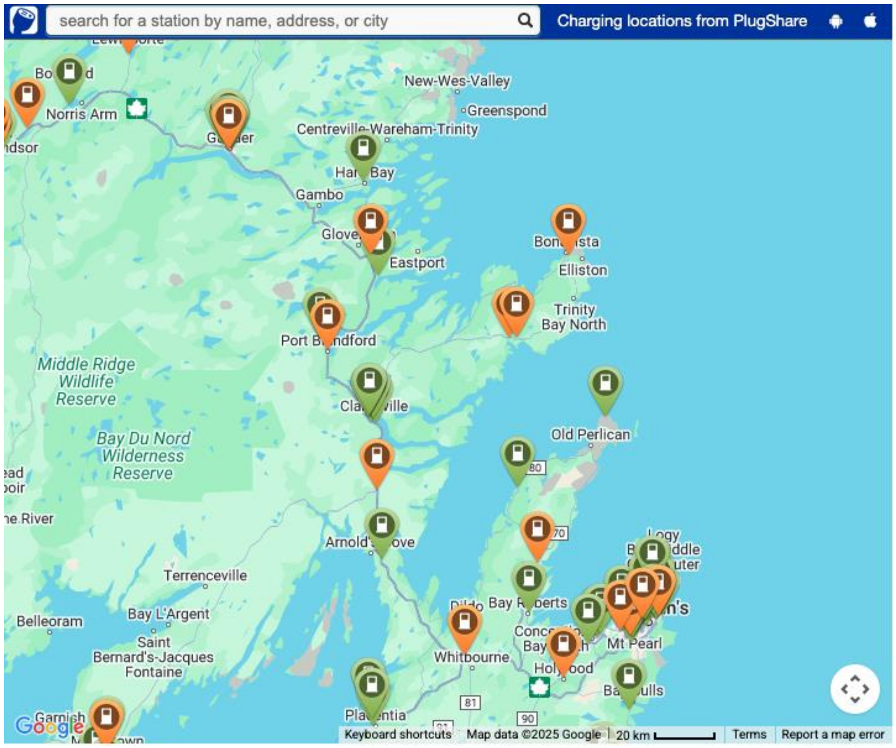


Figure 7.3 EV Chargers between Torbay and Gander

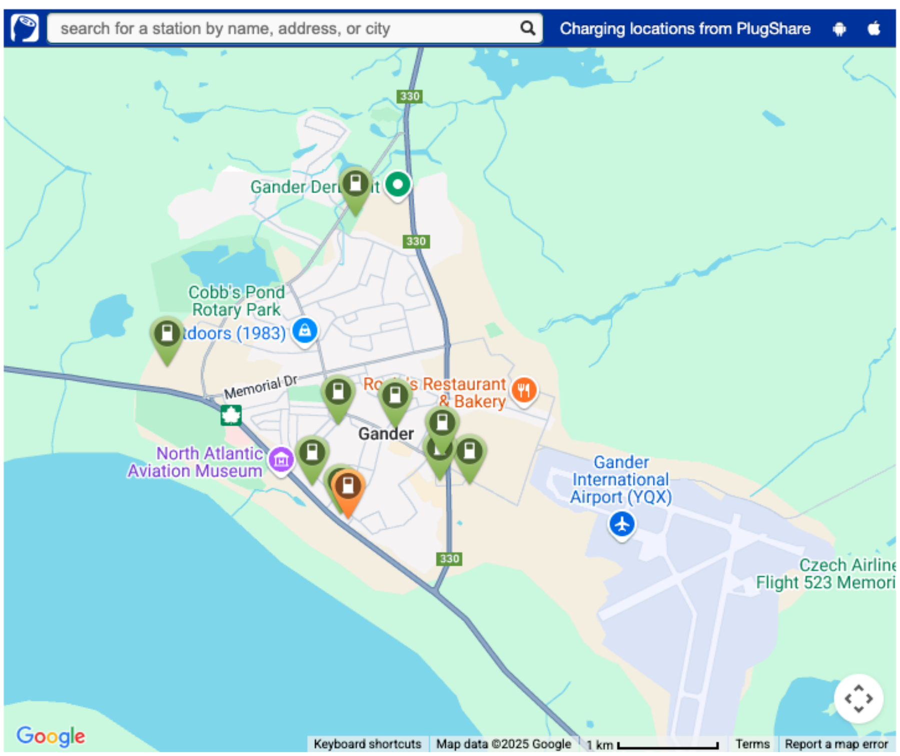


Figure 7.4 EV Chargers in Gander

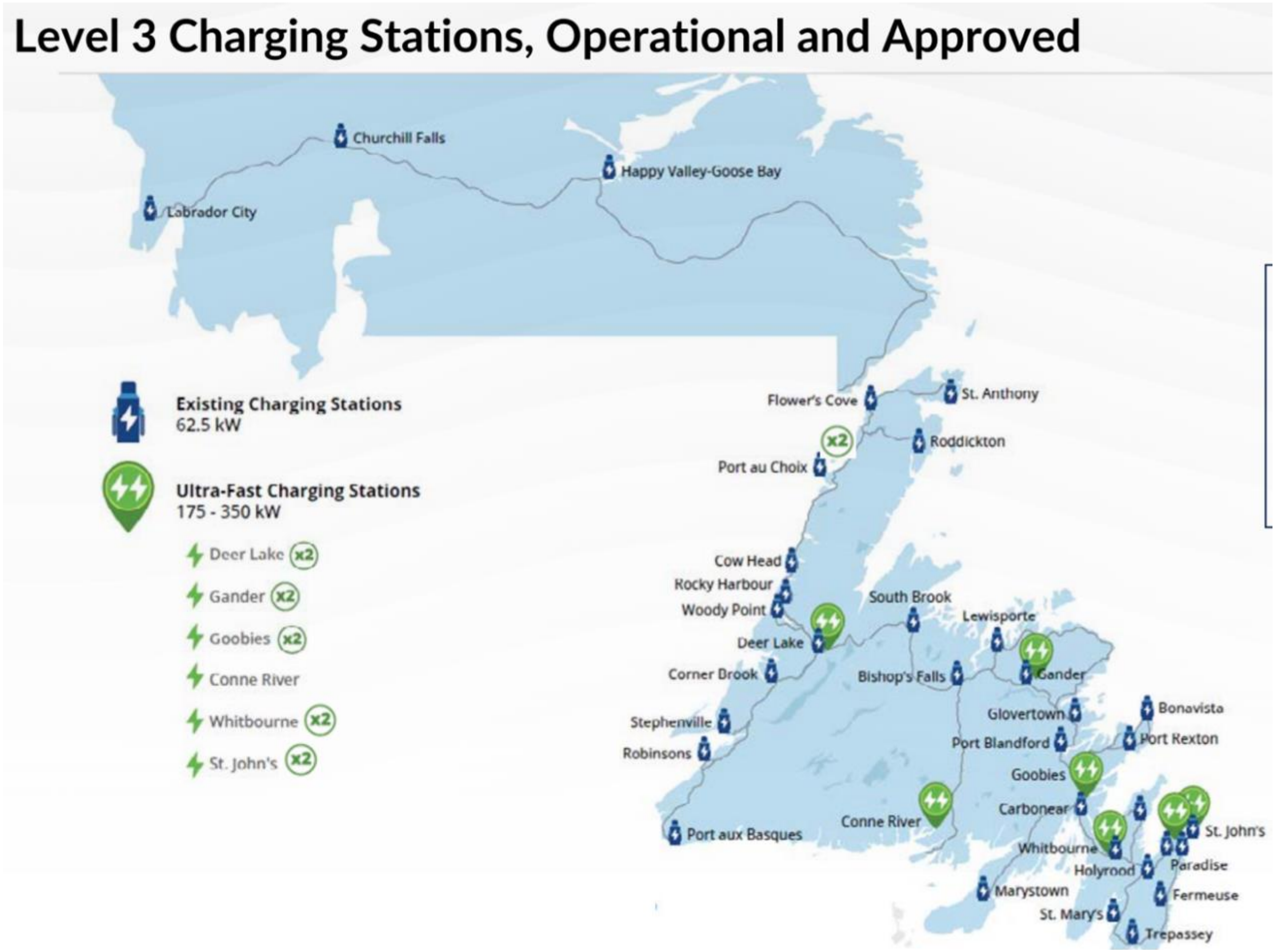


Figure 7.5 Level 3 Chargers across NL including upcoming Ultra-Fast units

Image from the Government of NL's 2025 update of their Climate Change Mitigation Action Plan.

8. ADDITIONAL CONSIDERATIONS FOR FIRE DEPARTMENT

8.A. EV FIRE TRUCKS

Vancouver was the first city in Canada to deploy an electric fire truck in 2023. The Rosenbauer RTX pumper truck cost about $1.8 million and the City was able to access $750,000 in rebates. The batteries have a 100 km range and an onboard diesel motor which kicks in when the charge drops below 20% and to power pumps when needed. The truck's wheels can "crab walk" to get in and out of tight spaces, is very quiet, and is ergonomic for firefighters. Vancouver also opened the first zero-carbon fire hall in Canada in 2022.

The City of Brampton has a long-term plan to add 14 electric and hybrid fire trucks over 3 years and is the second Canadian city, after Vancouver, to add a Rosenbauer RTX electric fire truck in 2023. In 2024, two additional electric fire trucks were added to the fleet costing about $ 5.4 million. Although there is a hefty upfront cost, it is estimated that the City will save at least $384,000 and reduce 256 tonnes of CO_2 over the lifespan of 12 years.

Toronto Fire Services and Varennes Fire Safety Service (Quebec) ordered fully electric Vector pumper and rescue trucks in 2022 from REV Group. The pumper trucks cost about $2 million each, have 327 kWh battery packs, and like the Rosenbauer, have a diesel generator to extend range for emergencies.

The Calgary Fire Department launched a pilot project in July 2024 to test a Pierce Volterra electric fire engine. According to the article, some sort of agreement was reached between the City and the manufacturer that allowed this project to take place without a significant long-term financial commitment from the City – a potentially interesting option for Torbay. Like the others mentioned, this vehicle also has a back-up diesel system.

8.B. RESPONSE TO EV FIRES

Three different studies from recent years have each shown that ICEVs are significantly more likely to catch fire than EVs – one study said ICEVs were 20 times more likely to catch fire compared to EVs, another said 60 times more, and the third said 83 times more. The fire risk for EVs? Between 0.025% and 0.0012% - it is not likely. Why does it feel like we hear about EV fires more often? Because the media does not report all the ICEV fires.

What is a valid concern about EV fires – in the rare instances when they occur - is that they must be treated differently than ICEV fires due to the chemistry and behaviour of the batteries. Extinguishers don't work in the same way so more water is required, the fire can remain active for longer and may reignite after settling down, and more toxic gases are released so more robust protection for responders is required. While further advancements in battery technology may address some of these challenges going forward, the solution at this time is to properly train first responders. The NL Association of Fire Services hosted training earlier this year to teach fire responders how to manage such incidents. EV Fire Safe out of Australia is a good source of information on this topic.

EV fires aren't extinguished the way you'd put out a kitchen fire and traditional fire extinguishers won't do the trick. In fact, when it comes to EVs, most fire extinguishers have little effect. The lithium-ion battery is well insulated and difficult to access, and the volume of extinguishing agent simply isn't enough. That's why the most effective approaches to managing EV fires don't look like what we're used to. There are three ways of controlling/putting out the EV fires:

- Cool down - Using fog nozzles to manage EV fires involves applying cooling water jets to the exterior of the battery pack to reduce thermal runaway. While this method is recommended by EV manufacturers and provides visible action that reassures the public, it has notable limitations. The water often doesn't reach the core of the fire where it's most needed, making it an inefficient approach. Additionally, this method can consume over 10,000 litres of water and requires careful monitoring of runoff, especially near sensitive environments like waterways.

- Burn - Allowing a lithium-ion battery pack to burn itself out is a strategy endorsed by some EV manufacturers, as it enables the fire to consume most of the active cells quickly, minimizing the risk of secondary ignition and leaving behind inert scrap metal. This method effectively removes stranded energy from the scene. However, the time required for the fire to fully burn out varies depending on factors such as battery size, charge level, and environmental conditions. It also presents air quality concerns, requiring monitoring and possible public warnings. Additionally, the approach may attract public or media criticism due to the perception that firefighters are not taking active measures.

- Submerge - Submerging an electric vehicle in a water-filled containment unit up to the battery pack level is an effective method for controlling fire spread and managing the incident swiftly. This approach also visibly demonstrates firefighter action, which can help reassure the public. However, it requires access to specialized containment units, which may not always be nearby. The process demands large volumes of water—often over 10,000 litres—and the vehicle may need to stay submerged for days or even weeks. Despite being underwater, thermal runaway can still continue, with its duration influenced by the battery's capacity and charge level. Moreover, the water used must be treated before disposal, which can be costly.

There are several types of EV fire equipment currently in use or under evaluation by fire services and emergency responders. These include **fire blankets, underbody spray systems, and water-filled containment units**. Each of these tools serves a unique role in managing EV fires, and while none offer a perfect solution, they can help improve safety, containment, and public confidence when used appropriately. In the section below, we'll take a closer look at each of these equipment types, exploring their strengths, limitations, and practical considerations.

Fire Blankets

Pros

- Do not extinguish EV fires, but do contain them or prevent them from spreading further.
- The advantage over water-filled containers/bag is the lower price, lower water use, and the EV is not damaged under the fire blanket.
- A fire blanket can also be used as a preventative measure by using it when transporting an EV involved in the accident.

Cons

- Thermal runaway will continue under the blanket and may slow down (as opposed to the Burn method).
- The process vapour cloud (off-gassing) will continue under the blanket. Where a blanket is lifted by wind or a person, the build-up of gases under the blanket may cause a localised vapour cloud explosion.
- Blankets often come as single or multi use, but there are no agreed-upon, safe decontamination procedures for multi-use blankets.

Vendors

- https://www.nationalfire.com/product/specialties/fire-blankets/ev-fire-blanket/
- https://bridgehill.com/fire-blankets/car/

Underbody Spray

Pros

- Provides safe system of work for firefighters, removing the need to be in close proximity to an EV in thermal runaway.
- May assist to contain fire spread, depending on width of water spray.

Cons

- Unit may be expensive and size (typically long metal tubes) may be difficult to carry on a truck.

Figure 8.1 Underbody Spray


Figure 8.2 Underbody Spray Nozzle

Vendors

- https://brimstonefireprotection.com/products/ev-fire-suppressor-mister
- https://www.avl.com/en/testing-solutions/e-mobility-testing/battery-testing/avl-stingray-one

Water-filled Containment Units

EV Firebox

- Keeps the EV battery submerged in a sturdy container with water filling, emptying and circulation/cooling features
- Likely expensive (costing not found as part of this study)
- Large – would need to be transported to the incident site using a tow truck or crane. May be more suitable to towing company lots or repair centres where unit can be stationary and at-risk EVs can be placed preventatively.

Figure 8.3 EV Firebox

Vendors

- https://zips.com/parts-detail/firebox-ev-containment-and-isolation-sto-firebox?variant=FIREBOX-STANDARD
- https://evfirebox.com/

Recover-E-Bag

- Easy to transport and stow away
- EV can be rolled in or lifted only slightly and the bag pulled under and around.
- Enables a 'mobile on-site breakdown bay' even in tight and poorly accessible places such as underground car parks, ferries, tunnels and large car parks.
- Vehicle can be handed over to the tow truck securely in the system
- Contaminated water is retained to be disposed of properly

Figure 8.4 Recover-E-Bag

Vendors

- https://www.weber-rescue.com/en/feuerwehr/zusatzausruestung/glasmanagement-und-sicherungssysteme/recover-e-bag.php
- https://www.lion-care.com/241/recover-e-bag-anpassbares-berge-und-aufbewahrungssystem-fuer-verunfallte-elektroautos?c=78

9. MUNICIPAL EV CASE STUDIES

9.A. PORTUGAL COVE-ST. PHILIPS

The Town of Portugal Cove-St. Philips (PCSP) received pilot project funding (80% coverage up to $500,000) from FCM in 2022 and was able to purchase 6 EVs (4 Ford F-150 Lightnings and 2 Volkswagen ID.4s). FCM unfortunately closed the pilot project stream in 2024 so this option is not available to Torbay. One may suspect that FCM has determined that pilot projects are no longer required for municipal vehicle electrification – they have proven time and time again save money and emissions and perform well, so there really is no need to "test" it out any longer.

As part of this feasibility study, a meeting was arranged between the public works staff in PCSP and Torbay so that PCSP could share their experience and give Torbay a hands-on look at their EVs. Some of the lessons learned so far include:

- Importance of using EV-rated tires – PCSP experienced a drop in range when non-EV-rated tires were used
- Range does reduce in the winter, but not by enough to be relevant to day-to-day operations (10-15% reduction in ID.4 range with heat pump)
- There is a learning curve for staff regarding charging – only one instance where a staff member forgot to plug in overnight, but it didn't end up being an issue since another vehicle was available.
- Longer distance travel requires some planning, but is completely doable - On one occasion, an EV was planned to go to Gander but another staff person had taken an extra trip prior without realizing the impact – the EV left for Gander with a lower starting range than planned and extra charging was required along the way, which took extra time. The second trip to Gander was smooth sailing – it left with 100% charge, the range indicator was accurate when driving at the speed limit, and charging infrastructure was available (total cost of $34.26 to charge at public stations during the trip). The staff person who took the trip reported that they would not hesitate to take the vehicle to Corner Brook.
- EVs are "peppy" – the quick acceleration and torque can take some time to get used to. It is easier for staff to accidentally speed.
- Communicating with the public about this topic is tricky – see next section (Public Communication)

An assessment of 6 months of data from PCSP indicates that the Town is spending about $325 per month on electricity to operate all 6 EVs. Considering this and the difference in gas spending, it appears that the Town has saved almost $9,000 and 13.2 tCO_2e in this time. Further analysis will be completed at the end of 2025 as PCSP's pilot project comes to a close.

9.B. ST. JOHN'S + THE PROVINCE

The City of St. John's recently released a 2022-2024 update of their Resilient St. John's Plan. EV-related actions listed include:

- 2 light-duty EVs piloted in the City Fleet and 8 fleet charging stations installed at City Hall and Depot
- 7 more light-duty EVs planned in 2025-2026, aligned with regular replacement schedule
- Development of a full roadmap for transitioning the City Fleet to be undertaken in 2025-2026, targeting a 100% low-carbon fleet by 2045
- 16 public EV charging stations installed at key City facilities in 2022-2024, 26 more planned for 2025-2026

The Government of NL similarly released an update of their Climate Change Mitigation Action Plan recently which states:

- There are currently 8 EVs in the Provincial Government fleet and 21 in the Newfoundland and Labrador Hydro fleet
- There are now 1,700 full battery electric vehicles registered in the province – a 1400% increase since 2018.

9.C. ACROSS CANADA

Across Canada, municipalities of all sizes are demonstrating that fleet electrification is achievable even in rural and northern settings. The examples highlighted here were selected because they offer practical insights relevant to smaller or rural communities like Torbay.

Kingston, Ontario offers a clear example of how to overcome the upfront cost barrier. Rather than purchasing vehicles outright, the city opted for a leasing model, allowing them to adopt newer EV technologies without locking into long-term vehicle ownership. In 2023–24, Kingston took delivery of 8 electric SUVs, one electric cargo van, and three PHEV SUVs. This followed an earlier lease of 8 EVs and 3 PHEVs, bringing their electrified fleet to 24 vehicles. By working with Enterprise Fleet Management, they were able to replace aging ICE vehicles and modernize their fleet incrementally, demonstrating that flexible procurement can work even in mid-sized municipalities.

In Atlantic Quebec (Gaspé Peninsula and Magdalen Islands), 10 regional municipalities purchased 10 EVs and installed supporting infrastructure in 2019. The results were striking: each EV reduced emissions by up to 95%, and fuel cost savings were estimated at 84%. Even more innovative, the vehicles were integrated into a shared-use system where municipal staff and residents could access them. This approach generated additional revenue for the municipalities and served as an effective tool for engaging the public with EVs.

Plessisville, Nicolet, Bromont, Témiscouata-sur-le-Lac, Rivière-du-Loup, and Sainte-Julienne, municipalities each added 1–2 electric vehicles to their fleets and launched a regional EV-sharing program open to municipal staff, residents, and local partners. Before the pilot concluded, nine other Quebec municipalities and five in New Brunswick expressed interest in replicating the model, highlighting how shared mobility can scale across rural and semi-urban settings.

While much of the focus has been on light- and medium-duty vehicles, municipalities are also beginning to electrify heavier fleet assets, proving that even high-demand services like waste collection can be a part of the electric transition. In Comox Valley, B.C., Emterra Environmental is deploying eight fully electric Mack LR garbage trucks to service 25,000 homes and businesses. These trucks can charge in 90 minutes using a 150-kW charge and cover a range of 113 km.

In addition to vehicle procurement, developing reliable charging infrastructure is critical to municipal fleet electrification. Municipalities that are proactively investing in infrastructure are laying the groundwork for long-term fleet transition while supporting wider EV adoption in their communities. The regional districts of East Kootenay, Central Kootenay, and Kootenay Boundary collaborated on building a community-led EV charging network. In areas where residents rely almost entirely on personal vehicles and where transportation accounts for up to 60% of local GHG emissions, their model shows how small communities can band together to support cleaner travel while promoting tourism and economic resilience.

10. PUBLIC COMMUNICATION

A public survey was completed as part of this feasibility study. The results (112 responses in total) revealed that a significant amount of misinformation about EVs is circling within Torbay. Many indicated that they believe EVs to be financially irresponsible, not environmentally friendly, and unsafe – all of which has been debunked within the content of this report. This high level of negative perception was also found in the survey that was conducted in PCSP as part of their pilot project – it is likely a theme across the population of NL.

The survey also revealed how much of an impact direct experience with an EV makes. Those with little to no hands-on experience had overwhelmingly negative views, while those that had owned, leased, or driven an EV before had much more positive or balanced views. Despite this key difference in experience, many members of both groups identified themselves as being highly knowledgeable about EVs. The full survey results have been provided to the Town separately.

Despite the survey explaining the project background upfront (that this was part of a feasibility study for a phased fleet electrification approach, not a large capital project), many respondents reacted as though the Town was going to spend significant amounts of money on EVs imminently. PCSP experienced a similar reaction from the public on a social media post – residents reacted strongly thinking that the Town had spent millions on the EVs (lesson: always include the details of the funding arrangement).

In both Torbay and PCSP, the purpose of the survey was not to get the public's opinion on the Town's actions, but to gauge overall perceptions surrounding EVs so that we can determine whether the project has an impact on those perceptions. This has proven difficult to communicate. The public survey in PCSP was conducted after the EVs had been procured and many residents questioned why they weren't consulted before. There does not seem to be a general understanding among the public that municipalities typically do not consult with residents about regular procurement decisions like fleet vehicles.

If this type of sentiment arises going forward, we recommend highlighting this - every Town maintains a budget to refresh their fleet according to an established policy, and procurement decisions are made considering the best long-term financial benefit to the Town (typically without any public engagement). This is how it has always been, and the presence of EVs on the market does not change that.

A public education campaign was developed considering the survey results as part of this feasibility study.

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