Electric Car Charging Stations

(M. Walters)

Recommendation:

That the September 28, 2016, Sustainable Development report CR_3849, be received for information.

Report Summary

This report describes what leading Canadian jurisdictions are doing to encourage the establishment of electric vehicle charging stations. As well, it explains that a formal strategy is under development detailing how the City of Edmonton can support the uptake of electric vehicles in Edmonton.

Previous Council/Committee Action

At the September 19, 2016, Agenda Review Committee meeting, this report was rerouted to the September 28, 2016, Urban Planning Committee meeting.

At the June 28, 2016, City Council meeting, Councillor M. Walters made the following inquiry:

> Can Administration provide a report on the role municipalities can play in encouraging the proliferation of electric car charging stations through incentives, partnerships or legislatively, and is any information available to us about what other cities have done to encourage increased provision of electric car charging stations and to what degree those efforts have been successful?

Report

Background

Canada's transportation sector accounts for approximately a quarter of national greenhouse gas emissions. For this reason, federal, provincial and municipal governments are taking action to encourage a shift from internal combustion vehicles (powered by gasoline and diesel) to lower greenhouse gas emitting vehicles (including electric vehicles powered by cleaner sources of electricity). The greenhouse gas reduction benefits of electric vehicles are most significant in places where the electricity grid is powered by renewable energy such as hydro. However, even in Alberta (where the carbon intensity of the Alberta electricity grid is relatively high), studies indicate that electric vehicles, on average, emit less greenhouse gas than their internal combustion counterparts. This advantage will continue to increase as Alberta's electricity grid becomes greener. As part of their electric vehicle strategies, governments are employing a variety of tools including direct subsidies, fiscal incentives, regulatory policies and support for electric vehicle charging infrastructure.

The term “electric vehicle” applies broadly to four types of vehicles:

- Battery electric vehicles – which run entirely on a battery with an electric drivetrain.
- Plug-in hybrids – which run mostly on a battery but are also equipped with an internal combustion engine that recharges the battery or replaces the electric drive train when needed.
- Conventional hybrids – which have complementary gasoline and electric energy storage and drive systems (with power coming entirely from gasoline and regenerative braking and cannot be recharged from the power grid).
- Hydrogen fuel-cell powered – in which hydrogen is fed through a fuel cell to generate electricity that powers the vehicle (a technology still in developmental stage).

The term “plug-in electric vehicle” (used throughout this report) applies to the first two categories, i.e., battery electric vehicles and plug-in hybrids. These types of electric vehicles depend on charging stations to recharge their batteries.

Worldwide, it is estimated that approximately 1.5 million electric cars and light trucks are on the road today (equivalent to 0.1 percent of all cars and light trucks). In Canada there are approximately 20,000 plug-in electric vehicles, also equivalent to 0.1 percent of the Canadian total. Approximately 96% of these vehicles are registered in three provinces - Québec, Ontario and British Columbia (Table 1). Alberta’s plug-in electric vehicle share is relatively small (fewer than 500 vehicles), with approximately 160 of these registered in Edmonton. This figure is closer to 4,000 in Edmonton when conventional hybrids are included. Leading the way internationally are countries like Norway where, in 2014, 12.3% of vehicle sales were electric vehicles. China, US and Japan are currently the top three holders of electric vehicles.

Table 1
Electric Vehicle Registration by Province (March, 2016)

Province	Number of plug-in electric vehicles	Percent of total electric vehicles
Québec	9,211	46%
Ontario	6,506	32%
British Columbia (BC)	3,682	18%
Alberta	482	2%
Other Provinces/Territories	336	2%
Total	20,217	100%

The functioning of plug-in electric vehicles requires the regular recharging of batteries. Depending on the vehicle model and the battery type, most electric vehicles can travel

approximately 110 to 150 kilometres on a full charge. Leading all models is the Tesla model 85D which can travel up to 430 kilometres on a full charge. In very cold weather (- 30 degrees Celsius) and very hot (+35 degrees Celsius) these distances are reduced by approximately 50% and 35% respectively, mainly due to additional heating and air conditioning requirements.

A variety of charging station types exist. Level I stations (typically purchased for homes) take eight hours to fully charge an uncharged battery. Level II stations take four hours and Level III (quick charge stations) take about one-half hour. The cost of this infrastructure (including installation) ranges from approximately $500 for a Level I home station, to $10,000 for a Level II station, to $100,000 for a Level III station.

Environmental scanning shows that the vast majority of electric car charging happens at home and at work. Nevertheless, public charging stations are needed to support electric vehicle drivers as they go about their daily errands, to support longer road trips and to provide peace-of-mind in the event drivers need extra kilometres. There is a limited amount of information about how many public charging stations are needed in a community to kickstart and support a growing electric vehicle stock. However one study recommended a city-wide ratio of 1.0 to 1.5 charging stations per 1 plug-in electric vehicle in these early days of electric vehicle deployment (i.e. between 2010 and 2020). This intentional oversupply of charging stations is intended to promote the adoption of electric vehicles through changed public perception and to quell anxiety over charging station availability. Today, worldwide, there is an average of one public Level II charging station for every 8 plug-in electric vehicles and one Level III charging station for every 45 plug-in electric vehicles. Applying this global average to Edmonton (and the possibility that Edmonton's electric vehicle stock could reach 4,000-5,000 units by 2020) there would be a need for approximately 550 publicly accessible Level II and 100 level III charging stations. Improving battery technology may reduce these requirements over time.

Leading Programs In Canada

Based on our review of Canadian programs (aimed at increasing the number of public electric vehicle charging stations and the overall uptake of electric vehicles), it appears that progress is greatest in those areas that have strong provincial government programs, i.e., Québec, Ontario and BC. Attachment 1 provides a summary of provincial programs in Québec, Ontario and BC along with details on how major cities in those provinces (Montréal, Toronto and Vancouver) are contributing.

Supporting Electric Vehicle Uptake in Edmonton

City Policy C585 (*Edmonton's Community Energy Transition Strategy)* states that "the City of Edmonton will lead Edmonton in becoming an energy sustainable city" exemplified by a number of things, including: "Increased electrification of Edmonton's transportation system with passenger vehicles, buses, light trucks and trains powered by clean electricity." As well, the Eight-Year Action Plan supporting C585 establishes the following tactics:

- Tactic 4.4.9A: Advocate to Province of Alberta for incentives/programs to encourage: (a) the purchase of fuel efficient vehicles and (b) the retirement of old, polluting, inefficient vehicles.
- Tactic 4.4.9B: Conduct a study to understand how Edmonton should prepare for electric vehicles in the community. As part of the study, assess infrastructure needs (e.g., charging stations throughout the community and in new buildings) and supporting bylaws.

Administration is currently advancing these tactics. With respect to Tactic 4.4.9A, Administration is submitting advice to the Government of Alberta's Energy Efficiency Advisory Panel (which is mandated to help the Minister of Environment and Parks shape the Province's new energy efficiency agency -- Energy Efficiency Alberta). In particular, Administration is encouraging the Province to establish a four-stage market transformation program to encourage the purchase of zero-emission vehicles including: (a) rebates for the purchase of new zero-emission vehicles and (b) rebates for the installation of electric vehicle charging stations. With respect to Tactic 4.4.9B, Administration has commenced a study on "preparing for electric vehicles" with the aim of presenting an Electric Vehicle Strategy to City Council in mid-2017.

Coincidentally, about the same time as this inquiry was made, Natural Resources Canada issued two requests for proposals for projects to advance electric vehicle charging infrastructure in Canada. In both cases, matching funding was offered by Natural Resources Canada with July 2016 the deadline for both applications. An accompanying report (CR_3961 - Opportunity to Expand Edmonton's Electric Vehicle Charging Station Network) discusses the City's applications that were submitted and the need for City of Edmonton matching funding.

Policy

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Metrics, Targets and Outcomes

Metrics	• Approximately 160 plug-in electric vehicles are registered in Edmonton
Targets	• No City of Edmonton target for electric vehicle adoption has been set
Outcomes	• Citizens and businesses make sustainable choices • Neighbourhood infrastructure investment is planned to support livability and sustainability

Attachment

1. Leading Canadian Programs

Others Reviewing this Report

- D. Jones, Deputy City Manager, City Operations
- A. Laughlin, Deputy City Manager, Infrastructure Services
- T. Burge, Chief Financial Officer and Deputy City Manager, Financial and Corporate Services