

**2021 BOMA Canada**

**Electric Vehicle Infrastructure Guide**



**Dear Friends,**

Continuing with its development of guides for the commercial real estate industry, BOMA Canada is proud to present the Electric Vehicle (EV) Infrastructure Guide.

Following the rapid development of electric vehicle technology and supportive public policies, Canada is quickly following the global trend that is redefining the transportation industry. As such, we'd like to take this opportunity to provide a primer not only on EV charging technology, but also on the environmental and economic benefits associated with installing EV chargers on commercial sites.

This guide is intended to act as an educational touchpoint on best practices for integrating EV charging infrastructure into the public and commercial real estate segments. Providing an overview of charging technology, it will describe the sustainability impacts of deploying stations at public and commercial real estate sites and act as a guide to selecting an appropriate solutions provider for your specific project.

This is not a comprehensive overview of electric vehicle charging technology; it should be supplemented with further reading, along with insight from your solutions provider and industry professionals. Similarly, adherence to regional standards and regulations is always recommended.

An executive summary has been included at the of the document to assist with quick and easy navigation of the content.

We hope that commercial real estate developers, building owners, site managers, and government officials find this tool helpful as they seek to understand this new technology and its opportunities.



**Benjamin L. Shinewald**  
President & Chief Executive Officer,  
BOMA Canada



## Copyright

The Building Owners and Managers Association (BOMA) of Canada owns the trademark on the cover of this document. Use or reproduction of this trademark is prohibited for any purpose (except as part of an accurate reproduction of the entire document) unless written permission is first obtained.

This document is subject to copyright protection. However, this document may be reproduced free of charge in any format or media without requiring specific permission, with the exception of its reproduction in whole or in part, in any medium or format that is wholly or partially for the purpose of commercial gain. This permission is subject to the material being reproduced accurately and not being used in a derogatory manner or in a misleading context. If the material is being published or issued to others, the source and copyright status must be acknowledged. The permission to reproduce copyright protected material does not extend to any material in this document that is identified as being the copyright of a third party. Authorization to reproduce such materials must be obtained directly from the copyright holders concerned.

## Disclaimer of Any Legal Liability

By reading this guide you hereby agree to abide, without restriction or limitation of any kind whatsoever, by the terms of this disclaimer.

The Building Owners and Managers Association of Canada, including all of its officers, directors, employees, advisors, consultants, committee members, task force members, agents, volunteers, and members (hereinafter collectively referred to as “BOMA”) has assembled the material in this document for the purpose of selecting an electric vehicle supply equipment provider. The information presented is solely and without exception, express or implied, for that purpose. BOMA makes no express or implied representations, warranties, guarantees, or promises, that the information presented is current or accurate at any point in time, be it presently, previously, or at any time in the future.

BOMA, its partners, and affiliates or related organizations make no implied or express representation or warranty that the information contained herein is without risk. Furthermore, absolutely none of these parties accept any responsibility or liability for any acts or omissions done or omitted in reliance, in whole or in part, on this written report or any of its contents or inferences. The same parties disclaim all responsibility or liability to any person, whether in contract, equity, tort, statute, or law of any kind, for any direct or indirect losses, illness or injury, or damage, be it general, incidental, consequential, punitive, or any other kind of damage, relating to the use of this document (the “Guide”).

The information in this document is not intended to cover every situation. Details which may be relevant to a user’s particular circumstances may have been omitted. Users are advised to seek professional advice before applying any information contained in this document to their own particular circumstances. Users should always obtain appropriate professional advice on security, legal, structural, organizational, personal, proprietary, public health, professional, or any other issues involved.

The information is presented “as is.” This Guide or any part thereof, including, without limitation, any appendices or related toolkits and/or resources, is not intended in any way, and is hereby expressly denied, to create any relationship of any kind whatsoever or any duty of care between BOMA (or any of the persons or parties included in BOMA as defined) and any other person or entity including, without limiting the generality of the foregoing, any person or entity that may read, review, use, or become aware of this Guide or any part thereof (collectively referred to as the “User” throughout this disclaimer). The User also acknowledges that no such relationship is created between it and the parties associated with the Guide’s development, production, or dissemination. The User also further acknowledges that this disclaimer prevents any possible duty of care owed by BOMA to the User from ever arising, either by rule of law, equity, or statute whatsoever, including any obligation to keep this information current, validate it, ensure its accuracy, or update it in any way, and that the use of this Guide in whole or in part, cannot form the basis for any possible legal claims or proceedings whatsoever as against BOMA.

# Executive Summary

Electric Vehicle (EV) adoption has increased significantly over the past ten years. Current projections suggest that by 2030, almost thirty percent of vehicles travelling on North American roads will be electric.<sup>[1]</sup> As the electric vehicle market expands, providing EV charging will become an economic and environmental imperative.

Installing EV charging infrastructure can provide a value-added amenity with which to attract new tenants, increase the retention rate of existing tenants, and increase current tenant satisfaction.

EV charging infrastructure can also provide an eventual new revenue stream.



## Industry Overview

### 4 Current State of the Electric Vehicle Market & Roadmap for the Future

## Impact of Deploying EV Charging Infrastructure

### 6 Sustainability Benefits of Deploying EV Charging Infrastructure

- Workplace
- Retail

### 8 Economic Impact of Deploying EV Charging Infrastructure

- Workplace
- Retail

## Procurement

### 10 Charging Infrastructure Basics

### 12 Site Analysis & Right Sizing

- Scalability & Future Proofing
- Networked Solutions
- Suggested Right-Sizing Algorithm
- Retail Buildings Calculation
- Workplace Buildings Calculation
  - Power Management Options
- Retail Buildings Calculation
- Workplace Buildings Calculation

### 17 Installation & Commissioning

### 18 Post-Deployment & Support

- Signage
- Examples

### 20 Data, Analytics and Access

- Best Practices – Workplaces
  - Onboarding & EV Etiquette
  - Billing Practices
- Best Practices – Retail
  - Billing Practices
  - EV Etiquette at a Retail Site

# Industry Overview

## Current State of the Electric Vehicle Market & Roadmap for the Future

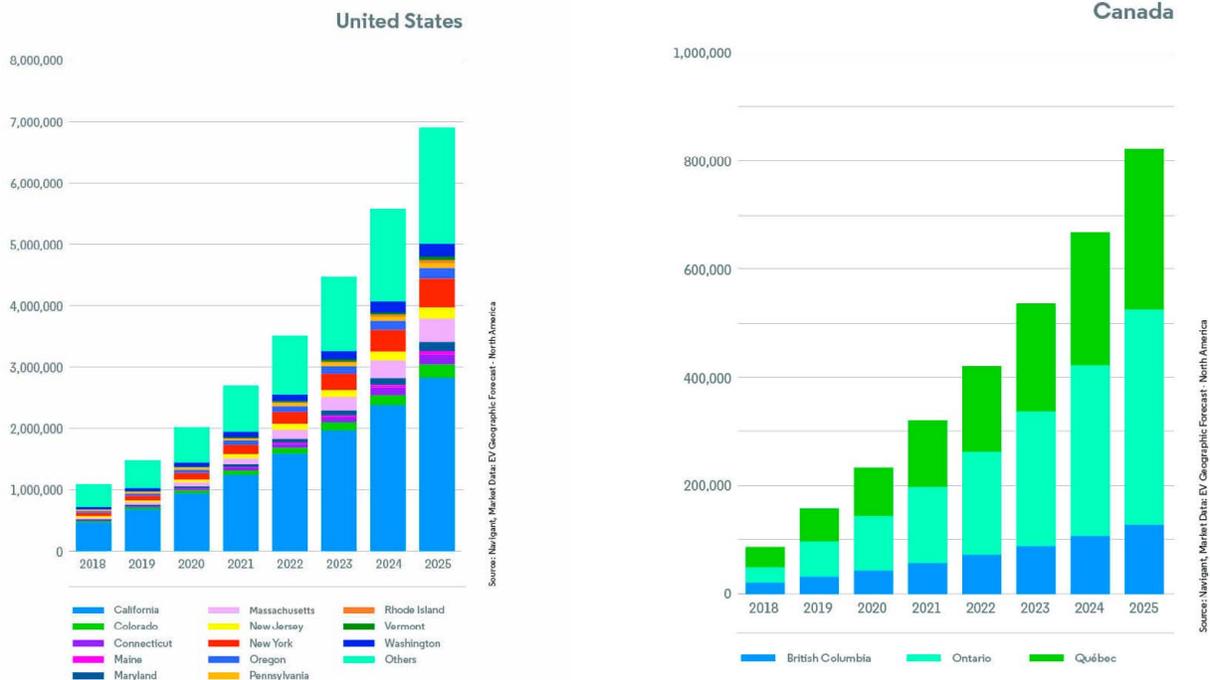
The electric vehicle market has expanded rapidly over the course of the last decade, and the increased demand for EVs has brought this technology to the forefront of conversations about climate change and sustainable development. In Canada and the United States, the transportation sector is the second largest contributor of greenhouse gas emissions, accounting for 24% and 29% of the respective national totals.<sup>[2][3]</sup> As the federal, state, and provincial governments of North America have responded to the need to reduce emissions and transition to a more sustainable mode of transportation, stimulus packages—including incentives, rebates, and grants—have been made available to both commercial developers and residential consumers interested in exploring EV charging technology.

EV sales have been growing at a consistent rate of 50% per year since 2010, and current projections suggest that there will be over one million electric vehicles travelling on North American roads by 2024.<sup>[4]</sup> This figure suggests that in short order, offering EV charging in commercial real estate settings will become a requisite element for property owners and managers as tenants, employees, and consumers begin to factor their ability to charge into their decisions about where they work and shop.

Electric vehicles are both a more sustainable mode of transportation and a much better value proposition than traditional gas-powered vehicles, with significantly reduced maintenance and fuel costs as compared to their predecessors.<sup>[5]</sup>

The refueling model for electric vehicles is vastly different from that of a gas-powered vehicle. Whereas a traditional combustion vehicle can refuel in a few minutes at a gas station, EVs must be connected to a charging station to replenish their battery. Depending on the charging solution, most sessions tend to take anywhere from thirty minutes to more than twelve hours.

**Automakers intend to invest between \$255 and \$300 billion in developing new electric vehicle technology in the immediate future.<sup>[6]</sup>**



North America EV Sales (Current and Forecast)

This marked distinction in the refueling methodology presents a unique set of opportunities for those individuals and organizations willing to install the infrastructure necessary to charge an electric vehicle. With many potential EV drivers suffering from “range anxiety”—a phenomenon that sees them concerned about their vehicle’s ability to meet their commuting needs—there is an increased desire to be able to charge away from home. The continued deployment of public and workplace charging infrastructure can help to allay this range anxiety, and the installation of electric vehicle chargers can act as an instantaneous draw for EV drivers eager to “top up” while on-the-go. With this in mind, deploying EV charging infrastructure provides an immediate competitive advantage. From a corporate perspective, installing charging stations provides a tangible benefit that could act as a draw when attempting to recruit and retain tenants.

As the number of electric vehicles increases across North America, so too will the need arise for a robust and dependable charging ecosystem that supports EV drivers as they travel. By installing charging infrastructure at your commercial site or workplace, you can be part of this solution.

With sustainability being a driving factor in corporate decision-making, all major automotive manufacturers, from GM to VW group, are making sizeable investments in the research and development of new EV models designed to satisfy consumer interest. This desire to innovate has led to rapid advancements in battery capacity, vehicle range, and driver amenities, and this burgeoning industry has led to great excitement as to where electric vehicles are now and to where they may take us next.

**The attachment rate (number of charging ports per thousand electric vehicles) in Canada is approximately 6.7%. More charging infrastructure is necessary to satisfy the growing demand!<sup>[7]</sup>**



# Impact of Deploying EV Charging Infrastructure

## Sustainability Benefits of Deploying EV Charging Infrastructure

There is a wide variety of environmental benefits consistent with deploying EV charging infrastructure in a commercial real estate setting. Due to the disparate nature of their charging infrastructure requirements, efforts have been made to distinguish office & light industrial buildings (“workplaces”) from commercially oriented sites such as shopping malls and entertainment centres (“retail”).

### Workplaces

For workplaces, installing charging infrastructure offers a multitude of sustainability benefits. As more and more federal, provincial, and state legislative bodies work towards mandatory greenhouse gas emissions reduction for businesses, electric vehicle charging infrastructure could become an unavoidable investment for those looking to meet the requirements of these new regulations.

**An analysis of workplace charging sites revealed an average gross greenhouse gas emission reduction of up to 9,750 kilograms per year. That is equivalent to planting 445 trees!<sup>[8]</sup>**

Perhaps the most significant impact of deploying electric vehicle infrastructure in a workplace setting is the direct effect this process has on EV adoption. Beyond simply offering individuals the ability to charge at work, installing EV charging infrastructure will allow those individuals considering electric vehicles to see their peers utilizing EV technology on a daily basis, and this may work to dispel any anxieties about transitioning to an EV themselves. Research shows individuals are up to six times more likely to transition to an electric vehicle if their place of work offers the opportunity to charge—and while this correlation between charging infrastructure and an increased propensity for EV adoption is not unique to the workplace segment, it does afford BOMA members the opportunity to participate directly in efforts to increase sustainability in the transit sector.<sup>[9]</sup>



## Retail

In a retail setting, the sustainability benefits of deploying EV charging infrastructure often overlap with those of an office deployment—specifically, fostering EV adoption within the community by providing convenient and reliable charging infrastructure. Accelerating EV adoption within a community assists in the transition to a more sustainable mode of transportation and can significantly decrease the greenhouse gas emissions of that community. The result is improved air quality at the site and surrounding area.<sup>[10]</sup> Moreover, a comprehensive charging ecosystem can assist commercial developments in significantly reducing their greenhouse gas emission totals, bringing them in-line with the increasing sustainability regulations brought on by local and federal governments.

**“Cadillac Fairview has one of the most comprehensive sustainability programs in Canadian Real Estate. We’ve partnered with FLO and Tesla for a national network of EV chargers across our retail and office portfolios. In addition to the environmental benefits, EV drivers have a very favourable shopper profile who can enjoy our retail offerings while charging. This also gives us opportunity to partner with retailers and our marketing teams to drive activations and retail sales.”**

**John Massy**

Vice President, Operations – Ontario Portfolio  
Cadillac Fairview



# Economic Impact of Deploying EV Charging Infrastructure

The economic benefits of installing electric vehicle infrastructure are significant; there are many ways a site owner can see a return, directly and indirectly, on their investment.

## Workplaces

The benefits of installing EV charging infrastructure in work-place buildings are varied and significant, especially given that the individuals in these types of buildings often return to the locale throughout the course of their working hours and are therefore able to consistently access charging infrastructure.

**Building owners who offer workplace charging at their facilities send the message that they are interested in providing smart, proactive solutions for their tenants' present and future needs. Entering this fast-growing niche market today may yield significant benefits in the long run. <sup>[1]</sup>**

For the business, choosing a site with EV charging infrastructure positions their business as innovative, cutting-edge, and committed to a sustainable economic model. With more and more consumers identifying social responsibility as a deciding factor in their purchasing decisions, potential tenants may be driven to sites that provide charging infrastructure so as to signal to these potential consumers that they share in their desire to facilitate a more sustainable world, and in doing so can potentially court increased revenue for their business.

For the employees of a business, especially those who currently or intend to own EVs (and studies show that as many as 1 in 5 drivers are considering replacing their current gas-powered vehicle with an electric one), having access to EV charging at the workplace is a tangible benefit that can make the difference when weighing employment options.<sup>[2]</sup> As such, tenants being able to offer employees the ability to charge their vehicle at the office becomes more than simply a sustainability initiative, and instead becomes a quality of life upgrade to those employees who currently own an EV or are considering one. This benefit is especially pronounced in urban areas, where some electric vehicle owners live in apartments or condos and are therefore less likely to be able to charge their vehicles at home. In this scenario, a workplace charging solution can be a make or break factor in someone's decision as to whether to purchase an electric vehicle.



## Retail

A retail setting will operate under different imperatives than those of an office or light industrial building, and as such will value different benefits associated with electric vehicle charging. The property owner of retail site would most likely seek to install EV charging as a value-added amenity for tenants of the building, and in doing so could help to provide those tenants with the resources necessary to allow their businesses to flourish economically by attracting desirable consumers and keeping them on-site for an extended period of time.

**An analysis of charging events at commercial and open-air retail sites revealed an average session time of over two hours.<sup>[13]</sup>**

Establishing a consumer profile for electric vehicle owners is key to understanding why retail sites would benefit from an investment in charging infrastructure. EV drivers make for desirable consumers; according to a survey conducted by the California Center for Sustainable Energy, 43% of EV owners have an annual household income of \$100K—\$199,000, and a further 18% exceed that and fall into the \$200K—\$299,999 range.<sup>[14]</sup> This is a significant benefit of procuring EV charging infrastructure, as these individuals will be attracted to sites that offer them the opportunity to charge their vehicle, and fully charging an EV usually requires upwards of thirty minutes (on a leading North American network, the average charging session duration at retail establishments is over two hours). The combination of increased consumer traffic and an extended duration of stay can help drive business to the tenants of a retail site.



# Procurement

## Charging Infrastructure Basics

Electric vehicles need to be charged regularly, and each EV is equipped with a battery management system (BMS) that manages the transfer of energy required to charge the car battery. This process occurs in concert with the charging station, or electric vehicle supply equipment (EVSE), which is the conduit and control device for managing the flow of electricity from the grid to the vehicle. Currently, the types of charging stations can be broken down into three “levels.”

### Level 1 Charging Station

The slowest of EV chargers, these operate at 120V and can be plugged directly into the existing electrical infrastructure of a building with little to no modifications; however, these chargers are often too slow to be convenient and are not designed for the repetitive use consistent with the charging experience of a workplace or retail site. They are often included with the sale of an electric vehicle.

### Level 2 Charging Station

The most popular commercial charging option, Level 2 charging stations are typically mounted on a pedestal, a wall or, in certain cases, deployed as a curbside charging option by cities and municipalities. Often found in workplaces or at retail sites, these chargers operate between 220V and 240V and can provide a full charge to a standard electric vehicle much faster than their Level 1 counterparts (approximately 6-8 hours, depending on the vehicle).



*FLO Home*



*SmartTWO*



*CoRe+*

***Examples of Level 2 Chargers***

## DC Fast Charging Station

By converting AC (alternating current) to DC (direct current), DC Fast Charging (DCFC) stations can provide a full charge to most compatible electric vehicles (for example, plug-in hybrids are not compatible with DC Fast Charging) in as little as thirty (30) minutes. Best suited for public and fleet deployments due to their requirement for fast turnover, DC Fast Chargers typically operate at power levels of 50kw or 100kw.

Usage statistics demonstrate that most EV drivers prefer to charge their vehicle at home or at work, as that is where the vehicle is parked for a long enough period to gain a charge able to facilitate their commuting needs. Level 1 charging stations often fail to meet both the necessary range-per-hour and durability considerations consistent with workplace and retail charging patterns; a Level 2 charging ecosystem is therefore recognized as the optimal solution for these environments. With significant incentive and rebate programs available, Level 2 and even DCFC solutions are becoming increasingly affordable and should be considered a crucial investment for those commercial real estate settings eager to attract new tenants and to support compliance with regional environmental regulations.

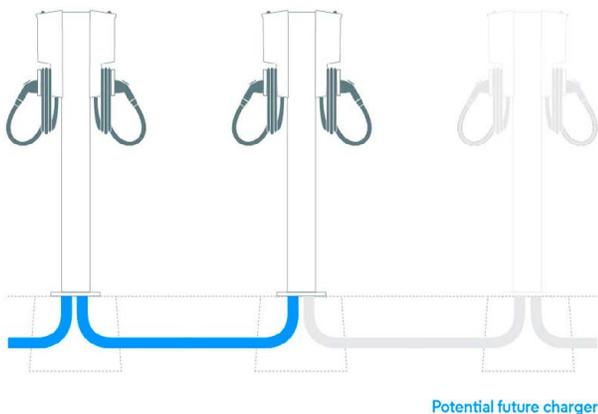


*SmartDC*



## Site Analysis & Right Sizing

A proper site analysis will be based on the size and scope of the charging project, along with the state of the electrical infrastructure at the site prior to work beginning. There are several key elements to consider when attempting to identify and “right-size” a charging deployment; “right-sizing” refers to a provider’s ability to generate a charging solution built around the unique needs of a site. While there are certain sites where installing the most or fastest charging stations is the optimal solution, there are just as many where it is more important to find the ideal ratio of chargers to potential EV drivers, so as not to overextend from an electrical or fiscal perspective. Finding a solutions provider that will work to identify the optimal solution and develop a plan for installation is the ideal scenario for commercial real estate deployments.



A primary point of site analysis is to determine the proximity of the charging stations to the electrical power service. Placing charging equipment near an existing power supply will reduce the cost of installation and the time required to do so; however, this is not always feasible and is highly dependent on the specific site. It is during this planning and analysis phase that site owners may need to consider any potential upgrades to their current electrical infrastructure, including upgrades to their capacity, electrical efficiency, and metering system.

Placing charging stations near an existing power source will reduce the total amount of trenching required to run conduits from the source to the stations. As the trenching of asphalt is costly, a proper site analysis will identify the extent to which it needs to be done, and work to ensure that this process only needs to be done once. Identifying a charging solutions provider whose stations

are designed for “daisy chaining” or “cascading” (a scalable in-sequence installation allowing for easy maintenance and future network growth) is recommended for commercial sites. By installing charging stations in sequence, future chargers can be added easily and without further trenching or construction.

After a site has been properly analyzed, it will become easier to select charging station hardware that is reflective of the specific needs of the charging project. While all sites will require a “right-sized” solution, there are consistent hallmarks of top-of-the-line charging stations that should be considered when selecting a hardware provider. These features include:

### Universal J1772 Connector

This industry standard connector is present on all American-made electric vehicles and is recommended for commercial applications.

### Aluminum Casing

Aluminum casing is recommended, as it will weather the elements better than its plastic counterparts. Moreover, aluminum casing will ensure that the charging station operates at a wide temperature range. NEMA certification is industry standard.

### Cable Management System

Cable management systems are recommended for outdoor installations, especially in regions where inclement weather can make seemingly innocuous issues like snow clearing a major liability.

### Safety & Accessibility Certifications

A charging station is an unattended electrical device, and any station installed in a workplace or retail setting should be certified to an appropriate standard (National Recognized Testing Lab, Underwriter’s Laboratories). Similarly, configurations that allow persons with disabilities to access the charging stations should be considered.

## Scalability & Future Proofing

Based on current industry forecasts, the growth rate for electric vehicles will continue unabated as the technology becomes increasingly affordable. With this in mind, planning ahead to ensure that charging deployments are prepared to grow in correlation with the growth of the EV market is considered best practice when deploying a charging ecosystem. This practice is called scalability.

**“The decision to work with a vertically integrated infrastructure partner was a key factor in the success and subsequent expansion of FortisBC’s EV charging network. By choosing a supplier with a robust product supply and support chain who continue to provide operational support to this day, FortisBC has been able to develop a comprehensive charging network capable of servicing the growing number of EV drivers throughout not only British Columbia but adjacent provinces and states.”**

**Michael Leyland**  
Innovative Initiatives Manager,  
FortisBC.

To ensure that the site remains able to grow alongside the demand for charging services, several factors should be taken into consideration when choosing a charging solutions provider, with the primary being the focus of the solutions provider itself. Many providers of charging technology choose to prioritize either a hardware (the station itself) or software (the network managing the stations) solution; in doing so, they render themselves more able to provide expertise relevant to their specific subset of the charging experience, but they lose the ability to provide quality control over the whole of the EV charging processes. With this in mind, choosing a solutions provider who is vertically integrated and capable of providing customers with the requisite hardware and software can help to ensure a seamless charging experience for potential drivers.

A vertically integrated charging solution renders a single entity responsible for the charging experience, ensuring quality in the best of times and a single point of contact should trouble arise. An important factor to consider when choosing a charging solutions provider is uptime, or the availability of the charging stations. As drivers expect stations to be active upon their arrival, a best practice would be to plan for 99% uptime (calculated on a yearly basis); this level of availability requires the use of commercial-grade charging stations that provide a mean time between failure (average time between station commissioning and station failure, “MTBF”) of at least five to ten years. To achieve this target uptime, the mean time to repair (average time between support ticket issuance and station repair, “MTTR”) should be no longer than two business days.

Similarly, interoperability is a key facet of a future friendly charging solution for any public site. As EV owners are generally members of the major public charging networks in their area, offering them the ability to use the same account across networks, and to have a consolidated view of their vehicle’s charging history, improves the EV user experience. Public site owners should consider solutions providers whose stations are interoperable with regional public charging network operators. This will also allow site owners and businesses to provide paid public access to charging stations when they are not being used by regular consumers or employees. For example, an employer could offer paid charging spots outside of business hours or liaise with a local car sharing organization to offer charging services for an agreed upon price.



## Networked Solutions

Given the increased presence of “smart” technology in today’s corporate and retail environments, it should come as little surprise that EV charging stations are often made available in networked (stations connected to a service and management network) and non-networked (stations not connected to any such network) capacities. Networked charging stations often offer a full suite of benefits, such as remote firmware and software upgrades, proactive station monitoring, and advanced data and analytics options. These functionalities ensure that networked charging solutions feature a lower total cost of ownership than their non-networked alternatives. While non-networked chargers represent a lower capital expense at the beginning of the procurement process, it should be noted that these stations are a poorer long-term value proposition compared to their networked counterparts, and their limitations are pronounced.

Networked charging stations can be combined with a services agreement to ensure optimization of a charging deployment, and choosing a solutions provider that is vertically integrated can ensure that both the hardware and software elements of the solution are operating in sync. Selecting a provider that is responsible for both the hardware and software components of the charging solution will help prevent stranded assets by ensuring that charging stations remain operating, maintenance and repairs are done quickly and efficiently, and remote updates are made as needed.

If scalability is a priority, network functionality is a critical component of keeping a charging deployment future friendly. For example, the data and analytics options consistent with a networked charging station will allow station owners to monitor crucial usage information such as energy transferred, station uptake, and monies earned from charging sessions—and could even help them understand when more stations are necessary to satiate the increasing demand for charging services. Similarly, networked stations offer remote firmware and software upgrades, a crucial component to ensuring that charging stations remain compatible with the growing number of EV models offered by the automotive industry.



## Suggested Right-Sizing Algorithm

The following is the suggested right-sizing algorithm as it pertains to electric vehicle charging in commercial real estate. This calculation is meant to assist in the development of a scalable charging solution for workplace and retail deployments. Due to the distinct nature of the charging solutions for these types of buildings, two suggested algorithms are included.



## Retail Buildings Calculation

$$\underline{[\text{Attachment Rate}] \times [\text{Parking Spaces}] \times [\text{EV penetration}]}$$

Variable definitions and recommended source for data:

### ■ Attachment rate

Ratio of the number of public charging ports per 1,000 personal electric vehicles.

*(Source: Electric Power Research Institute - Guidelines for Infrastructure Planning)*

### ■ Number of parking spaces

Total number of parking spaces available to the public at the site.

*(Source: Company's website and/or Parkopedia.ca)*

### ■ Electric vehicles registration rate (provincial)

Ratio of the number of electric vehicles registered in the year over the total number of vehicles registered in the same year.

*(Source: Statistics Canada. Table 20-10-0021-01 New motor vehicle registrations)*

## Workplace Buildings Calculation

$$\underline{[\text{Renters' ratio}] \times [\text{Number of Employees}] \times [\text{EV penetration}]}$$

Variable definitions and recommended source for data:

### ■ Renter's ratio

Ratio of the number of renters over the total number of households in the member's province.

*(Source: Statistics Canada (2018) - Housing in Canada: Key results from the 2016 census)*

### ■ Number of employees

Total number of employees working in the facility.

*(Source: Internal information and/or company's website)*

### ■ Electric vehicles registration rate (provincial)

Ratio of the number of plug-in electric vehicles registered in the year over the total number of vehicles registered in the same year.

*(Source: Statistics Canada. Table 20-10-0021-01 New motor vehicle registrations)*

## Power Management Options

Network functionality also ensures that the charging ecosystem can engage with power management offerings from select service providers. These software options, which manage the way the charging stations interact with the electrical infrastructure of the site, are often broken down into two overarching models:

### Power Limiting

Power limiting technology is invaluable for workplace or retail sites looking to avoid an increase in utility expenses upon the installation of EV charging stations. By offering fixed, schedule, or building systems-based charging models, power limiting effectively manages the flow of electricity from the grid to active stations, minimizing increases in demand charges and ensuring charging is occurring at an ideal rate. Figure 1 illustrates the ways in which a power limiting model can help avoid these charges by monitoring panel output and throttling it past a certain point of consumption. Depending on the region, this software could help an organization save monies on their monthly utility bill.



### Power Sharing

Power sharing technology will allow networked charging stations to “share” the available capacity from the existing electrical system. As upgrading an electrical system is often cost-prohibitive (depending on the site configuration, doing so can cost tens of thousands of dollars), deploying power sharing technology can be a far more fiscally responsible solution for many sites eager to offer charging services.

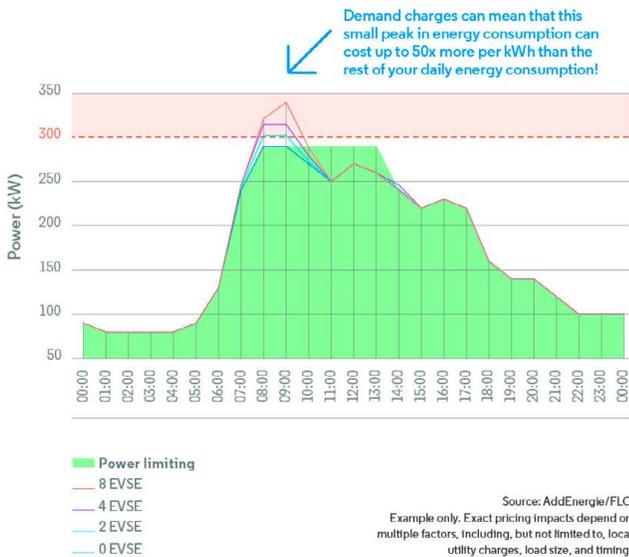


Figure 1

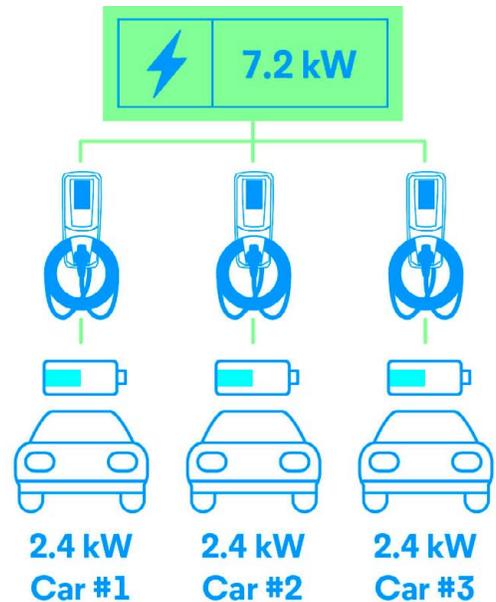


Figure 2

## Installation & Commissioning

The installation and commissioning process for EV chargers is not dissimilar from other electrical contracting work. Working with a solutions provider to identify certified electrical contractors that have experience installing EV charging infrastructure is recommended, but not entirely necessary. As with any contracting work, soliciting quotes from several contractors prior to choosing an installer will assist in mitigating installation costs for the project. Depending on the breadth and scope of the charging solution, the installation process can take anywhere from several hours to several days.

Identifying and obtaining all necessary permits pertaining to the installation of a charging project is essential. Depending on regional requirements, these permits can take time to acquire and should be requested as far in advance as possible.

Commissioning charging stations is a process usually done in concert with the charging solutions provider. This process involves activating the stations and running a series of diagnostic tests to ensure a station is connected to the grid and ready to charge; in any instance whereby the charger features power management solutions and is connected to a support network, additional tests and software updates may also occur during this process.



## Post-Deployment & Support

### Signage

One of the most effective ways to ensure that EV charging stations are utilised properly at a workplace or retail site is signage. Signage serves the dual purpose of informing EV drivers that they can find charging stations at the site and educating them as to the rules regarding these stations. While many charging solutions providers feature a mobile application to help drivers locate charging sites as they travel, they do not offer details as to the specific rules mandated by each site owner; consequently, signage is necessary to steer EV drivers to the stations and ensure they use them properly. There are three types of signage that should be considered for commercial EV charging applications:

#### Directional Signage

Should be placed off-site and along transit corridors to inform EV drivers that charging stations are available at the site.

#### Wayfaring Signage

Should be on-site to direct EV drivers to the parking spaces designated for charging.

#### Station Signage

This signage should inform the EV drivers about the rules of using the charging station and should communicate the following information:

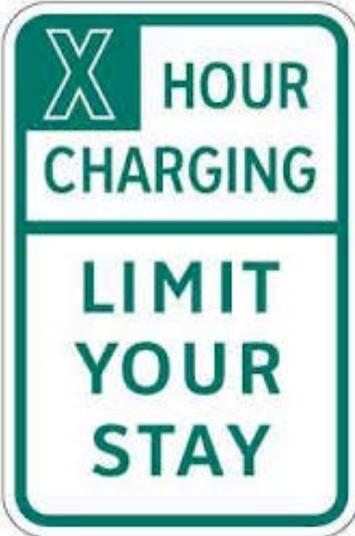
- Hours of availability for the charging station,
- Costs (if any) associated with using the charger,
- Who can use the charger (general public, employees, fleet vehicles, etc.),
- Reservation policy, if it exists.

As EV chargers often overlap with traditional parking spaces, there can be instances whereby individuals (knowingly or unknowingly) block access to the charger. As such, deploying signage that clearly identifies the space as dedicated to EV charging is necessary to ensure access to these valuable assets. Site signage should be pronounced and vivid (some sites even go so far as to paint the entire parking spot), making clear the rules and regulations surrounding proper use of the space, as well as any potential penalty for misuse.

Signage is one of the most important factors contributing to the seamless integration of charging infrastructure into a workplace or retail environment, as it can help avoid frustrations between employees, consumers, and combustion engine drivers who are still learning to navigate the nuances of parking spaces dedicated solely to EV charging



Examples of Proper Signage



## Data, Analytics and Access

Some charging solutions providers will leverage the network functionality of their stations and provide detailed data and analytics options for their clients. These analytics can provide valuable insights into the usage and uptake of an investment into EV charging technology, such as:

### **Growth in number of users (unique)**

Tracking the growth in the number of unique users allows a site manager to evaluate the return on investment of the charging infrastructure, and to plan for future potential increase in charging station demand.

### **Average overstay duration**

Tracking the average overstay duration allows a site owner to evaluate whether people are staying longer than needed to charge their vehicles. Reducing overstay duration could allow more EV drivers to use the site's chargers.

### **Average station daily usage duration**

Tracking the average station daily usage duration allows a site manager to evaluate site traffic. The longer this duration, the more the site is used. If this duration is more than half of the site opening time, adding additional chargers could prevent situations where EV drivers can't find an available charger.

### **Growth in number of sessions**

Tracking the growth in number of sessions over a period (monthly or yearly) facilitates planning for how many additional chargers may be needed in the future.

These insights are valuable for all commercial applications and illustrate the type of value-added services available from certain solutions providers dedicated to providing top-of-the-line charging experiences for their clients. Similarly, certain providers make the analytics and insights available directly to the consumer, oftentimes via a web portal or virtual dashboard.



Other valuable insights that could be offered by a charging network provider include:

**Gross CO2 savings**

Tracking gross CO2 savings allows workplace and retail sites to quantify their sustainability performance.

**Net CO2 savings**

Tracking net CO2 savings, and its growth, allows workplace and retail sites to evaluate if their sustainability performance is improving.

**Mean time to restore service (MTTRS)**

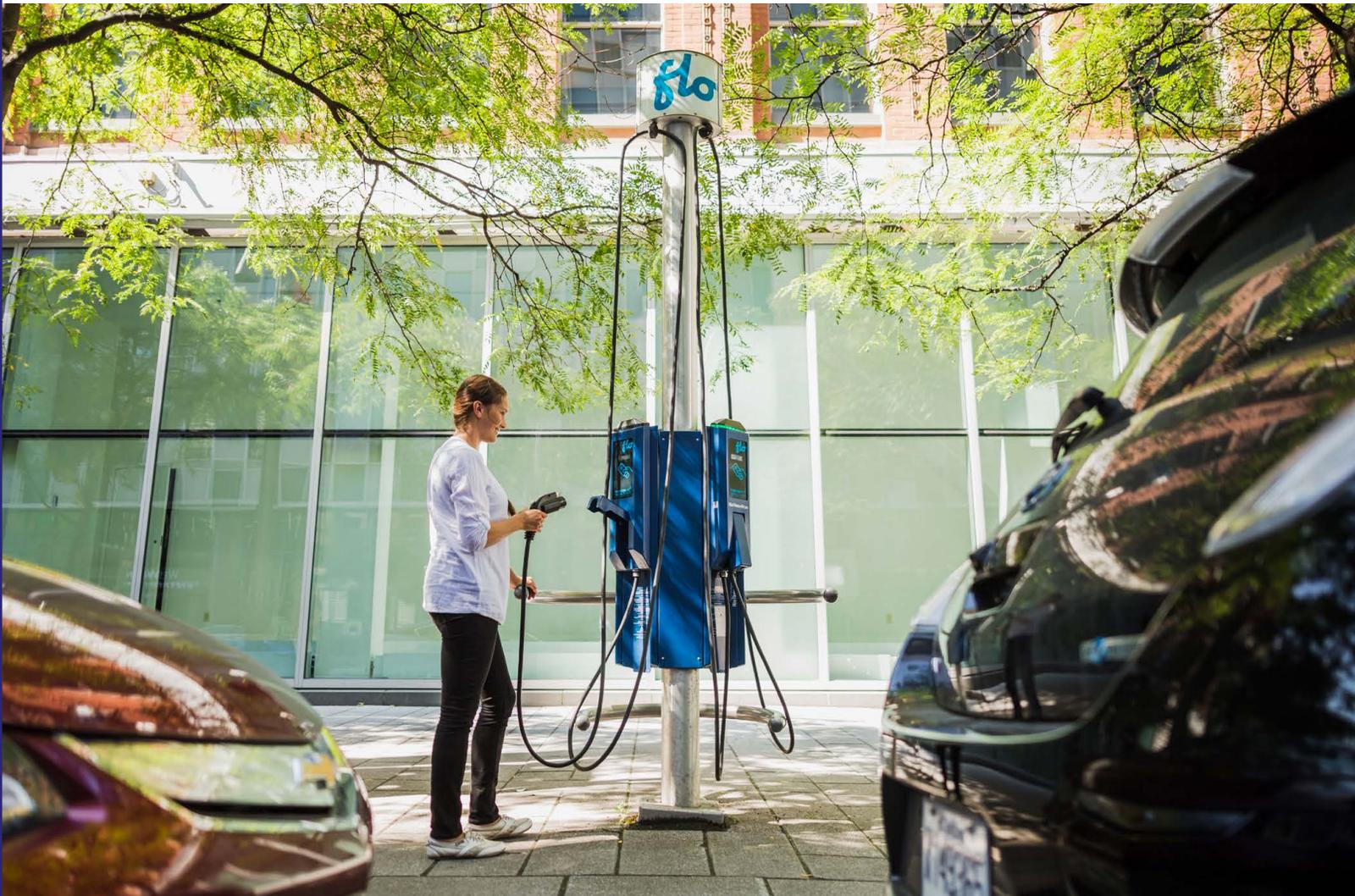
Tracking the mean time to restore service allows a site manager to estimate how long a charging station might be without service until it is back online.

**Uptime**

Tracking a site’s uptime allows a site manager to determine what percentage of a period the chargers are available to those who need charging services.

**Component Failure**

Tracking the type of component breakdown allows a site’s manager to understand the most vulnerable components of its charging stations and to take precautionary maintenance measures to protect them and extend their lifespan.



## Best Practices – Workplaces

### Onboarding & EV Etiquette

For workplaces, onboarding their employees and educating them as to the nuances of the charging policies they hope to implement is the best practice for ensuring optimal use of their electric vehicle charging stations. This can be a project undertaken by human resources, a facilities manager, a sustainability director, or even a committee formed via approval from management. A clearly defined workplace charging policy should consider items such as:

### Charging Priority

When deciding who will get to use the chargers and in what order, it makes the most sense to assign priority to those employees who are unable to charge at home or who must commute long distances to and from the workplace.

### Station Turnover

Since most EVs will not require a full day to fully recharge their battery at a Level 2 station, implementing a policy that sees fully or mostly charged EVs moving to accommodate those still requiring a charge is recommended. Certain workplaces designate a time to do so (such as suggesting a morning/afternoon rotation, with the swap occurring at the onset of lunch), while others prefer to simply ask employees to move their EV during the day when their charge is complete or has reached a certain percentage of their battery capacity. However, in an ideal workplace charging scenario, there is a charging station available for every potential EV driver.

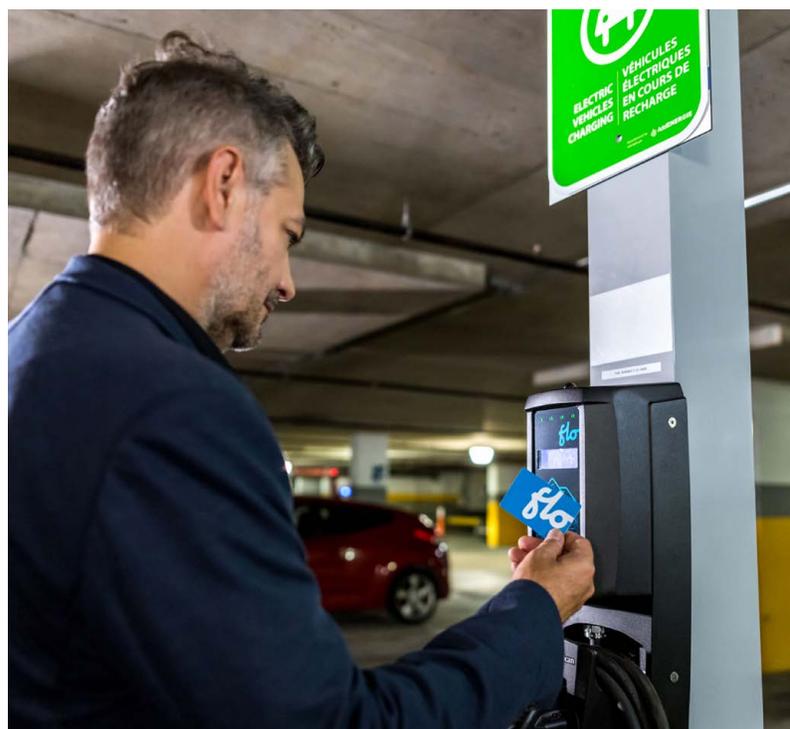
### Station Intent

In any situation in which a workplace uses EV chargers for both employees and other applications, such as fleet, it is imperative that these applications be kept separate. Fleet charging stations should be kept separate from those of general use and should be clearly designated as such.

As previously mentioned, properly demarcating parking spaces designated for charging, and clearly stating the penalty for blocking these spaces, will assist in preventing “ICEing” (the process whereby a combustion vehicle or a fully charged EV blocks an available charger).

### Billing Practices

A common question pertaining to EV charging infrastructure for workplaces revolves around the idea of charging a fee to employees or visitors for the use of these services. While there are certain instances whereby offering free charging solutions to employees can be a viable option, and doing so provides a significant value that can incentivize individuals to purchase an EV, many charging solutions providers recommend charging a fee for a variety of reasons. Free charging does not incentivize an employee to move their EV after they have fully completed a charge, and therefore reduces the efficiency of the charging services being offered. Similarly, offering free charging services at work can have the unintended effect of over-incentivizing workplace charging over home charging, a situation that can create frustrations and tensions in a business environment. Therefore, charging a nominal flat fee per session or a small hourly fee is recommended for workplace charging deployments.



## Best Practices – Retail

### Billing Practices

Billing modes for retail sites are somewhat less complicated than those for the workplaces. Unless there is a particular imperative for offering free charging (such as publicity or subsidized utility costs), most retail sites will charge visitors for the use of charging stations. In these scenarios, a fixed fee attached for the cost of the total session or an hourly fee for continued use are the most common billing solutions. Choosing a solutions provider that offers flexible billing and can facilitate a variety of modes based on specific requirements will help ensure that the charging stations are being utilized in the most efficient manner possible, while helping to recoup the costs of installing the charging stations.

### EV Etiquette at a Retail Site

In conjunction with effective signage, enforcing proper charging station etiquette at a retail site will help reduce frustration among EV drivers who frequent the location. Some site owners and organizations choose to employ a parking attendant or security officer who can enforce site rules and regulations regarding EV charging; however, this is not a viable solution for all sites. Clearly communicating potential penalties (including administrative tickets and towing) and instituting billing models that prevent overstay (such as charging an increased fee per hour after the first four hours) have also proven to be effective deterrents for “ICEing” at retail sites.



## Conclusion

The continued integration of electric vehicles into the transportation and automotive industries is an inevitable facet of the future. With electric vehicle charging technology currently in its infancy, those commercial real estate developers, site owners, and workplaces that embrace this exciting new technology could better position themselves for the inevitable rise in demand for charging services.

We hope that this guide can provide an introduction to the technology and benefits associated with EV charging and offer instructions on how to engage in a thorough and vendor-agnostic procurement process for electric vehicle charging infrastructure.

**“EV Charging is yet another place where sustainability meets innovation and produces enhanced tenant value – so understanding how best to capture this new value will be critical for property managers for years to come.”**

**Benjamin L. Shinewald**  
President and Chief Executive Officer  
BOMA Canada



## Citations

1. Global EV Outlook 2017, the International Energy Agency (IEA), Retrieved November 27, 2017, from: <https://www.iea.org/publications/freepublications/publication/GlobalEVOutlook2017.pdf>
2. Transport Canada's 2017-2020 Departmental Sustainable Development Strategy (DSDS), Retrieved March 8, 2018, from: <https://www.tc.gc.ca/eng/2017-2020-departmental-sustainable-development-strategy.html>
3. Sources of Greenhouse Gas Emissions, United States Environmental Protection Agency, Retrieved March 30, 2018 from: <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>
4. Navigant Research, from: <https://insideevs.com/news/326503/navigant-annual-plug-in-electric-car-sales-in-north-america-to-exceed-11-million-by-2024/>
5. BC Hydro, "How much does owning an electric vehicle cost? Comparing long-term ownership costs" from: <https://electricvehicles.bchydro.com/learn/costs-of-electric-vehicles>
6. Reuters, from: <https://graphics.reuters.com/AUTOS-INVESTMENT-ELECTRIC/010081ZB3HD/index.html>
7. Guidelines for Infrastructure Planning: An Explanation of the EPRI Red Line/Blue Line Model (2014)
8. Internal Report, Greenhouse Gas Emissions Reductions at Commercial Sites, FLO Services Inc., 2020
9. U.S. Department of Energy, Workplace Charging Challenge, from: [https://www.energy.gov/sites/prod/files/2017/01/f34/WPCC\\_2016%20Annual%20Progress%20Report.pdf](https://www.energy.gov/sites/prod/files/2017/01/f34/WPCC_2016%20Annual%20Progress%20Report.pdf)
10. Clean Air Research BC, "Clean Air Benefits From Electric Vehicles", from: [https://www.fraserbasin.bc.ca/\\_Library/CCAQ\\_BCCLEAR/bcclear\\_project\\_air\\_from\\_evs-bailie.pdf](https://www.fraserbasin.bc.ca/_Library/CCAQ_BCCLEAR/bcclear_project_air_from_evs-bailie.pdf)
11. Electric Mobility Canada, retrieved 10-09-2020, here: <https://emc.mec.ca/evse-101/workplace/>
12. AAA Survey 2018, from: <https://newsroom.aaa.com/2018/05/1-in-5-us-drivers-want-electric-vehicle/>
13. Internal Report, Commercial Site Charging Session Duration, FLO Services Inc., 2020
14. Center for Sustainable Energy (2016). California Air Resources Board Clean Vehicle Rebate Project, EV Consumer Survey Dashboard. Retrieved November 27, 2017, from: <http://cleanvehiclerebate.org/survey-dashboard/cv>