Fraser Basin Council

A Gap Analysis for B.C.'s Electric Vehicle Level 2 Charging Network

A report prepared by
Fraser Basin Council

Funded by the
B.C. Ministry of Energy and Mines

September 2015

CONTACT:

Charlotte Argue
Assistant Manager,
Climate Change & Air Quality Program
E: cargue@fraserbasin.bc.ca
T: 604-488-5369

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The Province of British Columbia has renewed funding for the Clean Energy Vehicle Program, which includes an investment of up to $441,000 towards Level 2 (220-volt) charging stations. This report assesses the critical gaps in the existing Level 2 charging infrastructure in B.C., and provides recommendations for the most effective application of these funds, based on research findings and programs from across North America.

Research has shown that the primary driver and indicator of electric vehicle adoption is the ability to charge at home. Access to charging is generally not an issue for residents in single detached housing, but can be problematic for those living in multi-unit housing complexes. As such, it is recommended that the province could encourage electric vehicle adoption by reducing the barriers to the installation of Level 2 charging stations in multi-unit housing.

Barriers for electric vehicle charging in multi-unit dwellings go well beyond financial obstacles. It is therefore recommended that additional training, guidance and support be provided in addition to financial incentives, in order to overcome barriers in this sector.

A secondary focus for investment is in workplace charging. The presence of workplace charging can positively influence electric vehicle adoption, and is the predominant place for electric vehicle charging after residential charging. However, compared to the value of and considering the barriers that remain with regards to charging stations in multi-unit residences, it is of secondary importance. Furthermore, increasing the number of Level 2 public charging stations would not likely be an effective use of resources at this time.

KEY ACRONYMS

BEV: Battery Electric Vehicle (fully-electric)
CCI: Community Charging Infrastructure
CEV: Clean Energy Vehicle
EV: Electric Vehicle (in this document, interchangeable with PEV)
EVSE: Electric Vehicle Supply Equipment, or charging stations
MURB: Multi Unit Residential Building
PEV: Plug-in Electric Vehicle, refers to fully electric or plug in hybrid electric
PHEV: Plug In Hybrid Electric Vehicle

INTRODUCTION

On April 1 2015, the Province of British Columbia introduced Phase 2 of the Clean Energy Vehicle (CEV) Program, to encourage and accelerate the adoption of CEVs in B.C. Over three years, the program will distribute $10.6 million from the Province's Innovative Clean Energy Fund, including point-of-sale incentives for plug-in electric (PEV) and hydrogen fuel cell vehicles, as well as investments for charging and fuelling infrastructure[1].

Phase 1 of the CEV Program, which ran from 2011 to 2014, supported the purchase of 950 EVs and the installation of over 1,000 charging stations, resulting in B.C. having the highest number of EV charging stations per capita in Canada. However, there remain critical gaps in the existing charging infrastructure in the province that continue to be a barrier for EV adoption. This report reviews research findings and programs throughout North America to assess the most effective use of public investments in Level 2 (220 volt) charging stations, to guide the deployment of $441,000 in provincial funding. This is a companion document to a gap analysis prepared to identify priorities for DC Fast-Charging.

CHARGING SPEEDS

There are three classifications for EV chargers, also known as Electric Vehicle Supply Equipment (EVSE), and are based on charging speed, as outlined in Table 1 below.

Table 1. Classification of Electric Vehicle Charging

Classification	**Voltage (and Power)**	**Charging time (24 kWh EV)**	**Cost ***
Level 1	110 V (1.5 kW)	16 hours	$0+
Level 2	220 V (3-6 kW)	4-8 hours	$1,500+
DC Fast-Charging	400 V (50+ kW)	30 min	$30,000+

* Cost largely depends on whether existing electric outlets need to be moved, or new circuits added.

Level 1 charging describes charging speeds that can be obtained from standard 110V wall outlets. This so-called "trickle-charging" is suitable for topping up vehicles when

[1]For a breakdown of program funds, see the February 2015 Provincial press release: http://www2.news.gov.bc.ca/news_releases_2013-2017/2015MEM0009-000380.htm

they are parked for long periods of time. Level 1 charging may also be sufficient for owners of plug-in hybrid electric vehicles (PHEV's) — vehicles that have batteries as well as a gasoline propulsion system. General Motors reported in 2012 that about half of the early buyers of the Chevy Volt opted to use Level 1 charging at home[2].

Level 2 charging describes charging speeds that can be obtained from 220V circuits. Charging stations outfitted with Level 2 are often used for home, workplace, public or fleet charging. Level 2 charging is the ideal charging type for regular day use, particularly for EVs with larger battery capacities, and is the focus of this report.

Direct current fast-charging (DCFC) describes very high charging speeds. These chargers allow compatible PEVs (typically fully-electric) to be recharged in about half-an-hour. A separate gap analysis report has been prepared which provides initial recommendations for priorities related to this charging type.

CHARGING LOCATIONS

It is well established that EV owners charge primarily at home, but the commonly-held belief that 90% of charging occurs at home[3] is an overstatement, particularly in B.C., where public charging infrastructure is relatively abundant.

Three studies' findings are summarized in Table 2 below.

Table 2: Where North American electric vehicle drivers charge their vehicles

Drivers	Vehicle Type	% charging at home	% charging at work	Source
Chevy Volt	PHEV	86%	no access	1
Chevy Volt (with work access)	PHEV	60%	37%	1
Nissan Leaf	BEV	85%	no access	1
Nissan Leaf (with work access)	BEV	68%	30%	1
EV owners (general)	PHEV, BEV	81%	7%	2
EV owners in British Columbia (general)	PHEV, BEV	63%	19%	3

Table 2 Data Sources:
1 - NRC (National Research Council). 2015. Overcoming Barriers to Deployment of Plug-in Electric Vehicles. Washington, DC, USA: The National Academies Press. Table 5-2. Charging statistics based on kWh.
2 - PlugInsights, 2013 U.S. PEV Study. Referenced in: http://www.plugincars.com/comprehensive-study-ev-drivers-reveals-plug-attitudes-128883.html
3 - Axsen et al., 2015. Figure 31. Charging statistics based on number of charging events.

Regardless of the exact magnitude of home-based charging, all studies conclude that home-based charging is where the majority of charging occurs. The predominance of at-

[2] http://content.usatoday.com/communities/driveon/post/2012/05/some-chevrolet-volt-drivers-opt-for-electric-mode-only/1#.Vd-U4us37xc, Accessed August 2015.
3 Examples include https://chargedevs.com/features/the-economics-of-free-public-ev-charging/, http://www.fleetdrive-electric.com/charging/charging-info/ and http://www.esquimalt.ca/municipalhall/sustainabilityenvironment/evcharging.aspx . (All Accessed between July 2015- September 2015)

home EV charging, followed by workplace and public charging, gives rise to the EV "Triangle Diagram" shown in Figure 1[4].

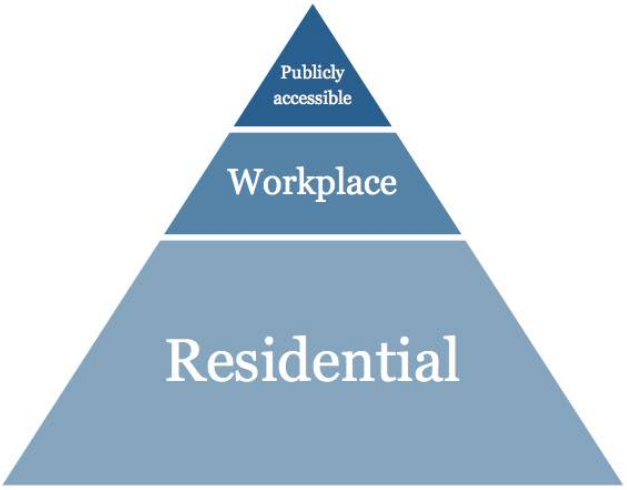

Figure 1: EV Charging Triangle Diagram

The Argonne National Laboratory[5] provides a more complex, three-dimensional charging pyramid showing charging levels along with location types, with the following descending order of priority for charging infrastructure:

(1) single-family residential charging stations
(2) multi-family residential charging
(3) workplace charging stations
(4) public and private fleet charging stations
(5) opportunity charging stations within a metro area
(6) inter-metro charging stations along major transportation corridors.

Figure 2: 3D Charging Pyramid

Given that charging is done primarily at home, even with the presence of workplace and public charging (see Table 2), it is essential that any obstacles to residential charging be addressed first and foremost, to enable EV use. This is corroborated by research from the U.S. National Research Council, on overcoming barriers to PEV deployment:

[4] Seattle Office of Sustainability & Environment, Removing Barriers to Electric Vehicle Adoption by Increasing Access to Charging Infrastructure, 2014. Figure 8.
[5] Argonne National Lab http://docs.trb.org/prp/14-5337.pdf

> Home charging is a virtual necessity for mainstream [plug-in electric vehicle] buyers of all four vehicle classes given that the vehicle is typically parked at a residence for the longest portion of the day[6].

Furthermore, a study by researchers at Simon Fraser University suggests that the availability of EVSE at home is a more important predictor of EV interest than public charger awareness, and will have greater impact on EV adoption rates[7].

Workplace charging, while not deemed a virtual necessity, is still important for increasing EV miles travelled. Additionally, it is the second-most used charging location for EV drivers, behind home charging. Investments for charging infrastructure should therefore prioritize workplace charging second to residential EVSE.

Residential: Single-Family Housing

Generally speaking, PEV drivers in single-family homes have relatively few barriers to accessing home charging. Single-family homes typically have easy access to electricity — except in the case where there is no garage or driveway (sometimes referred to as "garage-orphans"). A comprehensive study would be needed to assess the prevalence of garage orphans in B.C., such as that done by the City of Seattle[8]. We believe them to be far less common than detached single-family homes with a garage or driveway.

A disproportionate number (79%) of early adopter PEV owners in B.C. live in single detached housing[9]. However, only 54% of B.C.'s total population live in single detached housing[10], suggesting that barriers to adoption for these residents are reasonably minimal.

Furthermore, installation costs do not appear to be a significant barrier for these early adopters. During Phase 1 of the Clean Energy Vehicle Program, only about one-third of EV owners applied for the LiveSmart rebate of $500 for residential Level 2 chargers[11], suggesting that early adopters were opting to charge with available Level 1 at home, or that the cost of installing Level 2 wasn't a significant concern. (It is also possible that some EV buyers were not informed about the LiveSmart rebate. The extent to which lack of information influenced the rate of uptake is unknown).

Residential: Multi Unit Housing

Unlike single-family housing, installing and accessing charging in MURBs can be very complex, and often requires coordination between multiple parties. These include strata

---

[6] NRC (National Research Council). 2015. Overcoming Barriers to Deployment of Plug-in Electric Vehicles. Washington, DC, USA: The National Academies Press. (page 83)

[7] Bailey, H., A. Miele, and J. Axsen (2015a). Is awareness of public charging associated with consumer interest in plug-in electric vehicles? *Transportation Research Part D: Transport and Environment*, 36, 1—9. See http://www.sciencedirect.com/science/article/pii/S1361920915000103

[8] Seattle Office of Sustainability & Environment 2014 http://www.seattle.gov/Documents/Departments/OSE/FINAL%20REPORT_Removing%20Barriers%20to%20EV%20Adoption_TO%20POST.pdf (Accessed July 2015)

[9] Axsen et al, 2015. Electrifying Vehicles: Insights from the Canadian Plug-in Electric Vehicle Study. Simon Fraser University, Vancouver, Canada Table 16.

[10] Statistics Canada, "Private households by structural type of dwelling, by province and territory (2011 Census) (Manitoba, Saskatchewan, Alberta, British Columbia)". 2011 Census of Population and Statistics Canada catalogue no. 98-313-XCB. http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/famil55c-eng.htm

[11] According to Nick Clark, Sr. Policy Analyst, Clean Transportation with BC Ministry of Energy and Mines: during the initial CEV for BC program, which ran from 2011 to 2014, about 950 point-of-sale electric vehicle incentives were issued, but only 306 applications were received for $500 LiveSmart incentives towards the installation of home charging infrastructure.

councils, property managers, unit renters or owners, and electricians in addition to physical barriers such as parkade design.

The California Plug-in Electric Vehicle Collaborative, for example, identified a twelve-step process with four stakeholder groups to navigate the installation at a MURB shown in Figure 3.

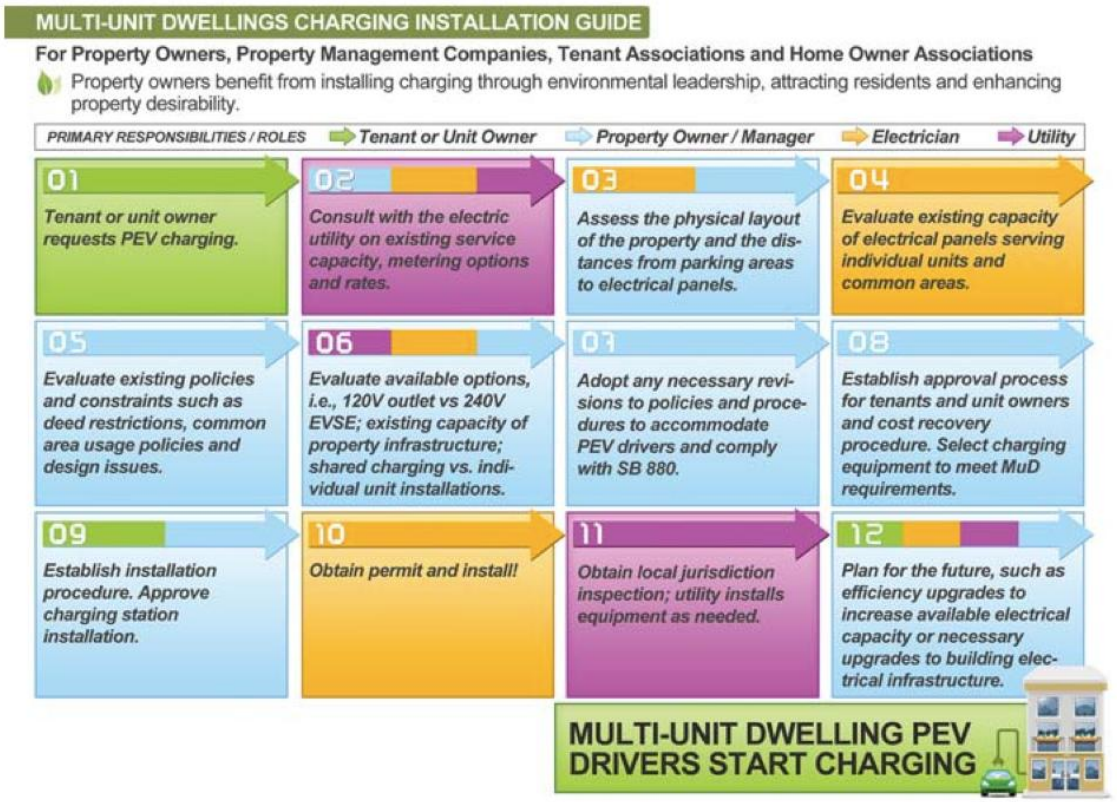

Figure 3. Flowchart for Installing EV Chargers in Multi-Unit Housing[12]

The added complexity of installing EVSE in MURBs poses a challenge for EV adoption in B.C., as proportionally more British Columbians live in MURBs or stratas than in the rest of Canada. With 44% of B.C.'s total population living in multi unit housing, the expectation would be that EV ownership would be a comparable amount. However, only 20% of EV owners currently live in multi-unit residential buildings (MURBs)[13]. The disproportion is greater still in Metro Vancouver, where more residents live in MURBs than single detached housing, as noted in Table 3.

Table 3. Percentage of Population by Dwelling Type

	Canada[i]	B.C.[i]	Metro Vancouver[ii]
Single Detached Housing	62%	54%	41%
Multi-Unit Housing, Less Than 5 Storeys [iii]	30%	38%	48%

[12] California Plug-in Electric Vehicle Collaborative, Plug-in Electric Vehicle Charging Infrastructure Guidelines for Multi-unit Dwellings, November 2013. Retrieved from www.pevcollaborative.org at http://www.pevcollaborative.org/sites/all/themes/pev/files/docs/MUD_Guidelines4web.pdf

[13] Axsen et al, 2015. Table 16.

Multi-Unit Housing, 5+ Storeys	7%	6%	10%
Other (e.g. mobile housing)	1%	2%	1%

[i] Statistics Canada, "Private households by structural type of dwelling, by province and territory (2011 Census) (Manitoba, Saskatchewan, Alberta, British Columbia)". 2011 Census of Population and Statistics Canada catalogue no. 98-313-XCB. http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/famil55c-eng.htm

[ii] Statistics Canada, "Private households by structural type of dwelling, by census metropolitan area (2011 Census) (Kelowna, Abbotsford, Vancouver, Victoria)". 2011 Census of Population and Statistics Canada catalogue no. 98-313-XCB. http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/famil124g-eng.htm

[iii] includes semi-detached houses, row houses ("townhouses"), duplexes, apartments in buildings with fewer than five storeys, and other single-attached houses

Some of this discrepancy could be attributed to the difference in percentage of car ownership for British Columbians living in MURBs compared to those living in single-family dwellings. The Canada Mortgage and Housing Corporation published information showing that residents in downtown Vancouver own on average 1 car per household, but suburban residents owned between 1.5 and 1.7 cars per household[14], linking household type with car ownership. However, accounting for the lower car ownership per household for MURBs, the small number of EV owners – 20% – is still disproportionally low compared to single-family dwellings – 79%. For EVs to be widely adopted in the province, it will be necessary to provide solutions to the challenges faced by EV adopters who live in MURBs.

Specific barriers to the installation of EV charging infrastructure in MURBs include:

- The structure and governance of parking assignments (ownership, responsibility, liability, and control of each parking space)
- Existing electrical capacity and accessibility
- Sub-metering capacity
- Cost and cost allocation
- Informed approval of strata corporations
- Absence of charging infrastructure-related policies and guidelines in the *Strata Property Act*

To be effective, provincial solutions would need to address each of these barriers in turn.

Solutions for Multi-Unit Housing

Installing EVSE in MURBs requires more planning, coordination and technical expertise than single-family detached homes. As such, costs tend to be higher, and the provision of incentives would help bring these costs down. As installation costs in multi-unit housing are unlikely to decrease in the near future, it is recommended that such incentives would have to be sustained over time. Incentives may also help make the case for strata councils, who have to approve any infrastructure investments through a council vote.

While financial incentives will help, additional support will be needed to adequately address the non-financial barriers listed above. Particularly, "right to charge" legislation (ideally outlining cost responsibilities) is desirable to ensure that individuals wishing to install chargers could do so. This type of legislation would also address the barrier of stakeholder buy-in, by preventing a veto from indifferent or risk-averse strata councils or

[14] Canada Mortgage and Housing Corporation, Comparing Neighbourhoods – Vancouver, 2015. Retrieved from http://www.cmhc-schl.gc.ca/en/co/buho/sune/sune_007.cfm

landlords. While legislation may be necessary to ensure the long-term growth of EVSE in MURBs, incentive programs can help fill the gap in the interim.

California Senate Bill 880 (known colloquially as the state's "right to charge" law) makes it illegal to impose any condition that "effectively prohibits or unreasonably restricts the installation or use of an electric vehicle charging station in an owner's designated parking space"[15]. In B.C., this would need to be addressed through amendments to the *Strata Act*, and possibly through sample by-laws for the *Landlord and Tenant Act*.

Furthermore, companion resources are needed to help address the barrier of the perceived complexity of the installation process for MURB charging stations. A provincial handbook and checklist for the installation of EVSE in multi-unit housing, in cooperation with utilities and homeowner associations, would simplify the installation process for prospective EV buyers. As it currently stands BC Hydro, the Condominium Homeowners Association, the Building Owners and Managers Association, and other stakeholders have developed handbooks and other resources, but there has not been a provincial handbook developed. Metro Vancouver is developing a website to assist interested parties with installation of EVSEs. Similarly, a Southeast Florida EV readiness plan made facilitating charging at MURBs a key area of focus because of a comparably high percentage of MURBs in that area (41 percent, compared to the national average of 23 percent). They developed fact sheets, seminars, and workshops on multi-unit dwellings to empower building managers and residents with the knowledge to make the case for charging station installation[16].

Another example that simplified the installation process is the single state-wide permit for residential EV chargers offered in Oregon State, for the benefit of buyers and contractors alike, a streamlining process that is about a tenth of the cost of a regular permit[17].

Successful MURB EVSE installation initiatives have been deployed in B.C. and elsewhere, and could be drawn on in the development of a provincial solution.

> The Clean Connect program of the Building Owners and Managers Association of B.C. (BOMA BC) installed 128 Level 2 chargers in 60 buildings in 13 cities, that included 61 residential EVSE. The program was in partnership with the provincial government during Phase 1 of the CEV Program. Incentives of up to $4,500 per station were offered, and an information booklet was created[18].
>
> In the private sector, Bosa Properties provides a turnkey solution whereby condominium purchasers in new developments can have a Level 2 charging station installed at their assigned parking spot for

[15] The bill is available for viewing at: http://www.leginfo.ca.gov/pub/11-12/bill/sen/sb_0851-0900/sb_880_bill_20120229_chaptered.pdf

[16] Drive Electric Florida Volume I: Getting Southeast Florida Plug-in Ready, Section 6-68 http://www.floridagoldcoastcleancities.com/Grant_Opportunities.html

[17] Oregon State Permit Rule http://www.evroadmap.us/sites/default/files/20121001_EVSE_pr.pdf ; see also: http://www.afdc.energy.gov/case/1000

[18] see https://www.boma.bc.ca/green-buildings/clean-connect/ . The booklet, "Electric Vehicle Charging Stations for Multi-Unit Residential and Mix-Use Commercial/Residential Buildings", can be downloaded at https://www.boma.bc.ca/media/19602/EVCS%20Info%20Booklet%20For%20MURBs%20-%20BOMA%20BC%20.pdf

> $5000 to $6000. While inapplicable to existing developments, the developer's lessons-learned may be applicable across the industry[19].

Drawing from the lessons of these initiatives, the province could devise incentive programs and/or legislation to reduce the barriers to the installation of charging infrastructure in multi-unit housing.

Workplace Charging

As illustrated in the Triangle Diagram of Figure 1, the workplace is the second-most common charging location for EV drivers, after the home.

Workplace charging allows owners of EVs to top up their batteries during the day, potentially reducing the distances that PHEVs drive in gasoline mode, and increasing the daily range of BEVs. Furthermore, for PEV drivers who do not have access to home charging, workplace charging can serve as the primary charging location, making PEVs a viable option for more drivers.

Given that cars are typically parked at workplaces for eight or more hours per day, in some cases Level 1 charging may be sufficient for EV drivers and often is a more practical option for employers, given the relatively inexpensive costs. However, Level 1 at the workplace may not be as influential on EV adoption, and it is likely that a combination of Level 1 and Level 2, or load-sharing Level 2 chargers may be the most effective option.[20]

When 70 workplaces in California that had installed charging infrastructure were surveyed, more than half believed Level 2 charging was necessary to make a company charging initiative successful. Of the participants, 87% reported that the charging stations had encouraged employees to purchase EVs. [21] For all employers surveyed, costs were rated as the number one obstacle for installing charging stations. [22] As such, while workplace charging is of secondary importance (relative to home charging) for EV adoption, there is justification for the provincial government to continue supporting the build-out of workplace charging infrastructure.

The relative impact of workplace charging seen in California may not be the same in B.C., as the size of business, commuting distance, and alternative transportation options available, among other factors, are likely to also influence consumer behaviour. A pilot project partnering with a few key businesses would help shed light on the impact of workplace charging in B.C.

The best practices booklet published by California's CALSTART[23] could be a suitable starting point for the development of provincial workplace electric charging policy. It

---

[19] see http://bc.ctvnews.ca/condos-to-feature-electric-vehicle-charging-stations-1.987813; the websites for Bosa's new developments also feature a page for the BosaVolt program, though without cost information.

[20] U.S. Department of Energy: Energy Efficiency & Renewable Energy, A Guide to the Lessons Learned from the Clean Cities Community Electric Vehicle Readiness Projects. January 2014. Available at: http://www.afdc.energy.gov/uploads/publication/guide_ev_projects.pdf

[21] California Plug-in Electric Vehicle Collaborative, Amping Up California Workplaces: 20 case studies on plug-in electric vehicle charging at work. November 2013. See pages 8 and 50. Available at: http://www.pevcollaborative.org/sites/all/themes/pev/files/WPC_Report4web.pdf

[21] California Plug-in Electric Vehicle Collaborative, Amping Up California Workplaces: 20 case studies on plug-in electric vehicle charging at work. November 2013. See pages 8 and 50. Available at: http://www.pevcollaborative.org/sites/all/themes/pev/files/WPC_Report4web.pdf

[23] CALSTART, Best Practises for Workplace Charging. September 2013. Available at: http://www.calstart.org/Libraries/Publications/Best_Practices_for_Workplace_Charging.sflb.ashx

emphasizes the importance of companies gaining internal support and conducting employee interest surveys to inform the selection of charging systems tailored to drivers' needs while minimizing financial outlays.

Lessons learned were also compiled from the 16 Clean Cities Community Electric Vehicle Readiness Projects funded by the U.S. Department of Energy[24]. Some workplace charging overlap would have occurred with the province's Community Charging Infrastructure (CCI) Fund, which may offer British Columbia-specific insights.

Public Charging

Thanks in part to Phase One of the Clean Energy Vehicle Program[25], B.C. is leading Canada in per-capita public EVSE, and compares well with leading American states such as California, Oregon and Vermont[26].

While Level 2 public charging opportunities increase the possible EV miles travelled, awareness of public chargers does not appear to propel EV adoption, as noted by Simon Fraser University researchers above (see footnote 7).

As already indicated, public charging is a tertiary location for EV drivers. Findings from the Idaho National Lab, which collected data from the EV Project and the ChargePoint America project over three years, showed the preference of home and work charging over public locations. Of the public station use, DC Fast Chargers were used much more frequently than most public Level 2 stations (although a small number of Level 2 did see consistently high use).[27] Phase 2 of B.C's Clean Energy Vehicle Program includes funding for public DCFC and it is follows that the best use of the province's effort and expenditure for Level 2 charging would be to focus on non-public locations, such as home and workplace.

Arguably, an exception for supporting Level 2 public stations would be to supplement the DCFC network to build in redundancy, which was highlighted as a critical need in the companion DCFC Gap Analysis report[28]. Furthermore, if the province would like to continue its Level 2 public infrastructure leadership, usage information for charging stations built through the CCI Fund is available through FleetCarma's evCloud portal[29]. The data could be used to target incentives for expanding public charging infrastructure only at the province's most heavily-used sites. This would be a data-driven, cost-effective approach for increasing public charger usage, which circumvents the impression that public funds are being directed towards seldom-used infrastructure.

[24] U.S. Department of Energy: Energy Efficiency & Renewable Energy, A Guide to the Lessons Learned from the Clean Cities Community Electric Vehicle Readiness Projects. January 2014. Available at: http://www.afdc.energy.gov/uploads/publication/guide_ev_projects.pdf

[25] For more on the Community Charging Infrastructure Program, see www.pluginbc.ca

[26] As reported by EV ChargeHub at the EV2015VE Electric Mobility Canada conference, and reproduced at: http://www.evchargehub.com/infographicjuly2015.html. Prince Edward Island was excluded from the chart, as its small population results in extraordinarily high per capita numbers. Hawaii was also excluded; it has about twice as many charging stations per capita as California.

[27] Idaho National Lab."Plugged In: How Americans Charge Their Electric Vehicles. Findings from the largest plug-in electric. http://avt.inel.gov/pdf/arra/SummaryReport.pdf

[28] BCFC Gap Analysis Report, Plug In BC http://pluginbc.ca/resource/a-gap-analysis-for-b-c-s-fast-charging-infrastructure/

[29] https://www.fleetcarma.com/evCloud

CONCLUSION

Electric vehicles can help B.C. reach its GHG emissions reductions targets, given the province's clean hydroelectric resources. To that end, the province has already invested in incentives for the purchase of EVs (CEV for BC) and related infrastructure (CCI Fund, BOMA BC).

Research has shown that drivers are unlikely to consider EVs if they aren't able to charge their vehicles at home. This is generally not an issue for residents in single detached housing, but can be problematic for those living in multi-unit housing complexes — who represent 44% of British Columbians, and 58% of the population of Metro Vancouver.

As such, the province could most effectively encourage EV adoption by reducing the barriers to the installation of Level 2 EV charging stations in multi-unit housing. Efforts to increase the availability of workplace charging would also be of value, but would have a secondary impact. Increasing the number of Level 2 public charging stations would not likely be an effective use of resources at this time.

Policies to reduce the barriers to installation of Level 2 charging stations in multi-unit housing can leverage the experiences of other jurisdictions' pilot programs and legislation. We would recommend not only that financial incentives be focussed on this sector, but also that additional training and guidance support be provided. This would assist existing and prospective EV owners in multi-unit housing to overcome barriers to charging station installation.