

# Electric Vehicle Strategy

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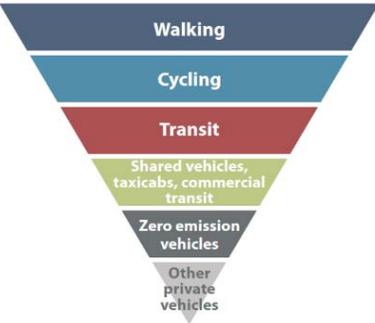
# Electric Vehicle Strategy

## Introduction

Climate protection forms a key part of the City's core values, policies and programs. The City's Community Energy and Emissions Plan provides a pathway to reducing greenhouse gas emissions 15% by 2020 and 50% by 2050 below 2007 levels. The pathway requires strategic planning, policy and actions across all sectors.

Emissions from private passenger vehicles account for 43% of greenhouse gas emissions in the City. Making the transition from fossil fuel powered vehicles to low or zero emission electric vehicles is a key action required to meet the City's emissions reductions targets.

The City's approach to personal transportation promotes health, safety and environmental quality through prioritizing walking, cycling and transit according to the sustainable transportation hierarchy (Figure 1). The City is a leader in advancing sustainable transportation through integrated land use and transportation planning. This Electric Vehicle Strategy focuses on key actions and policies to accelerate the transition from fossil fuel powered to zero emission vehicles.



**Figure 1. Sustainable transportation hierarchy.**

## Electric Vehicles 101

### TYPES OF ELECTRIC VEHICLES

An electric vehicle (EV) is powered partially or entirely by a rechargeable battery which powers an electric motor. EVs can be recharged by plugging into the electricity grid. Since they use no or less fossil fuel, EVs have low or zero tailpipe emissions. There are two types of EVs:

1. Battery Electric Vehicles (BEV) which are entirely powered by an electric battery and motor and must be plugged into the electricity grid to fully recharge.
2. Plug-In Hybrid Electric Vehicles (PHEV) which use an electric battery and motor which are recharged by plugging into the electricity grid, but also have the support of a small internal combustion engine when the battery is running low.

Electric motors in EVs are up to five times as efficient as traditional internal combustion engines. Since they have only 18 to 20 moving parts, compared to over 2000 in gas-powered vehicles, they require significantly less maintenance. There are currently over 30 EV models available for purchase in B.C.

## TYPES OF ELECTRIC VEHICLE CHARGING

Electric vehicle charging stations are classified according to the rate at which they can recharge EV batteries. There are three types of EV charging stations:

1. Level 1 Charging (120 Volts):
  - Uses a standard household (120 V) outlet
  - Takes 8 to 12 hours to recharge a depleted battery
  - Typically used at home (overnight) or at work (all day)
  - Retrofit cost is around \$500
2. Level 2 Charging (240 Volts):
  - Requires a specialized station on a dedicated circuit
  - Takes 4 to 6 hours to recharge a depleted battery
  - Typically found in homes, workplaces or public charging locations
  - Installation cost ranges from \$2,500 to \$15,000+
3. Level 3 or DC Fast Charging (480 Volts):
  - Requires specialized station and utility connection
  - Takes 30 minutes or less to recharge a depleted battery
  - Typically found in commercial settings or along transit corridors
  - Installation cost is \$75,000+

## Background to the Strategy

### COMMUNITY ENERGY AND EMISSIONS PLAN

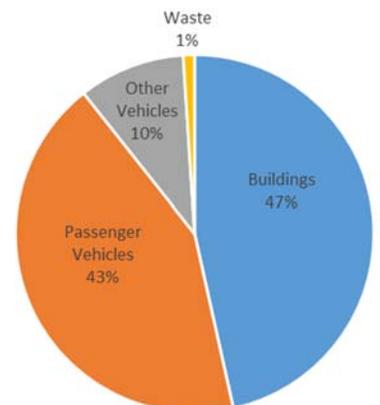
In 2010, the City of North Vancouver adopted a Community Energy and Emissions Plan (CEEP) which set ambitious yet achievable targets for greenhouse gas emissions reductions. To meet the 2050 target of reducing emissions in the City by 50% below 2007 levels, the CEEP laid out a strategy to reduce emissions from private transportation sector by 69% by 2050. The strategy requires reducing the number and length of trips that people take in private vehicles by increasing accessibility of pedestrian areas, bicycle routes and public transit, and reducing the amount of greenhouse gases that are emitted by vehicles. To that end, one of the necessary actions defined in the CEEP is facilitating the adoption of low and zero emission vehicles.

The City's goal of encouraging transportation options that reduce fossil fuel use was further supported as an objective in the 2014 Official Community Plan (OCP goal 2.3.8).

### TRANSPORTATION EMISSIONS

The City's 2015 community emissions inventory shows that passenger vehicle emissions account for 43% of the City's emissions (Figure 2), and have not changed significantly from 2007 levels.

Electric vehicles (EVs) produce 80% fewer lifecycle emissions than the average gasoline-powered vehicle (Pembina Institute).



**Figure 2. Community Emissions Inventory (2015).**

## ELECTRIC VEHICLE OWNERSHIP

As the number of EV models available in B.C. continues to increase and upfront costs decline, EV ownership has increased exponentially over the past few years (Figure 3). In BC, EV sales increased 202% in the spring of 2018 over the spring of 2017.

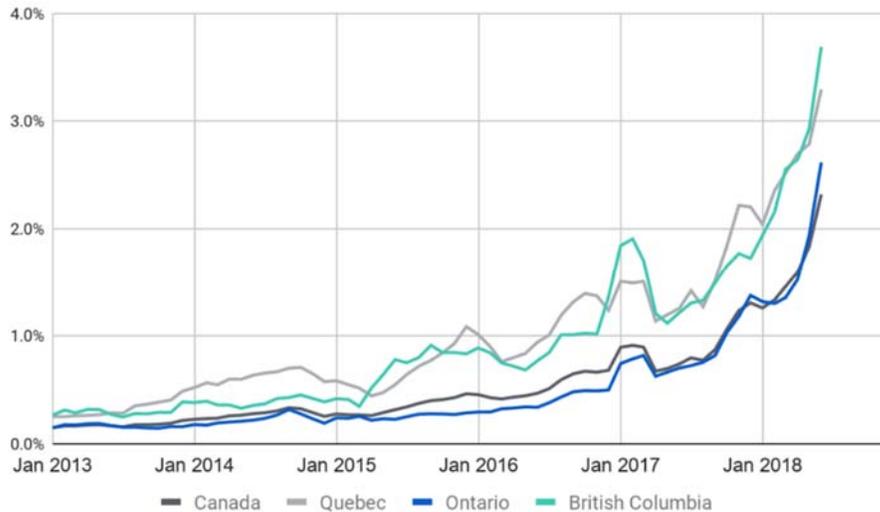


Figure 3. EV portion of vehicle sales (Source: Fleetcarma).

## CITY ACTIONS TO DATE

**Installing public charging stations.** Over the past five years, the City has encouraged EV ownership by installing charging stations for public use. The City currently provides seven Level 2 charging ports and one DC fast charger leased from BC Hydro. Usage of these stations has increased exponentially each year with the amount of energy issued at the DC fast charger increasing by 250% in 2017 over 2016 (Figure 4). Congestion at the stations indicates that the City is not keeping up with the demand for public charging among residents.

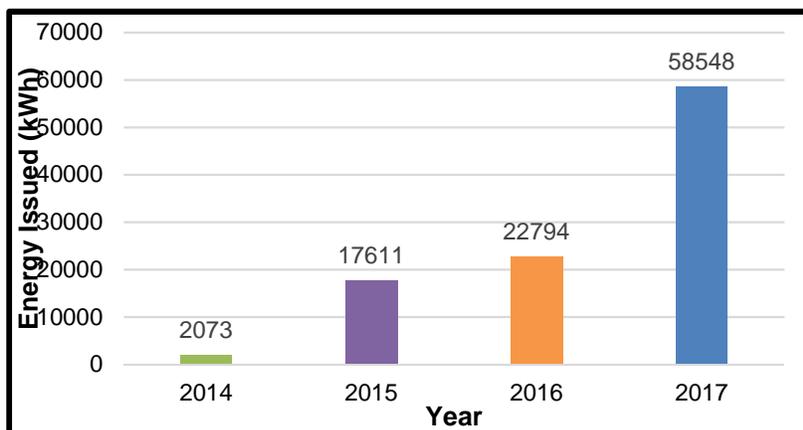


Figure 4. Energy issued at the DC Fast Charger on East 1st Street at Lonsdale.

**Adding EVs to the City's fleet.** The City has shown leadership by introducing EVs into the City's fleet, including one Might-E Truck, three plug-in hybrid electric passenger vehicles and one battery electric vehicle.

**Introducing EV charging guidelines for new construction.** The City's Sustainable Development Guidelines were amended in 2016 to outline the expectation that all projects seeking rezoning provide 20% of residential parking spaces equipped with Level 2 EV charging capability.

## **BARRIERS TO ELECTRIC VEHICLE ADOPTION**

Despite the trend of increasing EV ownership in the City, significant barriers to EV adoption remain among residents:

**Initial purchase cost.** Residents report the most significant factor preventing them from buying an EV is the initial purchase cost. Though the operating costs associated with EVs are significantly lower than gasoline-powered vehicles and more used EV vehicles are becoming available, the purchase price of new EVs remains a barrier for many potential owners. As more used EV vehicles become available and battery costs decline, this barrier will become less significant.

**Ability to charge at home.** For many residents, the decision to purchase an EV depends on their ability to charge at home and installing EV charging infrastructure in existing buildings can pose challenges. In particular, the ability to install EV charging infrastructure in multi-family buildings<sup>1</sup> is a significant barrier. In the City, where multi-family buildings comprise 70% of households and ground-oriented dwellings such as single family homes, townhouses and row homes are in the minority (30%), this poses a particularly significant challenge for those wishing to purchase an electric vehicle.

**Concerns regarding range and knowledge gaps.** In addition, concerns around the vehicle's range and confusion about the different types of charging infrastructure can prevent residents from purchasing an EV. EV advocacy groups such as the Vancouver Electric Vehicle Association report a prevalence in knowledge gaps and common misconceptions that persist regarding EVs.

With these barriers in mind, the City has an opportunity to encourage EV adoption by addressing challenges that the City can influence.

## **Strategy Development**

Staff gathered input from key stakeholders, staff, industry experts, and the broader community to inform strategy development. This City retained SES Consulting and Dunsky Energy with funding from BC Hydro to assist with this work. An open house was held and an online survey conducted to gather input from residents regarding barriers to EV ownership and potential City actions to enable EV adoption. A workshop was also organized for key businesses and institutions where

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<sup>1</sup> In this Strategy, multi-family buildings refers to multi-unit residential buildings that have a common parking area.

participants shared their interests in deploying EV charging infrastructure along with associated challenges. An internal interdepartmental staff workshop was also held to brainstorm actions to promote EV adoption across departments.

The input gathered through the engagement activities helped to identify barriers to EV adoption in the City and inform actions most likely to accelerate the transition from fossil fuel-powered vehicles to EVs. The City also completed an electric vehicle charging infrastructure gap analysis to guide the City's involvement and investment in public charging infrastructure.

Going forward, the City will need to continue to work collaboratively with community stakeholders and across departments to implement the actions in this strategy. The actions in this Strategy aim to increase EV readiness of new buildings, improve access to public charging and reduce some of the barriers related to EV charging retrofits.

## Goal

The goal of the Electric Vehicle Strategy is to remove barriers to EV ownership by increasing access to charging infrastructure and providing public education about EVs and EV charging.

## Objectives

The Electric Vehicle Strategy seeks to accelerate the transition to EVs in line with the sustainable transportation hierarchy to reduce greenhouse gas emissions from private vehicle transportation in the City. To that end, the Strategy has the following high-level objectives:

1. Maximize access to EV charging;
2. Displace fossil fuel kilometres travelled with electric kilometres travelled in the City; and
3. Increase awareness and knowledge level of EVs and EV charging options among residents.

## Actions

The Electric Vehicle Strategy identifies 30 actions to undertake to accelerate EV adoption in the City.

### **1.0 CHARGING INFRASTRUCTURE: NEW CONSTRUCTION**

Respondents to the City's online EV survey reported that their ability to charge at home is one of the main challenges for potential EV ownership. Convenient and reliable access to charging is essential for owning an EV. In order to enable EV adoption, the City needs to have a sufficient charging infrastructure network available to residents at home, at work and on the go.

To ensure all new construction in the City, including single family homes, multi-family buildings, and commercial buildings provide EV charging capability, requirements for EV-ready parking spaces can be added to the Zoning Bylaw. While the authority of a local government to require EV charging infrastructure in new construction was originally unclear, the Province has confirmed the BC Building Act does not prevent local governments from making requirements for EV charging infrastructure in new developments.

Access to home charging in multi-family buildings can be increased by requiring all residential parking spaces in new construction to be equipped with Level 2 charging capability. The City currently expects 20% of residential parking spaces to be EV-ready for developments seeking rezoning under the Sustainability Development Guidelines. Recent analyses led primarily by the City of Richmond have shown that parking stalls can be equipped using load sharing and load management systems, at a significantly lower cost than dedicated circuits. Load sharing allows for multiple vehicles to use the same circuit without exceeding the circuit capacity. Load management systems enable control over the current drawn by an EV charging station, allowing for less current to be drawn during periods of high demand and reducing the total electrical supply needed for EV charging. Changes to the 2018 Canadian Electrical Code allow for the installation of EV load management systems. The developments in load sharing and load management systems make the requirement EV charging capability in 100% of residential parking spaces more affordable.

Currently the commitments for providing EV-ready parking spaces under the Sustainability Development Guidelines are not tracked internally within the City. By tracking these spaces, City staff will have a greater ability to ensure the requirements for EV-ready stalls are being met and be able to report on the number and location of EV charging stations at private buildings in the City. This information will give a more comprehensive understanding of the EV charging network in the City than is currently possible.

1.0 Charging Infrastructure Actions: New Construction		Timeframe	Responsibility
1.1	<b>EV-Ready Multi-Family Buildings:</b> Incorporate requirement of energized outlets <sup>2</sup> capable of providing Level 2 charging for 100% of residential parking spaces, allowing for load management systems, in new developments into the Zoning Bylaw	2018 - 2019	<b>Planning/ Community Services</b>
1.2	<b>EV-Ready Single Family Homes:</b> Incorporate requirement of energized outlets capable of providing Level 2 charging for new one and two unit residential developments into the Zoning Bylaw	2018 - 2019	<b>Planning/ Community Services</b>

<sup>2</sup> An “energized outlet” means a connection point in an electrical wiring installation at which current is taken and a source of voltage is connected to supply utilization equipment. An energized outlet may be either a junction box for permanent connection or a receptacle/plug, and does not include the “electric vehicle supply equipment” (eg. EV charging station).

1.3	<b>EV-Ready Commercial Buildings:</b> Incorporate requirement for EV charging stations in a prescribed percentage of parking spaces in new commercial and industrial buildings into the Zoning Bylaw	2018 - 2019	<b>Planning/ Community Services</b>
1.4	<b>Internal Record Keeping:</b> Ensure EV supply equipment data from new developments is tracked in CityPAL in a meaningful way and incorporates historical permits to have a robust database of EV charging equipped parking spaces in buildings across the City	2018 - 2019	<b>Information Technology/ Planning</b>
1.5	<b>Partnerships with Car Sharing Services:</b> Consider electric only car share vehicles in negotiations for car share parking spaces in new developments	2019 – 2020	<b>Planning</b>

## 2.0 CHARGING INFRASTRUCTURE: EXISTING BUILDINGS

Home charging is the preferred method for most EV owners. However, this can be a challenge for residents who rent their homes, do not have parking on their property, or live in multi-family buildings. For the majority of City residents who live in multi-family buildings, the challenges associated with installing charging infrastructure in a shared space can seem insurmountable.

Retrofitting multi-family buildings with EV charging infrastructure can be logistically challenging and quite costly depending on the location of the parking spaces and the proximity to the electrical panel. Research conducted for the City has shown that providing incentives for installations of EV charging infrastructure in existing multi-family buildings, in tandem with increasing access to DC fast charging, will effectively accelerate EV adoption. Current provincial incentive programs for existing multi-family buildings have been successful to the point of being over-subscribed. The City could offer incentives that compliment provincial programs and enable installations in multi-family buildings with the expectation that eventually other multi-family buildings will pursue retrofits independently to stay competitive with EV charging-equipped buildings.

Strata buildings pose unique challenges to residents who want to charge an EV in their building. To retrofit a parking stall with charging infrastructure, the strata council must approve the installation. Due to the complexities of the retrofit process, concerns around payment for the electricity and lack of understanding about EV charging retrofits, strata councils often deny the installation. To address this barrier to EV adoption, some jurisdictions including State of California, have introduced “right to charge” legislation which requires strata councils to approve EV charging retrofits if they are technically feasible and safe. The City can advocate that the Province adopt a similar policy to facilitate EV adoption among strata residents.

Workplace charging provides an alternative for residents who do not have access to EV charging at home, and provides support for residents who have long commutes and need to top-up their batteries while at work prior to the return trip home.

2.0 Charging Infrastructure Actions: Existing Buildings		Timeframe	Responsibility
2.1	<b>Retrofit Incentives for Multi-Family Buildings:</b> Provide funding through incentives or rebates to improve access to home charging for residents in existing multi-family buildings	2019 - 2020	<b>Planning</b>
2.2	<b>“Right to Charge” Advocacy:</b> Advocate for provincial regulations to require that strata corporations allow the installation of EV charging infrastructure where it is technically feasible and safe	Ongoing	<b>Planning</b>
2.3	<b>City Staff Training:</b> Provide training for building and development staff on EV charging requirements, technologies and potential configurations in building construction and retrofits which could be disseminated to builders, contractors and developers	2019 - 2020	<b>Planning/</b> Community Services
2.4	<b>Workplace Charging:</b> Explore opportunities for providing charging for City staff personal vehicles during work hours	2018 - 2020	<b>Planning/</b> Facilities
2.5	<b>Parking Challenges for Existing Multi-Family Building Retrofits:</b> Review potential opportunities to amend requirements for on-site parking to decrease barriers to EV charging	2019 – 2020	<b>Planning</b>

### 3.0 PUBLIC CHARGING NETWORK

Public charging stations can provide access to EV charging for residents that do not have charging at home or at work. EV owner respondents to the City’s recent survey reported using public charging stations on a weekly basis on average and 38% of EV owner respondents indicated they do not have access to charging where they park their car overnight.

Public charging stations also provide a supplement for home and workplace charging as residents visit amenities throughout the City, and a substitute for home charging for residents who live in multi-family buildings unequipped with EV charging or in single family homes lacking off-street parking. Centrally located Level 2 charging stations can enable EV owners to charge their vehicles while they visit local amenities. Alternatively, Level 2 charging stations can be sited curbside on residential streets near homes without garages or on-site parking. Integration with street light infrastructure can significantly reduce the costs of curbside EV charging installations as the electrical supply is already available near the street and civil work is not required.

While additional public Level 2 charging stations can contribute to increased public awareness of EV charging infrastructure and some additional EV charging capacity, research conducted for the City has shown that deployment of public DC fast chargers and investment in incentives for multi-family building retrofits will have the most significant impact on increasing EV adoption in the City. Lengthy charging time requirements pose a significant barrier to most mainstream consumers, but when the charging time is reduced to 15 minutes or less, as in the case with newer DC fast chargers (depending on the battery and the DC fast charger power level), this barrier is removed and public charging becomes a viable substitute for home charging.

Charging fees for usage of public charging station can help to recover the costs associated with the stations. The fee structure can be designed to reduce congestion at stations during peak usage hours and encourage home charging, while maintaining a cost incentive compared to operating a gas-powered vehicle.

The City's role in providing public EV charging infrastructure is designed to be short term but critical to enabling the long-term transition to EV ownership. By increasing access to EV charging through public charging stations, the City can enable residents to confidently switch to EVs which will result in a growing market for EVs and EV charging infrastructure. As the market expands, the business case for owning and operating EV charging stations will become stronger and more certain, allowing the transition to private sector ownership and reducing the need for the City's support (Figure 5).



**Figure 5. Transition from public to private sector EV charging infrastructure deployment and management.**

3.0 Charging Infrastructure Actions: Public Charging Network		Timeframe	Responsibility
3.1	<b>Improve DC Fast Charging Access:</b> Deploy two to four new DC fast charging stations in partnership with NRCan, BC Hydro and private site hosts to compensate for lack of home and workplace charging, sited close to amenities, clustered together when possible and with minimal impact on streetscape and pedestrian experience	2018 - 2023	<b>Planning/ Facilities/ Engineering</b>

3.2	<b>Improve Level 2 Charging Access:</b> Deploy three to five new Level 2 charging stations to expand the existing EV charging network and compensate for lack of home and workplace charging, sited close to amenities or curbside when possible with minimal impact on streetscape and potentially integrated with streetlight infrastructure	2018 - 2023	<b>Planning/ Facilities</b>
3.3	<b>Fee Structure:</b> Implement an appropriate fee structure for public charging stations to recover costs and increase turnover and encourage home charging, while maintaining a cost incentive compared to fossil fueled vehicles	2018 - 2019	<b>Planning/ Finance</b>
3.4	<b>Station Usage Data:</b> Review current station usage to determine daily usage trends and explore opportunities to maximize access and reduce congestion through financial rate structures and parking regulations	2018 - 2019	<b>Planning</b>
3.5	<b>Funding Opportunities:</b> Seek additional external funding for public charging infrastructure as new opportunities arise through NRCan, BC Hydro and other partners	Ongoing	<b>Planning</b>
3.6	<b>Car Sharing Partnerships:</b> Work with car share providers to facilitate access of shared vehicles to charging infrastructure and to support transition of car share fleets to EVs	2019 - 2023	<b>Planning</b>
3.7	<b>Shared Use of Workplace Charging Stations:</b> Explore possibility of making charging stations used for City staff workplace charging available to the public overnight	2018 - 2019	<b>Planning/ Facilities</b>

#### 4.0 CITY FLEET AND EQUIPMENT

The City fleet and equipment actions offer a significant opportunity to reduce corporate greenhouse gas emissions. Currently, the City fleet contributes contribute 30% of the City's corporate emissions from City operations. Many of the tasks performed by the City's fleet and equipment could be accomplished by an electric alternative. As City vehicles and equipment come up to be retired and replaced, an electric version should be considered first.

City facilities can pose limitations on the ability to support EV charging infrastructure. Feasibility studies to determine buildings’ baseline capacity will reveal the opportunities for the transition to EVs for the City’s fleet.

Options for electric medium and heavy duty vehicles have been very limited in the past, but more models are beginning to be introduced into the market and are increasingly being incorporated into municipal fleets. Ongoing monitoring of these developments is required to identify opportunities to transition to EV vehicles as the technology becomes accessible and reliable.

4.0 City Fleet and Equipment Actions		Timeframe	Responsibility
4.1	<b>Fleet and Equipment Policy:</b> Develop an “electric-first” fleet and equipment policy for the City that prioritizes the procurement of electric versions of vehicles and equipment, given model availability and ability to perform the required function	2018 - 2019	<b>Planning/ Finance/ Engineering</b>
4.2	<b>Charging Infrastructure Feasibility Studies:</b> Conduct feasibility studies for each City facility to determine baseline capacity to install EV charging infrastructure	2018 - 2019	<b>Planning/ Facilities</b>
4.3	<b>Staff Training:</b> Provide training opportunities to familiarize City staff with current fleet EVs and with potential options for fleet EVs and electric equipment	Ongoing	<b>Planning/ Engineering</b>
4.4	<b>Medium and Heavy-Duty Vehicles:</b> Complete an analysis of opportunities for replacing fossil-fueled medium and heavy-duty vehicles at end of life with electric alternatives, and complete a feasibility analysis to determine upgrades required at the Operations Centre	2019	<b>Planning/ Engineering Operations</b>
4.5	<b>West Coast Electric Fleets:</b> Join network of fleet managers and owners sharing resources and lessons learned, and pledge to contribute to the goal of expanding the use of EVs in fleets	2018	<b>Planning</b>

## 5.0 EDUCATION AND OUTREACH

Levels of awareness of EVs and EV charging remains a barrier for residents. Common misconceptions about range, financial resources and types of charging persist and can prevent residents from purchasing EVs. The City has an opportunity to address these knowledge and awareness barriers through strategic education and outreach actions.

5.0 Education and Outreach Actions		Timeframe	Responsibility
5.1	<b>Multi-Family Building Retrofits:</b> Provide education to stratas, landlords and property managers to facilitate EV charging retrofits in existing multi-family buildings by clarifying means by which charging infrastructure can be installed in existing multi-family buildings, increasing awareness of available financial incentives and promoting resources available through <a href="http://www.evcondo.ca">www.evcondo.ca</a>	2019 - Ongoing	Planning
5.2	<b>Workplace Charging:</b> Promote installation of EV charging infrastructure at workplaces by raising awareness among employers, building managers and property owners and disseminating information about the installation process and available financial incentives	2019 - Ongoing	Planning
5.3	<b>Single Family Home Retrofits:</b> Address knowledge gaps surrounding home charging by clarifying options for installation of charging stations in existing homes, increasing awareness of available financial rebates and promoting online educational resources	2019 - Ongoing	Planning/ Community Services
5.4	<b>General EV Knowledge:</b> Increase awareness of EV models available in BC and provincial incentive programs, and clarify common EV misconceptions among City residents	2018 - Ongoing	Planning
5.5	<b>Charging Station Visibility:</b> Utilize public charging stations as an educational opportunity by enhancing signage to raise the profile of stations and disseminate EV information at the stations	2018 - Ongoing	Planning
5.6	<b>City Webpage:</b> Further develop the City's EV webpage to increase understanding of City EV policy and actions, EV models and available incentive programs and resources for EV charging retrofits; provide links to other informational resources	2018 - Ongoing	Planning/ Communications

5.7	<b>City Fleet Visibility:</b> Consider raising the profile of EV vehicles in City fleet through use of vehicle graphics	2018 - Ongoing	<b>Planning/</b> Engineering
5.8	<b>Non-Financial Incentives:</b> Explore potential non-financial incentives for EV drivers including preferential parking spaces and EV-only passenger zones in high traffic areas to increase EV visibility and signal to residents the City's prioritization of EVs over other private vehicles	2019 – 2020	<b>Planning</b>