

**TO:** CHAIR AND MEMBERS  
SUSTAINABLE CITY ADVISORY COMMITTEE

**DATE:** 2018 April 04

**FROM:** DIRECTOR PLANNING AND BUILDING

**FILE:** 76500 20  
*Reference: Env. Plng*

**SUBJECT: EV CHARGING REQUIREMENTS FOR NEW RESIDENTIAL DEVELOPMENT**

**PURPOSE:** To seek Council's approval for the proposed requirements for EV charging in new residential development, and to outline additional EV policy topics for further review.

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**RECOMMENDATIONS:**

1. **THAT** Council authorize staff to work with the City Solicitor to prepare the necessary text amendments to the Zoning Bylaw to implement the recommended requirements for EV charging in new residential development, as outlined in *Section 4* of this report.
2. **THAT** Council receive for information the updates on the status of policy research into topic areas for future policy and program direction as outlined in *Section 3* of this report.

**REPORT****1.0 INTRODUCTION**

On 2017 November 01, Burnaby City Council approved the report titled "Development of Electric Vehicle Policy for Burnaby", which presented background about electric vehicles (EVs), including technology, market trends, and policy at various levels of government, and outlined the process for development of EV Policy for the City. As outlined in that report, the EV market, while still small today, is rapidly growing, and policy at various levels of government will play a significant role in the rate of growth. The availability of charging was highlighted as a key factor influencing individuals' choice whether or not to purchase an EV.

The purpose of this report is to present updates in the EV sector, to seek Council's approval for a proposed policy for EV charging in new residential development, and to outline additional policy topics proposed for further investigation.

## 1.1 Policy Context

Policy supporting the uptake and use of electric vehicles is supported by Burnaby's approved (2016) Environmental Sustainability Strategy (ESS) and Community Energy and Emissions Plan (CEEP) due to the significant potential to reduce community greenhouse gas (GHG) emissions and make progress toward Burnaby's GHG targets. EV policy can also support the City's approved plans for social and economic sustainability through reduction of air pollution and noise, and fostering green economic development, among other benefits.

EV policy, including the topic areas outlined in *Section 3*, is also well aligned with the City's Corporate Strategic Plan by supporting the following four goals and seven sub-goals:

### A Connected Community

- Digital connection
- Geographic connection

### A Dynamic Community

- Community development
- City facilities and infrastructure

### A Healthy Community

- Healthy environment

### A Thriving Organization

- Organizational culture
- Technology and innovation

EVs are one component of the city's transportation system, set in a broader policy landscape of planning and developing complete, compact communities to reduce the need for vehicle trips, encouraging the use of transit, and investing in and encouraging walking and cycling.

## 2.0 UPDATES

### 2.1 Markets and Technology Updates

The overall rapid growth of EV markets presented in the November 2017 Committee report still holds true. 2017 was a benchmark year for EV sales across Canada, with sales up by 68% over 2016. BC saw a 53% increase over 2016 sales, with a total of 3,270 EVs sold in the province<sup>1</sup>.

In addition, a number of major auto manufacturers have announced a greater emphasis on EVs, including GM, Ford, Mercedes-Benz, BMW, and Volvo. Volvo has further committed that all new car models launched after 2019 will be electric or hybrid, as a part of a long-term phase-out of pure internal combustion engines, an intention also stated by GM.

A significant development in charging technology is the advent of *energy management systems*, which allow multiple charging points to safely use a single circuit simultaneously, reducing the overall electrical load needed to supply the building. Energy management systems are typically used for Level 2 EV charging (see *Appendix A, attached*, for a review of the common EV charging levels). This technology is further described in *Section 4.1.2* below, as it relates to the proposed policy for new residential development in Burnaby.

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<sup>1</sup>Source: Fleetcarma.com

## 2.2 Policy and Program Update

A number of nations around the world have recently announced future bans on fossil fuel powered vehicles<sup>2</sup>, and/or targets for EV sales<sup>3</sup>. Canada has not yet implemented such policies, but is developing a Zero Emission Vehicle Strategy, to be completed this year. In addition, the federal government has committed \$80 million over four years for new EV charging infrastructure (as well as natural gas and hydrogen fueling stations) along the national highway system. On 2018 February 27, the federal government also announced a \$4.3 million investment toward EV infrastructure including a project being led by BCIT (at the Burnaby campus) that is demonstrating technologies for public EV charging, also referenced in **Section 3.3** below.

The Province of BC is continuing funding of the Clean Energy Vehicle (CEV) program through to 2020, which provides incentives for purchasing an EV. The Province is also continuing to provide support and funding, through a program administered by the Fraser Basin Council, for the installation of EV charging in existing multi-family residential buildings and workplaces.

A number of local governments are undertaking reviews or have recently updated their EV programs, policies and requirements for new development. The most recently approved new requirements, by the City of Vancouver (March 2018), City of Richmond (December 2017) and City of Port Coquitlam (November 2017), establish increased levels of EV-readiness in new residential buildings, to provide all (or most) of the required electrical infrastructure to supply each residential stall or dwelling unit with EV charging. Other Metro Vancouver municipalities are also considering similar requirements. Together with the policy approach proposed in **Section 4** for Burnaby, a new standard with greater regional consistency is being established for EV charging.

## 3.0 OVERVIEW OF EV POLICY TOPIC AREAS

As outlined in the Sustainable City Advisory Committee Report approved by Council on 2017 November 1, Burnaby's EV policy was to give priority to establishing updated standards for EV charging in new development, while also setting direction for public charging and charging at City owned facilities (for public and/or staff), and consideration for EVs in City fleets. Accordingly, these issues have been categorized into four policy topics, and are proposed to be addressed as follows. The first of these policy topics (EV charging in new residential development) would be advanced as outlined in **Section 4**, while the other topics would be subject to further review and research prior to reporting back to Council.

### 3.1 EV Charging in New Residential Development

Research has shown that having access to charging at home is one of the most important factors in an individual's decision whether or not to purchase an EV. Charging an EV while at home is the most convenient and reliable option, and at the time of construction new homes can be

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<sup>2</sup>Including: Norway (by 2025), The Netherlands (2030), Scotland (2032), the United Kingdom (2040), France (2040), India (2050), as well as Germany and China (with no dates yet confirmed).

<sup>3</sup>Including: Austria, Denmark, Ireland, Japan, The Netherlands, Portugal, Korea and Spain.



equipped with EV charging with relatively modest cost, as outlined below. In contrast, retrofitting older homes, particularly multi-family buildings, can be challenging, costly and sometimes not feasible. Advances in *energy management systems*, as described in more detail in **Section 4.1.2** below, make it feasible to provide access to a greater number of parking stalls by sharing electrical circuits and energy loads, with modest cost at the time of construction. This helps to address many of the difficulties of stall allocation and access in strata buildings. For these reasons, Burnaby's EV policy would advance new standards for new residential development at this time, as outlined in **Section 4**, while continuing to review the other policy areas described below.

### 3.2 EV Charging in New Commercial/Office and Institutional Development

Access to workplace charging can also be an important factor in people's decision to purchase an EV, particularly if they have a longer commute from home, and/or need to make additional trips prior to returning home each day. Charging at business places can also help to fill in the day-to-day needs of drivers. In some cases, business owners and institutions may want to install EV charging at their own cost, for customer service; but, as in multi-family buildings, retrofitting can be challenging or infeasible at the desired scale. At the same time, policy for EV charging in new commercial and institutional development is somewhat more complex compared to residential development. A wider variety of land uses and ownership and management of parking spaces, and potentially different charging needs for staff vs. customers, may require different approach(es) than recommended for residential development. Therefore, further review and stakeholder consultation is proposed prior to advancing a specific policy recommendation for EV charging in new development of this sector. It is anticipated that recommendations in this area would be forwarded to Council at a later date.

### 3.3 Public EV Charging

In addition to charging at home and at workplaces, public charging can further support the widespread adoption of EVs, and contribute to the prosperity of businesses that rely on public parking for their customers. Staff are reviewing opportunities and considerations, including the role of the City in this service area, fees for charging, possible partnerships with other agencies and/or private enterprises, resource and cost considerations, and criteria for site selection. Two general options for public charging include curbside charging, and charging at city owned facilities.

Some innovative options are emerging suitable for curbside charging. For example, EV charging can be integrated into street light standards to utilize "extra" electrical supply after conversion of lighting to LED, such as recently demonstrated in the City of New Westminster in a pilot project with BCIT<sup>4</sup>. This may also be a suitable option for surface parking lots. Some EV charging systems can also potentially be combined with services such as public WiFi, wayfinding, sensors, and associated Smart City technologies.

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<sup>4</sup>The project was recently granted additional federal funding, at an announcement at BCIT that was attended by Councillor McDonnell. <https://www.canada.ca/en/natural-resources-canada/news/2018/02/government-of-canada-supports-electric-and-alternative-fuel-vehicle-infrastructure-in-bc.html>

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City owned facilities such as community centres, libraries and administration buildings also present opportunities for EV charging, for both public and staff. This could support the City's community and corporate sustainability goals and help to attract and retain visitors and employees, particularly as EVs become more common.

It should be noted that although some cities initially offered free public EV charging, the practice is generally shifting to a pay-for-use model. Today's charging technologies allow users to easily create an account and swipe their card or app to initiate charging, with a usage-based fee applied at the discretion of the agency providing the charging. Fee-based charging is seen to be most equitable, would encourage parking turnover and help to recoup capital and operating costs.

Upon further examination of the above noted considerations and opportunities for public charging, staff would report back to Council at a later date.

### 3.4 City Fleets

The City fleet of on-road vehicles consists of approximately 250 heavy duty vehicles, 70 light duty cars and 225 light duty trucks/SUVs/vans, with the majority of GHG emissions resulting from the heavy duty vehicle class. Burnaby has already undertaken a number of initiatives to reduce the fuel costs and greenhouse gas emissions associated with City fleets, including right-sizing of vehicles, more sharing of pool cars vs. allocated cars, and purchasing more fuel-efficient vehicles. Considering opportunities for EVs for City fleets is a natural progression of these initiatives, and could be considered as part of a broader review of fleet optimization strategies.

Incorporating EVs in corporate fleets could support the approved ESS ("Manage" goal<sup>5</sup>), support the Corporate Strategic Plan<sup>6</sup>, and help to meet the City's commitments to reduce GHG emissions.

Therefore, to both support ongoing efforts and to leverage the opportunities for EVs to further advance these policy goals, a fleet review would be undertaken, led by the Finance and Engineering (Fleet Management) departments. The review would include quantification of high level costs and benefits of improvements to fleet efficiencies including EVs, and would address capital costs of vehicles and infrastructure, operating costs and savings, and GHG reduction. This further technical review is necessary in order to determine an advisable approach. Following this review, a report would be advanced to Council on future fleet purchasing and management programs and budget.

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<sup>5</sup> ESS, Manage, Strategy 10.3 (New Big Move), **emphasis added**: "Demonstrate leadership in sustainability through City facility and operations management by **reducing energy and GHG emissions...**", Suggested Action b) "Explore ways to implement further improvements in operational areas such as City procurement, **vehicle fleet, staff commuting...**new and existing buildings and infrastructure..."

<sup>6</sup> In particular, the goals of A Healthy Community (Healthy environment); A Dynamic Community (City facilities and infrastructure); and A Thriving Organization (Organizational culture; Technology and innovation).

## **4.0 PROPOSED REQUIREMENTS FOR EV CHARGING IN NEW RESIDENTIAL DEVELOPMENT**

### **4.1 Background**

#### **4.1.1 Existing Policy and Challenges**

For large new multi-family residential developments subject to the City's supplemental density policy, the City has established the practice to require, through the application review process, 10 percent of stalls to be provisioned with Level 2 EV charging. This takes the form of dedicated electrical circuits (one circuit per stall) and includes all electrical infrastructure and EV supply equipment (EVSE, a.k.a. "chargers"). In addition, DC Fast Charging (DCFC) systems have been supplied in some common parking areas, to serve residents without access to a dedicated charger (see *Appendix A* for a review of charging types). DCFC is typically quite expensive to install and draws a high power supply over a short duration.

Based on projected market trends, it is likely that 10 percent of stalls will not be enough to serve future demand, and also does not provide appropriate electrical supply and distribution of the wiring to significantly expand the system in future. Retrofitting existing buildings for EV charging can be prohibitively expensive unless there is sufficient electrical infrastructure in place. Allocating a limited number of stalls is also challenging due to legal and administrative barriers in strata rules and policies that make switching stall ownership difficult, and unless an owner is able to pre-purchase a unit with charging, they may not be able to take advantage of the service. The difficulties stratas face in managing the charging, and establishing a fair billing system to users, means that they have sometimes opted to forgo use of the provided EV charging altogether.

Finally, the existing practice only addresses large multi-family developments within Town Centres. There is also need for residential EV charging in areas outside of Town Centres, in single and two-family homes and in multi-family developments, for which Burnaby does not currently have policy or requirements for EV charging.

#### **4.1.2 Energy Management Systems**

*Energy management systems*, also known as "smart charging", "power sharing" or "load sharing", refers to a variety of technologies and services that control the rate and timing of EV charging. In shared parking garages such as multi-family residential buildings (MURBs), energy management systems allow multiple charging points to safely use a single circuit simultaneously. This is in contrast to a dedicated circuit where a single circuit supplies a single charging point.

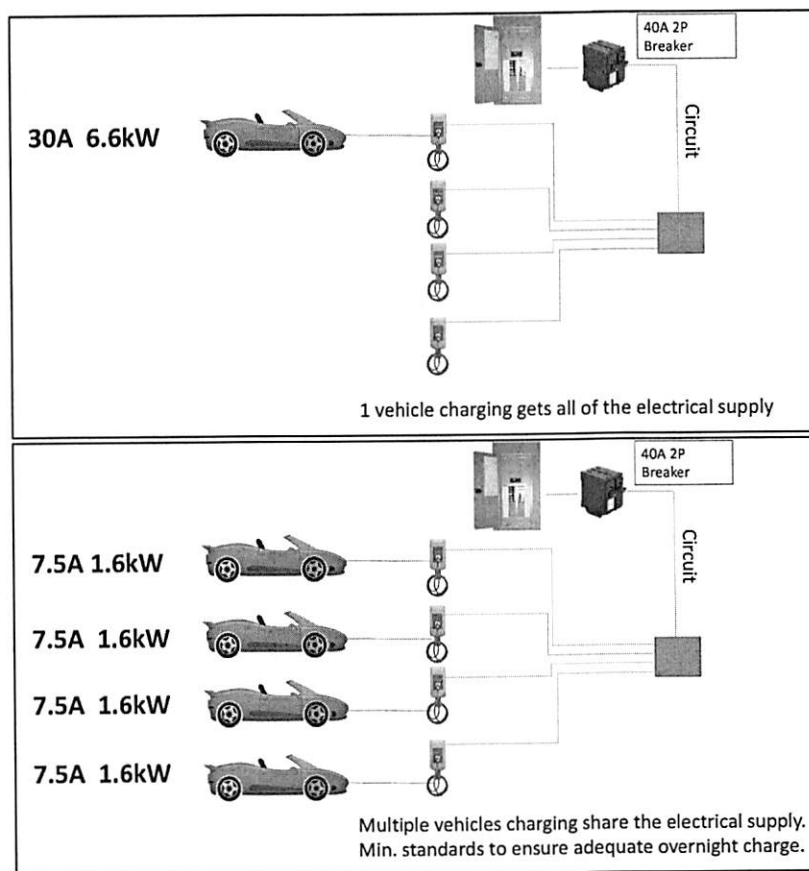
As shown conceptually in *Figure 1* below, when only one EV is plugged in to one of the outlets it receives all the electricity, but when multiple EVs are plugged in the electricity delivered to any one outlet is reduced. Energy management systems can greatly reduce the total amount of electrical supply that a building requires by sharing these loads, significantly reducing the infrastructure costs compared to dedicated circuits. Through a digital network supported with



software they can also track usage and allocate billing to individuals, and some systems can adjust the timing of EV charging according to the needs and preferences of users.

Energy management systems can be deployed in any situation with shared parking, including MURB, commercial, office, institutional, and single family homes with multiple parking stalls. Since the energy supplied to any one charging point can be reduced with shared usage, *performance standards* are needed to ensure an adequate charge is delivered over a given time, for example for overnight charging using a typical driving range.

EV energy management systems are recognized in the latest Canadian Electrical Code updates<sup>7</sup>, and will be incorporated in provincial code with a technical bulletin to be published later in 2018. In the meantime local governments have the ability to issue a code variance to allow for an energy management system. Burnaby's electrical inspection staff are engaged and informed on this process.



**Figure 1.** Illustration of an energy management system: when only one vehicle is plugged in (top), it receives 100% of the electrical supply; when multiple vehicles are plugged in (bottom), they share the supply. (Image modified from Electrum Charging, used with permission).

*Note: Although a 1:4 system is shown here, various configurations are possible, including from 1:2 to 1:18 (with larger supply).*

<sup>7</sup> <http://www.electricalindustry.ca/latest-news/3739-2018-canadian-electrical-code-part-i-top-15-changes>

## 4.2 Proposed Requirements

### 4.2.1 Objectives

In order to address the expected future demand for EVs and to support their use to achieve environmental, social and economic sustainability benefits, increased provision of charging is needed, with home charging identified as a priority. The approach proposed below for new residential development was based on optimizing and balancing the following objectives.

- **Minimize upfront costs:** EV charging infrastructure has a cost, however, it is desirable to identify solutions that provide increased charging opportunities in a cost-effective manner at the time of new construction.
- **Allow for and minimize costs of retrofits:** installing EV charging at the time of construction for only a portion of parking can make future system expansion more costly overall, or infeasible.
- **Simple for stratas to administer:** as noted above, it is difficult for stratas to fairly allocate access to EV charging among a limited number of stalls, and to allow owners to change stalls.
- **Simple for City to administer and inspect/approve:** standards that are simple to inspect and approve are preferred.
- **Equitable for residents:** ensure residential charging is available in all types of buildings and locations in the City.
- **Future-proofing:** allow for future increased EV uptake, and accommodate specific charging systems and technologies as they change overtime, through a standard that is flexible.

Consideration of these objectives led to the following recommended requirements for new residential development.

### 4.2.2 Proposed Requirements: Summary and Benefits

*The proposed requirement is for each required residential parking stall in new development to be made EV-ready, through the provision of an energized outlet for Level 2 EV charging. The policy would allow for the use of energy management systems, and would apply to new multi-family, single and two-family buildings, with the exception of visitor parking and secondary suites.*

The policy would apply City-wide, for all new residential development, and would not apply to a renovation, nor a new garage associated with an existing home. Visitor parking is proposed to be exempted because it would be difficult for stratas to manage and bill the charging service from a common account, and it is not seen as necessary since a resident could provide a guest with



access to their own stall. Secondary suites are proposed to be exempted because of the need for access to a second circuit, and associated costs. However, the outlet in the principal dwelling's required parking stall could be shared for tenant use, including with an energy management system.

Developers/builders would not be required to install the full EVSE ("chargers"); instead, that cost would fall to the vehicle owner. DC Fast Charge stations would also not be required in multi-family developments since all residents would have access to Level 2 charging. Developers would, of course, still have discretion to provide some or all of the EVSE if they so choose.

This approach has a number of benefits:

- Providing an outlet in all required residential parking stalls effectively gives all residents of new homes the choice of EV ownership, whether now or in future.
- Not requiring full installation of chargers eliminates guesswork to anticipate future need, and allows the system to grow and adapt to new types of chargers over time. Vehicle owners can also have greater choice in the selection of charger most suited to their needs.
- Installing outlets to every required parking stall at the time of construction, with provision of energy management systems, is the lowest-cost and most feasible option to service all stalls for EV charging, compared to trying to retrofit later.
- The proposed approach alleviates the need for complex legal agreements to ensure stratas provide owners access to charging among a limited number of stalls.
- The provision of energized outlets is simple for the City to review and inspect, and is not expected to add additional time for review nor require additional staff to administer.

#### 4.3 Costs

In all circumstances, owners would be responsible for purchasing the charger for their vehicle, unless the developer/builder chose to provide this additional infrastructure.

The costs of installing an outlet for EV charging in new single and two-family development is considered to be nominal as the necessary electrical wiring can be installed at the time of construction and does not involve extra-ordinary technical advice or materials<sup>8</sup>. Consultation with EV service equipment providers and the City's electrical inspections staff indicates that the required outlet could typically be provided within a building's standard electrical supply, and that there are options for load-sharing that could mitigate rare situations where supply was constrained.

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<sup>8</sup> The estimated incremental cost for single and two-family homes is estimated at about \$200-\$500 for materials and labour however this may be over-stated since the work would be undertaken as part of related servicing.

The cost for multi-family developments, while higher than for single-family, is also relatively modest and provides a marketable benefit. Compared to an approach that would provide more stalls with charging (e.g. 20 to 30 percent) through installing dedicated circuits for Level 2 charging, the proposed approach (with energy management systems) is expected to be generally equal or less in total costs, while also better addressing other considerations noted above. The proposed approach is also significantly lower in cost than a standard that would require dedicated circuits to all stalls, for either Level 2 or even Level 1 charging<sup>9</sup>.

Consultation with the Urban Development Institute and architects and engineers involved in large multi-family developments in Burnaby indicated general support for the proposed approach, and while there were some questions and concerns raised about technical considerations and provisions of the policy, cost was not an overriding concern. It is anticipated that the concerns can be largely addressed through further communication about the standards, including a technical bulletin as described below.

Energy management systems are the critical element that mitigate the need for costly electrical supply upgrades for multi-family development, and on a per-stall basis the result is significantly less expensive than supplying each stall with a dedicated circuit. For multi-family developments, the standards of the new policy should be feasible without triggering a substantial electrical supply upgrade, a key driver of costs.

#### **4.4 Implementation**

The policy requirements are proposed to be implemented through a text amendment of the Zoning Bylaw. Following approval of this report, staff would work with the City Solicitor to prepare the necessary Bylaw amendments, which would then be advanced for Council's approval, for a subsequent Public Hearing. The effective date of the new standards would be outlined in the following report and would ensure sufficient time to communicate the requirements to development applicants as outlined in the following section, and to inform the necessary City staff.

The new standards would not apply to development that has applied for a Building Permit or Preliminary Plan Approval prior to the effective date. In addition, projects subject to Rezoning that have advanced past Second Reading would be exempted from the new standards for EV charging, but would be encouraged to comply if feasible. This is because at this stage the building design is generally confirmed and the addition of the EV charging could be difficult to incorporate.

The Zoning Bylaw would also include a provision for the Director Planning and Building to issue a variance for an unanticipated, exceptional circumstance in which the requirements were demonstrated to not be feasible.

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<sup>9</sup>Source: AES Engineering for the City of Richmond <http://udi.bc.ca/city-richmond-electric-vehicle-ev-charging-infrastructure/>

A technical bulletin is under preparation to guide more complex installations, which will include background on various energy management systems, establish a requirement for stations to be networked (vs. stand-alone), and set a performance standard to ensure a minimum electricity supply over a given time for adequate charging. Guidelines and FAQs for single and two-family home builders will also be prepared.

#### 4.5 Communication Plan

Upon Council's approval of the proposed policy, the following communication approaches would be initiated. Interested and affected groups would be provided with information to advise them of the new standards, including in the following formats.

- **Developers/builders of smaller multi-family and single and two-family buildings:** Outreach is planned via email and mail to inform these professionals of the upcoming new requirements, as well as by making a technical bulletin and brochure available as described below.
- **Developers of larger mixed-use and multi-family developments:** will be informed of the new requirements through existing communication channels including email, website and through development inquiries.
- **Commercial property managers and leasing agents:** A workshop for these stakeholders is being planned for Spring 2018 to seek their input on possible approaches for EV charging standards for commercial and office development, as outlined above in *Section 3.2*.
- **Technical bulletin and brochures:** A bulletin would be prepared outlining the technical requirements of the new standards for residential development, for developers, designers and builders, and a brochure targeting single family home builders would also be prepared, and provided on the City's website and in the Building Department.
- **Website:** The EV policy would be posted on the ESS/CEEP implementation webpage for the general public, alongside updates and opportunities to engage on other policy topic areas as they are advanced.

#### 5.0 CONCLUSION

Electric vehicles represent a technology advancement with significant potential to reduce community GHG emissions and provide related social and economic sustainability benefits. In order to support this evolution, charging infrastructure is needed in various forms and locations. This report outlines the first proposed component of the City's EV policy, outlining a standard that would require all new residential parking stalls to be made EV-ready through the provision of an outlet for Level 2 charging, in a manner that is feasible and cost-effective. As such, it is recommended that Council authorize staff to work with the City Solicitor to prepare the



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necessary text amendments to the Zoning Bylaw to implement the policy for EV charging in new residential development as outlined in **Section 4** of this report, for Council's approval and subsequent advancement to a Public Hearing. At the same time, further investigation is proposed to address other EV policy topics, as outlined in **Section 3**, for later reporting back to Council, on the further results of this review for commercial/office new development, public and staff EV charging, and EVs in City fleets.

  
Lou Pelletier, Director  
PLANNING AND BUILDING

LT:sla  
*Attachment*

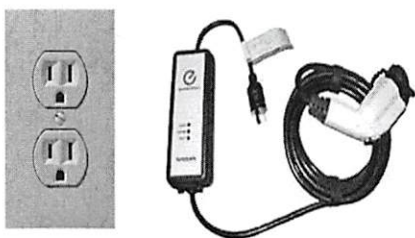
cc: City Manager  
Director Engineering  
Director Finance  
Chief Building Inspector  
City Solicitor  
City Clerk

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## Electric Vehicle Charging Types and Uses

### Level 1

(110 v)



#### Level 1 Charging:

- 3-8 km per h charge
- Useful charge in 8+ hours
- Still used in some home charging and workplace
- Not suitable for longer range vehicles due to long charge time

### Level 2

(208/240 v)



#### Level 2 Charging:

- 18-45km per h charge
- Useful charge in 2-6h
- Residential, workplace, retail and public charging (e.g. curbside)
- Amenable to load-sharing (energy management) systems

### DC Fast Charge

(500 VDC)



#### Direct Current (DC) Fast Charge:

- 90-150km per ½ h charge
- Useful charge in 15 min
- Highways, public charging "hubs" with fast turnover